Flora of the Southern and Mid-Atlantic States

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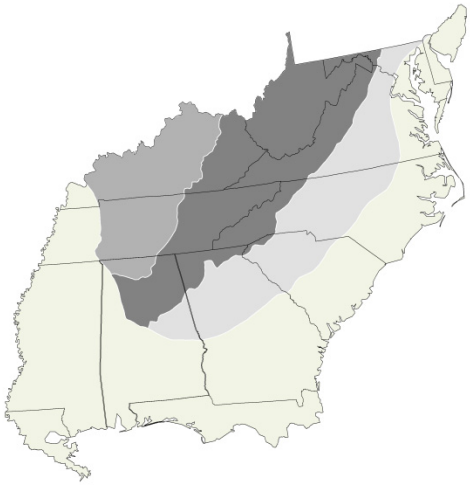

by
Alan S. Weakley
University of North Carolina Herbarium (NCU)
North Carolina Botanical Garden
University of North Carolina at Chapel Hill
Campus Box 3280
Chapel Hill NC 27599-3280

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374. PHRYMACEAE *Schauer 1847 (Lopseed Family) [in LAMIALES]* *836*
375. PAULOWNIACEAE *Nakai 1949 (Paulownia Family) [in LAMIALES]* *837*
376. OROBANCHACEAE *Ventenat 1799 (Broomrape Family) [in LAMIALES]* *837*
377. LENTIBULARIACEAE *Richard 1808 (Bladderwort Family) [in LAMIALES]* *845*
378. ACANTHACEAE *Durande 1762 (Acanthus Family) [in LAMIALES]* *848*
379. BIGNONIACEAE *A.L. de Jussieu 1789 (Bignonia Family) [in LAMIALES]* *853*
382. VERBENACEAE *J. St.-Hilaire 1805 (Verbena Family) [in LAMIALES]* *854*
384. MARTYNIACEAE *Stapf 1895 (Martynia Family) [in LAMIALES]* *857*
389. AQUIFOLIACEAE *Bartling 1830 (Holly Family) [in AQUIFOLIALES]* *857*
391. CAMPANULACEAE *A.L. de Jussieu 1789 (Bellflower Family) [in ASTERALES]* *861*
397. MENYANTHACEAE *Dumortier 1829 (Buckbean Family) [in ASTERALES]* *867*
398. GOODENIACEAE *R. Brown 1810 (Goodenia Family) [in ASTERALES]* *868*
399. CALYCERACEAE *R. Brown ex Richard 1820 (Calycera Family) [in ASTERALES]* *868*
400. ASTERACEAE *Dumortier 1822 or* ***COMPOSITAE*** *Giseke 1792 (Aster Family) [in ASTERALES]* *869*
405. ADOXACEAE *Trautvetter 1853 (Moschatel Family) [in DIPSACALES]* *980*
406a. DIERVILLACEAE *(Rafinesque) Pyck 1998 (Bush-honeysuckle Family) [in DIPSACALES]* *984*
406b. CAPRIFOLIACEAE *A.L. de Jussieu 1789 (Honeysuckle Family) [in DIPSACALES]* *985*
406c. LINNAEACEAE *(Rafinesque) A. Backlund 1998 (Twinflower Family) [in DIPSACALES]* *988*
406d. DIPSACACEAE *A.L. de Jussieu 1789 (Teasel Family) [in DIPSACALES]* *988*
406e. VALERIANACEAE *Batsch 1802 (Valerian Family) [in DIPSACALES]* *989*
410. PITTOSPORACEAE *R. Brown 1814 (Pittosporum Family) [in APIALES]* *990*
411. ARALIACEAE *A.L. de Jussieu 1789 (Ginseng Family) [in APIALES]* *990*
413. APIACEAE *Lindley 1836 or* *993*
UMBELLIFERAE *A.L. de Jussieu 1789 (Carrot Family) [in APIALES]* *993*

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INTRODUCTION

The Flora

Floras serve as the basic reference of the plant biota of an area; they are critical tools that serve botanists, conservationists, ecologists, foresters, gardeners, agronomists, researchers, and the general public. In the nineteenth and early twentieth centuries, the botanical exploration of an area and writing a flora to summarize that information was seen as a basic societal need leading to the discovery of economically valuable information. Financial support for the research and writing of floras has waned in recent decades, though, as they have been increasingly regarded as "old science" and resources have shifted to areas of plant science seen as more "cutting edge." Even in taxonomic research, the advent of molecular techniques has largely supplanted detailed taxonomic research (at generic levels and below) and the writing of floras, and the great majority of papers in plant systematics now address phylogenetic relationships within a particular group of plants, and mostly at higher taxonomic levels. Traditional monographic taxonomy, with descriptions of taxa, keys to facilitate their identification, distribution maps, and assessments of habitat and relative abundance or rarity, has become increasingly rare.

Yet, paradoxically, the societal uses and needs for the translation of taxonomic information to a useable form, such as floras, have never been greater. Globalization of human societies and economies has meant that plants are regularly introduced far away from their regions of nativity, and many become established and can be either benign or cause economic and conservation damages. Increasing human utilization of land resources has fueled a biodiversity crisis, with many species now considered imperiled. In the United States and elsewhere, this has resulted in considerable governmental and nongovernmental activity focused on biodiversity inventory and conservation, "recovery" of endangered and threatened species, ecological studies and ecological restoration, and assessment and suppression of invasive exotics. All these activities require an accurate and sophisticated understanding of the flora of an area. These activities also generate new information about the taxonomy, distribution, and conservation status of components of a region's flora which then needs to be incorporated into new iterations

In the southeastern United States, the publication thirty-seven years ago of the Manual of the Vascular Flora of the Carolinas, by A.E. Radford, H.E. Ahles, and C.R. Bell (Radford, Ahles, & Bell 1968), was a landmark. In the decades since its publication, it has served as the primary reference for the identification of plants in the Carolinas, and throughout the southeastern United States (since most other states were not covered by comparable, recent references. The effort to research and write the Manual of the Vascular Flora of the Carolinas took about 11 years, and resulted in a series of publications, the Guide to Vascular Flora of the Carolinas (Radford, Ahles, & Bell 1964), the Atlas of the Vascular Flora of the Carolinas (Radford, Ahles, & Bell 1965), and finally the Manual itself (1968). Once published, the existence of "the Manual" helped generate an interest in and further studies of the flora of the region; since then, many additional species have been documented as part of the region's flora, additional alien species have become naturalized, new species have been described, monographs have given new taxonomic insights into groups, nomenclature accepted in 1968 has been found to be invalid, new and more reliable keys have been developed, and systematic treatments have changed and advanced. Increasingly, identification of the flora of our area (and other states of the Southeast and Mid-Atlantic) by academic researchers, agency personnel, and the interested public is hampered by the lack of an up-to-date flora. Without such a flora, identification must involve reference to herbaria and thousands of monographs, papers, and other floras – resources not readily available to many people who need them. The absence in the region of a single-source modern standard for the systematic treatment, nomenclature, and identification of the flora compromises scientific studies, ecological research, and agency inventory, management, and monitoring of ecosystem and species biodiversity.

Chapter 1 consists of a new treatment of the flora of the Carolinas, Virginia, and Georgia, to fill the need for a new standard reference to aid in the consistent identification of the flora of the region. While building on the tradition of the Manual, the Flora is not a revision or second edition; it takes some different approaches, has features the Manual lacks, lacks features the Manual has, and has an expanded geographic scope. At the present time, the Flora includes treatment of all species in the flora area of Delaware, Virginia, West Virginia, North Carolina, South Carolina, Georgia, northern Florida (the Panhandle and northeastern Florida, south to and including Dixie, Gilchrist, Columbia, Union, Bradford, Clay, and Duval counties), Alabama, Mississippi, Tennessee, Kentucky, the District of Columbia, and Maryland, and portions of the additional states of New Jersey (southern New Jersey, south of and including Monmouth and Burlington counties), and Louisiana (the Florida Parishes, east of and including West Feliciana, East Baton Rouge, Ascension, St. James, St. John the Baptist, St. Charles, Jefferson, and Plaquemines parishes) (see Figure 1.A.). Approximately 6800 taxa are keyed and treated, making the Flora a comprehensive resource for understanding the flora of all of the Southeastern United States east of the Mississippi River and south of the Ohio River and Mason-Dixon Line, excluding peninsular Florida.

Sources of information.
This new flora is based on all resources available: herbarium specimens, published literature, grey literature, Natural Heritage databases and rare species lists, and personal communication with a regional network of botanists and taxonomic experts. Herbarium specimens have been consulted at major institutions in the region.

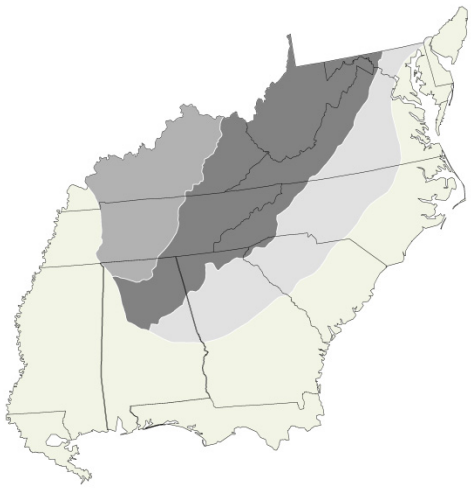

Figure 1.A. Map of the area covered by the Flora.

Criteria for inclusion of taxa.

One of the first challenges that the author of a flora encounters is to decide the criteria for the inclusion of taxa. The general rule in most floras can be simply summarized as "all native taxa and naturalized alien taxa," but within this simplistic phrase hide many complicated issues, and floras often differ widely in the actual criteria and judgments that they apply (Pyšek et al. 2004; Palmer, Wade, & Neal 1995). In particular, coverage of alien species is very uneven in floras, and the frequent exclusion of many alien species from floras hampers ecological studies, conservation efforts, and efforts to minimize the ecological and economic impacts of invasive aliens.

The following categories of taxa are included and treated fully as "primary" species:
1. Native taxa documented from the Flora (Georgia, South Carolina, North Carolina, Virginia, West Virginia, Delaware, and northern Florida, Alabama, Mississippi, Tennessee, Kentucky, Maryland, District of Columbia, Maryland, eastern Louisiana, and southern New Jersey), whether extant or presumed extinct. Some authors, such as Isely (1990), have "excluded" taxa from a flora if they believed them to be extinct or extirpated. This philosophy seems poorly considered: these taxa may prove not to be extinct or extirpated and their inclusion in the Flora will facilitate possible rediscovery, even if never found again specimens of them in the herbarium need to be identified or confirmed, and their former existence in the region should be documented.
2. Alien taxa introduced by whatever means and demonstrably established and reproducing (sexually or vegetatively) as a component of the flora. Parallel to #1 above, established alien taxa which have been presumably eradicated (such as *Striga asiatica* in the Carolinas) are included, as their eradication may not have been effective, they may be reintroduced, specimens need to be identifiable using the Flora, and their former existence should be documented.
3. Alien taxa substantially cultivated in the Flora area as crops, such as *Triticum aestivale*, *Zea mays*, *Vitis vinifera*, and *Pinus clausa*. Such species are variably represented in herbaria, and are often included in floras only if one or more herbarium specimens indicate that the species is persisting, or has been collected around a dump or in the edge of a field "out of cultivation." This seems an arbitrary criterion to apply to species which are among the most commonly seen and economically most important in a region, and may cover many thousands of acres or square miles in the region covered by the flora.

Additional categories of taxa are included and treated as "secondary" species:
1. Native taxa with uncertain documentation, this varying from literature reports not definitely verifiable with specimens (some of these old and some new), to sight reports regarded as probably correct. Taxa in this category are included as secondarily-treated taxa, and their imperfect documentation is described.

Species which have been reported from the Flora area but which are excluded for one reason or another are also listed and the reason for their exclusion mentioned or discussed.

Taxonomic philosophy. Taxonomic treatments generally follow recent monographic and revisionary work, but an effort has been made to provide a certain rough consistency of "splitting" vs. "lumping" across different taxonomic groups. As is generally true in recent treatments, generic and family concepts are often narrower than those used in the Radford, Ahles, and Bell (1968) Manual, based on new evidence, including (but not limited to) cladistic methods applied to morphologic and molecular data. Ironically, these results have often resulted in a validation of earlier, narrower generic (and familial) concepts espoused by J.K. Small, P.A. Rydberg, and others (see Weakley 2005 for extensive discussion). Varieties are less frequently recognized than by

Fernald (1950), though a considerable number of species and infraspecific taxa "lumped" by Radford, Ahles, and Bell (1968) are recognized (generally following more recent monographic or revisionary work). Some taxa not formally recognized are discussed and characters for their recognition provided in the text, to draw attention to putative taxa that may warrant recognition after further evaluation.

Format and features.

Detailed keys. Keys have been subjected to rigorous testing in the field and herbarium by hundreds of users. To the degree feasible, keys are structured to emphasize characters that are readily observable and available for long parts of the year, such as vegetative characters; this is not feasible for all groups, of course. Multiple characters are provided. Terminology strives to avoid abstruse technical terms which do not significantly add meaning (for some genera, an introduction to morphological characters and terms used is provided as "Identification notes" preceding the key). Geographic distributions and habitats are sometimes included in the keys as pragmatic, useful, secondary "characters," but are placed in brackets to indicate that they are not "true" characters. The keys include all species from the primary and secondary flora areas (North Carolina, South Carolina, Virginia, Georgia, Alabama, Mississippi, Tennessee, Kentucky, West Virginia, Maryland, Delaware, the District of Columbia , and parts of Florida, Louisiana, and New Jersey). In some cases, several alternate keys are provided. The primary emphasis of the keys is pragmatism – effective and efficient identification. For this reason, a key to a genus sometimes includes closely similar taxa not in the genus that may be mistaken for it. Another example is that the "family key" to ferns and fern allies is actually a key to genera, allowing an emphasis in the key on readily observable characteristics, rather than the technical characters often needed to distinguish fern families. Keys are based on herbarium specimens, though reference is made when characters based on live or fresh plants may differ from those of pressed and dried specimens. Some keys have been adapted from literature cited; where the adaptation is particularly close, credit is given to the source by specific citation.

Habitat. Information is provided about the habitat of the taxon. This information is largely from the field experience of the author, supplemented by information from other botanists, from herbarium labels, and from the literature. For species with wide ecological amplitudes, the habitat may be described simply and broadly ("a wide variety of upland forests"), while the habitat of more localized, specialized, or rare taxa may be described in considerable detail ("moist outcrops of calcareous to semi-calcareous metamorphic rocks, such as mylonite or marble, near waterfalls in humid escarpment gorges with high rainfall, at low elevations").

Native status. The native or alien status is stated. Also, an asterisk prior to the species' name indicates that it is considered alien throughout the primary flora area. Some past floras, including Radford, Ahles, and Bell (1968), were haphazard in their inclusion of this information, which is a very important attribute of each recognized taxon. If there is a question, it is mentioned or discussed. For aliens, an opinion is given as to whether the taxon is naturalized, persistent, waif, etc. in the primary flora area.

Flowering/fruiting dates. Flowering and fruiting dates are provided for the primary flora area. These are derived from herbarium specimens viewed by the author (collected from within the Flora area), from field observations by the author (within the Flora area), and from literature cited.

Distribution of species. A statement of the rangewide distribution of each taxon treated is provided. This is based on published distribution maps and distribution statements in other floras, amended and improved by additional herbarium specimens and published records (such as the "Noteworthy Collections" section in the journal Castanea). The distribution within the primary area is provided by state and physiographic province.

These distribution statements are being replaced by a map. The map shows distribution within the Flora area symbolically, with each state × physiographic province area, except that on the maps, the very small areas of the DC Piedmont, the DC Coastal Plain, and the DE Piedmont are not shown separately from the MD Piedmont, the MD Coastal Plain, and the MD Piedmont, respectively. The native/alien status of the taxon is shown by squares for native occurrence and triangles for alien occurrence. Note that some species have distributions including both alien and native distributions, so *Dionaea muscipula* for instance is native in the Coastal Plain of NC and SC, but alien in the Coastal Plain of FL. The abundance in that state × physiographic province area is shown by the symbol, an open symbol is rare, a symbol with a dot is uncommon, and a filled symbol is common.

In the lower right corner is a space designated for distributional information. If the species is endemic to the Flora Area, you will see "EN." If the species is alien, you will see the region of the world to which it is native. If the species is native but not endemic, you will see a compass rose. Eight arrows depict the native distribution of the taxon outside of the Flora area. Arrows can be long (common at least somewhere in that region), or short (only uncommon or rare in that region).

The regions to which the eight arrows point are:

N arrow -- ne. North America (PA and n. NJ north to the Canadian maritime provinces, west through QC to se. ON and e. and s. OH);

NW arrow -- nw. North America (w. OH, MI, w. ON, and NU west to AK, BC, and OR, north of and including n. MO, NE, WY, ID, and OR);

W arrow -- w. United States (the western "Southeast" of trans-Mississippi LA, AR, s. MO, OK, and e. TX), west to sw. United States;

SW arrow -- Mexico, Central America, and South America;

S arrow -- peninsular FL;
SE arrow (dashed to indicate oversea) -- West Indies (including Bahamas) and Bermuda;
E arrow (dashed to indicate oversea) -- Asia and/or Africa;
NE arrow (dashed to indicate oversea) -- Europe.

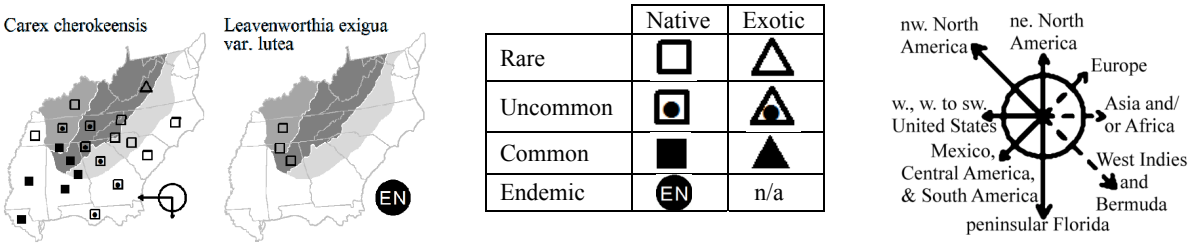

Figure 1.B: Sample distribution maps and distribution map key

Literature. Nearly all genera have citations to recent, pertinent systematic literature, as well as more limited citations to literature on ecology and population biology. The intent is to provide the user with access into more detailed literature, and to document the literature basis of the treatment followed in the Flora. About 2100 references have been consulted and are cited.

Synonymy. Cited synonymy is provided to regional floras, monographs, revisions, and other significant floristic treatments. This allows comparison of the treatment in the Flora to other treatments, and convenient access to the other treatments. Synonymy is provided comprehensively for the following floras: Radford, Ahles, and Bell (1968), as RAB; Small (1933, 1938), as S; Fernald (1950), as F; Gleason (1952), as G; Godfrey and Wooten (1979, 1981) as GW; Vascular Flora of the Southeastern States (Cronquist 1980, Isely 1990) as SE; Wofford (1989) as W; Gleason and Cronquist (1991) as C; Kartesz (1999) as K or K1; Kartesz (2010) as K2; and Flora of North America (1993b, 1997, 2000, 2002a, 2002b, 2003a, 2004b, 2005, 2006a, 2006b, 2006c, 2007a, 2009, 2010) as FNA; Brown & Brown (1984) as Md; Wunderlin & Hansen (2003) as WH; Strausbaugh & Core (1978) as WV. Synonymy used in recent monographs and revisions is also cited. All names known to me to be attributed to the ***Flora*** area in other floras, monographs, and revisions are accounted for.

Comments and discussion. Miscellaneous comments and discussion are provided for many species and genera, including discussion of biogeography, more details on distribution of rare species, additional notes on identification not included in the keys, information of particular interest on species biology and ecology, habitat, uses, discovery in the flora area or a state, etc. These "idiosyncratic comments" add to the general usefulness and interest of what is intended to be a rigorous, practical, and interesting flora.

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KEYS TO FAMILIES AND GENERA

ARTIFICIAL KEY TO THE GENERA AND FAMILIES OF LYCOPHYTES AND PTERIDOPHYTES

1 Plant a free-living gametophyte, consisting of filaments or thalli, generally a single cell thick, usually with abundant single-celled gemmae .... **Key A**
1 Plant a sporophyte, consisting of a stem, rhizome, corm, or crown producing well-developed leaves, > 1 cell thick (except in *Didymoglossum*, *Crepidomanes*, *Vandenboschia*, and *Hymenophyllum*), generally reproducing by spores.
2 Plant aquatic, either floating and unattached, or rooting and largely submersed ..... **Key B**
2 Plant of various habitats, including wetlands, where sometimes growing in soils saturated or intermittently flooded, but not aquatic.
3 Leaves not "fern-like," unlobed, variously awl-shaped, scale-like, or terete ..... **Key C**
3 Leaves "fern-like," variously lobed or divided, ranging from pinnatifid to 4-pinnate.
4 Leaf blades (not including the petiole) small, < 30 cm long or wide (some species will key either here or in the next lead).
5 Epipetric or epiphytic, growing on rock, tree bark, walls, or over rock in thin soil mats or in small soil pockets ..... **Key D**
5 Terrestrial, growing in soil, not associated with rock outcrops ..... **Key E**
4 Leaf blades medium to large, > 30 cm long or wide.
6 Epipetric or epiphytic, growing on rock, walls, over rock in thin soil mats or in small soil pockets, or on tree trunks ..... **Key F**
6 Terrestrial, growing in soil, not associated with rock outcrops ..... **Key G**

Key A – Pteridophytes reduced to thalloid or filamentous, free-living gametophytes

1 Gametophytes filamentous ..... ***Crepidomanes*** (HYMENOPHYLLACEAE)
1 Gametophytes thalloid, ribbon-like and branched.
2 Gemmae absent or spathulate (> 1 cell wide) ..... ***Hymenophyllum*** (HYMENOPHYLLACEAE)
2 Gemmae uniseriate (1 cell wide) ..... ***Vittaria*** (PTERIDACEAE)

Key B – Pteridophytes and lycophytes growing as floating or rooted aquatics

1 Plant with at least some leaves palmately or pinnately lobed or 1-4× pinnately divided ("fern-like") and > 2 cm long..... ..... ***Ceratopteris*** (PTERIDACEAE)
1 Plant either a floating aquatic with leaves <5 cm long, or with clover-like or linear leaves.
2 Plant a floating aquatic.
3 Leaves < 1 mm long, reddish or green, without hairs on the upper surface..... ***Azolla*** (SALVINIACEAE)
3 Leaves 5-50 mm long, bright green, with obvious hairs on the upper surface..... ***Salvinia*** (SALVINIACEAE)
2 Plant a rooted aquatic.
4 Plant clover-like, with 4 leaf segments borne terminally ..... ***Marsilea*** (MARSILEACEAE)
4 Leaves linear.
5 Plants cormose or with short rhizomes; leaves numerous, undivided leaves ..... ***Isoetes*** (ISOETACEAE)
5 Plants with creeping rhizomes; leaves few, reduced to a winged petiole..... ***Pilularia americana*** (MARSILEACEAE)

Key C – Lycophytes and pteridophytes with leaves not "fern-like" (unlobed, variously awl-shaped, scale-like, or terete)

1 Stem obviously jointed; leaves scale-like, borne in a whorl at each of the distant joints; spores borne in a terminal strobilus with peltate scales ..... ***Equisetum*** (EQUISETACEAE)
1 Stem not jointed; leaves scale-like or larger, but if scale-like not borne in whorls at distant joints; spores borne variously, but if in a terminal strobilus the scales not peltate.
2 Leaves linear, grass-like, 1-50 cm long, 20× or more as long as wide.
3 Leaves solitary (though often the internodes very short from a thin, creeping rhizome); sporangia borne in a spherical (ca. 3 mm in diameter) sporocarp on a separate branch from the rhizome..... ***Pilularia*** (MARSILEACEAE)
3 Leaves numerous from a corm or short rhizome; sporangia either borne in the expanded leaf bases (*Isoetes*) or in 2 rows at the tip of the linear fertile leaves (*Schizaea*).
4 Leaves straight, arching, or flaccid, from a 2-3-lobed corm; sporangia borne in the expanded, hyaline leaf bases..... ..... ***Isoetes*** (ISOETACEAE)
4 Leaves notably spiral-curly, from a short rhizome; sporangia borne in 2 rows at the tip of the linear fertile leaves..... ..... ***Schizaea*** (SCHIZAEACEAE)
2 Leaves various (scale-like, awl-like, moss-like, or flat), but not linear and grass-like, mostly 1-10× as long as wide.
5 Leaves inconspicuous, reduced to a few nerveless scales (< 1.5 mm long), the internodes much longer than the leaves; sporangia yellowish, 3-locular, 1-2 mm in diameter; stems upright, repeatedly branched dichotomously ..... ***Psilotum*** (PSILOTACEAE)
5 Leaves either larger or, if scale-like, with nerves and longer than the internodes (the leaves thus overlapping); sporangia yellowish to brownish, 1-locular, < 1 mm in diameter; stems either subterranean or surficial rhizomes or erect or ascending (and sometimes dichotomously branched in whole or in part in *Huperzia*, *Diphasiastrum*, and *Dendrolycopodium*).
6 Plant with leaves very numerous and overlapping along the creeping, ascending, or erect stems, the leaves usually scale-like or awl-like, 0.5-2 (-3) mm wide, typically acute, acuminate, or hair-tipped; sporangia either in terminal strobili (axillary to specialized, smaller leaves) or axillary to normal leaves.

7 Sporangia borne in flattened or quadrangular strobili sessile at the tips of leafy branches; spores and sporangia of two sizes, the megasporangia larger and borne basally in the strobili ..... ***Selaginella*** (SELAGINELLACEAE)
7 Sporangia borne either in the axils of normal foliage leaves, or in strobili sessile at the tips of leafy branches or stalked on specialized branches with fewer and smaller leaves; spores and sporangia of one size.
8 Leafy stems erect, simple or dichotomously branched, the ultimate branches vertically oriented; sporophylls like the sterile leaves or only slightly reduced, in annual bands along the stem; vegetative reproduction by leafy gemmae near stem apex..... ..... ***Huperzia*** (LYCOPODIACEAE)
8 Leafy stems prostrate or erect, if erect then generally branched, the ultimate branches spreading (horizontal) or ascending; sporophylls differing from sterile leaves, either broader and shorter, or more spreading, aggregated into terminal cones; lacking vegetative reproduction by gemmae.
9 Leaves herbaceous, pale or yellow-green, dull, deciduous; leafy stems creeping; rhizome dying back annually to an underground vegetative tuber at apex; [of wetlands, mostly on moist or wet sands or peats].
10 Leaves of the prostrate stems 0.5-1.2 mm wide, ciliate-toothed or not toothed; leaves of the erect stem many, overlapping, spirally arranged; leaves of the strobilus resembling leaves of the prostrate and upright stems in size and shape; upright stems 1.5-15 mm in diameter (including the leaves) ..... ***Lycopodiella*** (LYCOPODIACEAE)
10 Leaves of the prostrate stems 1.3-2.1 mm wide, not toothed; leaves of the erect stem few, not overlapping, whorled; leaves of the strobilus much reduced relative to leaves of the prostrate and upright stems; upright stems 1.5-3 mm in diameter (including the leaves) ..... ***Pseudolycopodiella*** (LYCOPODIACEAE)
9 Leaves rigid, bright to dark green, shiny, evergreen; leafy stems mainly erect, treelike, fanlike, or creeping (if creeping, then the leaves with elongate, hyaline hair-tips); rhizome perennial, elongate, surficial or subterranean; [of uplands, mostly in moist to dry soils].
11 Branches 1-5 mm wide (including the leaves), compressed to quadrangular, with 4 ranks of leaves; branching of strobilus stalks dichotomous ..... ***Diphasiastrum*** (LYCOPODIACEAE)
11 Branches 4-12 mm wide, terete (to somewhat compressed in *Dendrolycopodium obscurum*), with 6 or more ranks of leaves; branching of strobilus stalks (when present), pseudomonopodial (falsely appearing to have a main axis from which branches arise).
12 Strobili borne on elongate, sparsely leafy peduncles borne at the tips of leafy, ascending branches; leaves with attenuate, hyaline hair-tips..... ***Lycopodium*** (LYCOPODIACEAE)
12 Strobili sessile, borne directly above densely leafy portions of upright branches; leaves acuminate to acute.
13 Erect leafy stems 3-8 mm in diameter (including the leaves), treelike or fanlike, with a definite main axis; leaves acute at the apex; horizontal shoots subterranean, without winter bud constrictions .... ***Dendrolycopodium*** (LYCOPODIACEAE)
13 Erect leafy stems 10 mm or more in diameter (including the leaves), branched 1-4 times sub-dichotomously; leaves with a 0.4-1.0 mm long stiff spinule; horizontal shoots at or near the ground surface, with winter bud constrictions... ..... ***Spinulum*** (LYCOPODIACEAE)
6 Plant with leaves not as above (see below).
14 Plant with 1 (-several) leaves, the sterile leaf blade 0.3-24 cm long, ovate to lanceolate, entire-margined, obtuse, the longer fertile portion with 2 rows of sporangia somewhat imbedded in it..... ***Ophioglossum*** (OPHIOGLOSSACEAE)
14 Plant with many leaves, generally 5 or more, not divided into separate sterile and fertile segments, the leaves either (a) small, 0.3-1.6 cm long, obovate, scattered along a very thin creeping rhizome, or (b) larger, (2-) 8-30 cm long, cordate at base, the tip long-attenuate (often proliferous, bearing a plantlet at the tip).
15 Leaf blades (2-) 8-30 cm long, cordate at the base, the tip long-attenuate, often proliferous (bearing a plantlet at the tip); sporangia in indusiate sori on the undersurface; leaf texture moderately thick; rhizome erect or ascending, 1.0-1.5 mm in diameter, the leaves clustered from its tip..... ***Asplenium rhizophyllum*** (ASPLENIACEAE)
15 Leaf blades 0.3-1.6 cm long, cuneate at the base, rounded to obtuse at the tip, not proliferous; sporangia solitary in a marginal pocket on the leaf; leaf texture very thin; rhizome creeping on the surface of rock or bark, 0.1-0.3 mm in diameter, the leaves scattered along it..... ***Didymoglossum petersii*** (HYMENOPHYLLACEAE)

Key D – Small pteridophytes, epipetric or epiphytic, growing on rock, tree bark, walls, or over rock in thin soil mats or in small soil pockets

1 Leaves pinnatifid or bipinnatifid, most of the pinnae not fully divided from one another (the rachis winged by leaf tissue most or all of its length).
2 Leaves bipinnatifid, at least the lowermost pinnae deeply lobed.
3 Leaves of a very delicate texture, 1 cell thick; sori borne in cups on the leaf margins; [of rock outcrops with high air humidity].
4 Rhizomes filiform, <0.5 mm in diameter, glabrous or with sparse light-colored hairs; indusium ("involucre") bivalvate (deeply divided into 2 flaps); receptacle not exserted from between the deeply bilobed indusium..... ..... ***Hymenophyllum*** (HYMENOPHLLACEAE)
4 Rhizomes moderately stout, 0.8-1.5 mm in diameter, densely clad with dark-colored hairs; indusium ("involucre") tubular or funnelform, sometimes slightly 2-lobed; receptacle long and whiplike, exserted from the mouth of the tubular (slightly bilobed) indusium..... ***Vandenboschia*** (HYMENOPHYLLACEAE)
3 Leaves of an herbaceous, subcoriaceous, or coriaceous texture, > 1 cell thick; sori otherwise; [of various habitats, not strictly of moist sites].
5 Lowermost (and other) pinnae with numerous, rather even lobes..... ***Phegopteris*** (THELYPTERIDACEAE)
5 Lowermost pinnae with a few, irregular lobes (the upper pinnae unlobed) ..... ***Pteris multifida*** (PTERIDACEAE)
2 Leaves pinnatifid, the pinnae not lobed.
6 Leaf blades with a long-attenuate apex, blade unlobed for 1/3 its length; sori elongate ..... ***Asplenium*** (ASPLENIACEAE)
6 Leaves without a long-attenuate apex, blade lobed for most of its length; sori round.
7 Plants dwarf, the leave blades < 5 cm long; [occurring only in permanently moist habitats, as in grottoes behind waterfalls] .... ***Micropolypodium*** (POLYPODIACEAE)
7 Plants larger, the leave blades 7-30 cm long; [occurring on moist to dry habitats].
8 Leaf blade densely scaly on the lower surface; leaf segment margins entire; rhizome 1-2 mm in diameter .... ***Pleopeltis*** (POLYPODIACEAE)

8 Leaf blade scale-less on the lower surface; leaf segment margins denticulate; rhizome 3-6 mm in diameter ..... ***Polypodium*** (POLYPODIACEAE)

1 Leaves pinnate, pinnate-pinnatifid, 2-pinnate, or even more divided (the rachis naked for most of its length, often winged in the apical portion).
9 Leaves pinnate or pinnate-pinnatifid.
10 Leaves of a very delicate texture, 1 cell thick; sori borne in cups on the leaf margins; [of rock outcrops with high air humidity].
11 Rhizomes filiform, <0.5 mm in diameter, glabrous or with sparse light-colored hairs; indusium ("involucre") bivalvate (deeply divided into 2 flaps); receptacle not exserted from between the deeply bilobed indusium ..... ***Hymenophyllum*** (HYMENOPYLLACEAE)
11 Rhizomes moderately stout, 0.8-1.5 mm in diameter, densely clad with dark-colored hairs; indusium ("involucre") tubular or funnelform, sometimes slightly 2-lobed; receptacle long and whiplike, exserted from the mouth of the tubular (slightly bilobed) indusium ..... ***Vandenboschia*** (HYMENOPHYLLACEAE)
10 Leaves of an herbaceous, subcoriaceous, or coriaceous texture, > 1 cell thick; sori otherwise; [of various habitats, not strictly of moist sites].
12 Pinnae > 1 cm wide; leaves subcoriaceous to coriaceous; veins anastamosing, rejoining to form a netlike pattern ..... ***Cyrtomium*** (DRYOPTERIDACEAE)
12 Pinnae < 1 cm wide; leaves herbaceous to subcoriaceous; veins free, not rejoining.
13 Sori on the undersurface of the leaf, away from the margins ..... ***Asplenium*** (ASPLENIACEAE)
13 Sori on the undersurface of the leaf, marginal and more-or-less hidden beneath either the unmodified revolute leaf margin or under a modified, reflexed false indusium.
14 Leaf undersurface densely covered with stellate and ciliate scales ..... ***Astrolepis sinuata*** *ssp.* ***sinuata*** (PTERIDACEAE)
14 Leaf undersurface glabrous or with non-stellate scales.
15 Rachis dark-brown or purple; leaf margin unmodified, though often revolute ..... ***Pellaea*** (PTERIDACEAE)
15 Rachis green or tan; leaf margin modified into a false indusium, reflexed to cover the sori .... ***Pteris vittata*** (PTERIDACEAE)
9 Leaves bipinnate or more divided.
16 Leaf blade pentagonal or broadly triangular in outline, ca. 1× as long as wide.
17 Leaf blade pentagonal in outline, the terminal pinna by far the largest; rhizome 5-8 mm in diameter; indusia present, thick, persistent, and reniform; [introduced species, naturalized in moist ravines in SC] ..... ***Arachniodes*** (DRYOPTERIDACEAE)
17 Leaf blade broadly triangular in outline, the basal pinnae by far the largest; rhizome ca. 1 mm in diameter; indusia absent; [native species of mountain peaks of n. NC and VA] ..... ***Gymnocarpium*** (CYSTOPTERIDACEAE)
16 Leaf blade elongate, mostly lanceolate, generally > 4× as long as wide (except in *Adiantum capillus-veneris*, with leaf blade often only 1.5-3× as long as wide, but not notably triangular or pentagonal in outline).
18 Sori not marginal, either naked, or slightly to strongly hidden by indusia.
19 Leaf blades 3-12 cm long; sori elongate, covered by a flap-like, entire indusium ..... ***Asplenium*** (ASPLENIACEAE)
19 Leaf blades 4-30 (-50) cm long; sori globular, surrounded or covered by an entire, ciliate, or divided indusium.
20 Veins reaching the margin; indusium attached under one side of the sorus, hoodlike or pocketlike, arching over the sorus; petioles glabrous or sparsely beset with scales, the petiole bases not persistent ..... ***Cystopteris*** (CYSTOPTERIDACEAE)
20 Veins ending short of the margin; indusium attached under the sorus, cuplike (divided into 3-6 lanceolate to ovate lobes which surround the sorus from below) or of minute numerous septate hairs, which extend out from under the sorus on all sides; petioles often densely beset with scales, the petiole bases persistent ..... ***Woodsia*** (WOODSIACEAE)
18 Sori marginal, usually more-or-less hidden under the revolute margin of the pinnule.
21 Sori round or oblong, distinct and separate along the pinnule margins; leaves bright-green, glabrous, herbaceous, delicate, and flexible ..... ***Adiantum*** (PTERIDACEAE)
21 Sori continuous along the pinnule margins; leaves mostly dark-green or glaucous, often pubescent, coriaceous, tough, and stiff.
22 Leaves strongly dimorphic, the fertile leaves obviously longer than the sterile and with narrow elongate ultimate segments ..... ***Cryptogramma*** (PTERIDACEAE)
22 Leaves essentially monomorphic.
23 Lower leaf surfaces covered with whitish powder, otherwise glabrous or sparsely pubescent ..... ***Argyrochosma*** (PTERIDACEAE)
23 Lower leaf surfaces pubescent (or glabrous in *Cheilanthes alabamensis*), never with conspicuous whitish powder ..... ***Cheilanthes*** (PTERIDACEAE)

Key E – Small pteridophytes, terrestrial, growing in soil, not associated with rock outcrops

1 Petiole branched once dichotomously, each branch bearing 3-7 pinnae in one direction only, the outline of the blade fan-shaped, often broader than long ..... ***Adiantum pedatum*** (PTERIDACEAE)
1 Petiole not branched dichotomously, the outline of the blade either longer than broad or triangular and about as wide as long.
2 Leaves pinnatifid or bipinnatifid, most of the pinnae not fully divided from one another (the rachis winged by leaf tissue most or all of its length).
3 Sporangia borne on an erect stalk that arises at or above ground level from the petiole of the sterile leaf blade (joining the petiole of the sterile leaf above the rhizome) ..... ***Botrychium*** (OPHIOGLOSSACEAE)
3 Sporangia either borne on normal leaf blades or on specialized (fertile) leaves separate from the rhizome.
4 Leaves monomorphic, the sori borne on normal leaf blades ..... ***Phegopteris*** (THELYPTERIDACEAE)
4 Leaves dimorphic, the sori borne on leaves significantly different than normal leaves.
5 Fertile leaf woody, with bead-like segments; pinnae margins entire, often wavy or the lowermost even somewhat lobed; pinnae mostly with obtuse apices, tending to be borne opposite ..... ***Onoclea*** (ONOCLEACEAE)
5 Fertile leaf stiff but herbaceous, the pinnae linear, not at all bead-like; pinnae margins finely serrulate, otherwise slightly wavy or straight; pinnae mostly with acute apices, tending to be borne alternate ..... ***Woodwardia areolata*** (BLECHNACEAE)
2 Leaves pinnate, pinnate-pinnatifid, 2-pinnate, or even more divided (the rachis naked for most of its length, often winged in the apical portion).
6 Leaves broadly triangular in outline, about as broad as long; sporangia borne on an erect stalk that arises at or above ground level from the petiole of the sterile leaf blade (joining the petiole of the sterile leaf above the rhizome) ..... ***Sceptridium*** (OPHIOGLOSSACEAE)

6 Leaves lanceolate in outline, much longer than broad; sporangia either borne on normal leaf blades, on slightly dimorphic blades, or on an erect stalk that arises at or above ground level from the petiole of the sterile leaf blade (joining the petiole of the sterile leaf above the rhizome).
7 Leaf blades 1-8 cm long; sporangia borne on an erect stalk that arises at or above ground level from the petiole of the sterile leaf blade (joining the petiole of the sterile leaf above the rhizome)..... ***Botrychium*** (OPHIOGLOSSACEAE)
7 Leaf blades 10-30 (-100) cm long; sporangia either borne on normal leaf blades or on slightly dimorphic blades.
8 Leaves dark green, subcoriaceous, evergreen
9 Leaves 2 pinnate, the pinnules toothed ..... ***Rumohra*** (DRYOPTERIDACEAE)
9 Leaves 1-pinnate, the pinnae toothed..... ***Polystichum*** (DRYOPTERIDACEAE)
8 Leaves light to medium green, herbaceous, deciduous to semi-evergreen.
10 Sori continuous along the midrib of the pinna ..... ***Blechnum*** (BLECHNACEAE)
11 Sori distinct.
11 Sori elongate; leaf blades somewhat dimorphic, the fertile larger and erect, the sterile smaller and prostrate, the larger leaf blades 2-4 (-6.5) cm wide ..... ***Asplenium platyneuron*** (ASPLENIACEAE)
11 Sori round; leaf blades monomorphic; the larger leaf blades 5-15 cm wide..... ***Thelypteris*** (THELYPTERIDACEAE)

Key F – Medium to large pteridophytes, epipetric, growing on rock, walls, over rock in thin soil mats or in small soil pockets, or on tree trunks

1 Leaves vine-like, 0.3-10 m long, the branching dichotomous, 1 branch of each dichotomy terminating in a pair of pinnae, the pinnae often widely spaced (> 10 cm apart) ..... ***Lygodium*** (LYGODIACEAE)
1 Leaves not vine-like, 0.3-3 m long, the branching not as described above, the pinnae regularly and more-or-less closely spaced (mostly < 10 cm apart).
2 Leaves 1-pinnate-pinnatifid or less divided, the pinnae entire, toothed, lobed or pinnatifid.
3 Sori marginal, continuous, covered by a reflexed false indusium along the leaf margin; pinnae usually opposite, linear, not toothed or lobed ..... ***Pteris vittata*** (PTERIDACEAE)
3 Sori neither marginal nor continuous, slightly to entirely covered by an elongate or roundish indusium (sometimes ciliate, toothed, or divided into narrow segments); pinnae usually at least in part alternate, mostly lanceolate, toothed, lobed, or pinnatifid.
4 Sori elongate, the indusium flap-like, attached along the side; leaf blades (if > 30 cm long) < 7 cm wide ..... ***Asplenium platyneuron*** (ASPLENIACEAE)
4 Sori circular or globular, the indusium peltate, reniform, or cuplike; leaf blades (if > 30 cm long) > 5 cm wide.
5 Leaves pinnatifid.
6 Larger leaves with >25 pairs of segments, each 1.5-5 (-8) mm wide; [of ne. FL southward] ..... ***Pecluma*** (POLYPODIACEAE)
6 Larger leaves with < 25 pairs of segments, (3-) 5-40 mm wide; [collectively widespread in our area.
7 Venation highly reticulate, with 3-4 rows of areoles between the midvein and the margin; rhizome 8-15 (-30) mm in diameter; leaf blade 10-50 cm wide..... ***Phlebodium*** (POLYPODIACEAE)
7 Venation free or with a row of areoles between the midvein and the margin; rhizome 3-6 mm in diameter; leaf blade <9 cm wide ..... ***Polypodium*** (POLYPODIACEAE)
5 Leaves 1-pinnate or more divided.
8 Leaves 1-pinnate, the pinnae toothed and each with a slight to prominent lobe near the base on the side toward the leaf tip; indusia peltate (*Cyrtomium* and *Polystichum*) or reniform or crescent-shaped (*Nephrolepis*).
9 Leaves pale green, thin in texture; pinnae articulate to rachis, deciduous with age; thin, rhizome bearing elongate, thin, wiry stolons..... ***Nephrolepis*** (NEPHROLEPIDACEAE)
9 Leaves dark-green, subcoriaceous to coriaceous; pinnae not articulate and deciduous with age; rhizome not producing stolons.
10 Veins anastamosing, rejoining to form a netlike pattern; pinnae 4-25 pairs per leaf; [non-native, rarely naturalized]..... ***Cyrtomium*** (DRYOPTERIDACEAE)
10 Veins branching dichotomously, free, not rejoining to form a netlike pattern; pinnae 25-50 pairs on larger leaves; [native, common] ..... ***Polystichum*** (DRYOPTERIDACEAE)
8 Leaves 1-pinnate-pinnatifid, the pinnae pinnatifid, generally lacking a prominent basal lobe; indusia either reniform or cuplike.
11 Vascular bundles in the petiole 3-7..... ***Dryopteris*** (DRYOPTERIDACEAE)
11 Vascular bundles in the petiole 2, uniting above.
12 Indusium reniform, arching over the sorus ..... ***Thelypteris*** (THELYPTERIDACEAE)
12 Indusium cuplike, attached beneath the sorus and consisting of 3-6 lanceolate to ovate segments ..... ***Woodsia obtusa*** (WOODSIACEAE)
2 Leaves 2-pinnate or more divided, the pinnae divided to their midribs.
13 Sori marginal and borne on the underside of the false indusium; petioles and rachis shiny black or reddish-black, glabrous except at the very base of the petiole; pinnules fan-shaped or obliquely elongate..... ***Adiantum*** (PTERIDACEAE)
13 Sori not marginal, borne on the undersurface of the leaf blade (if marginal, as in *Pteridium* and *Dennstaedtia*, borne on the undersurface of the leaf); petioles darkened only basally (if at all), rachis green, tan, or reddish; pinnules not notably fan-shaped or obliquely elongate.
14 Leaf blades pentagonal or broadly triangular in outline, ca. 1× as long as wide.
15 Leaf blade pentagonal in outline, the terminal pinna the largest; sori submarginal, roundish, the indusium reniform; [alien, rarely naturalized] ..... ***Arachniodes*** (DRYOPTERIDACEAE)
15 Leaf blade broadly triangular in outline, the basal pinnae the largest; sori marginal, linear, indusium absent, protected by the revolute leaf margin and a minute false indusium; [native, common] ..... ***Pteridium*** (DENNSTAEDTIACEAE)
14 Leaf blades elongate, mostly lanceolate, generally 4× or more as long as wide.
16 Outline of leaf blade narrowed to base, the widest point > 7 pinna pairs above the base, the lowermost pinnae < 1/4 as long as the longest pinnae; rhizomes long-creeping, the leaves scattered, forming clonal patches..... ***Thelypteris noveboracensis*** (THELYPTERIDACEAE)
16 Outline of the leaf blade slightly if at all narrowed to the base, the widest point < 5 pinna pairs from the base, the lowermost pinnae > 1/2 as long as the longest pinnae; rhizomes short-creeping, the leaves clustered, not forming clonal patches (or with rhizomes long-creeping, leaves scattered, forming clonal patches in *Dennstaedtia*).

17 Rhizomes long-creeping, leaves scattered, forming clonal patches; vascular bundles in the petiole 1, U-shaped (even in the lower petiole); sori very small, marginal in sinuses, the indusium cuplike, 2-parted, the outer part a modified tooth of the leaf blade; leaf blades conspicuously puberulent with septate hairs.....***Dennstaedtia*** (DENNSTAEDTIACEAE)
17 Rhizomes short-creeping, the leaves clustered, not forming clonal patches; vascular bundles in the petiole 2-7 (sometimes uniting to 1 in the upper petiole); sori mostly larger, mostly not marginal, the indusium not as above (though cuplike in *Woodsia obtusa*); leaf blades either glabrous, glabrescent, with flattened scales, or puberulent with glandular trichomes.
18 Vascular bundles (3-) 5 (-7) in the petiole.....***Dryopteris*** (DRYOPTERIDACEAE)
18 Vascular bundles 2 in the petiole (or uniting near the leaf blade into 1).
19 Leaves 25-65 cm wide, with whitish, straight, acicular hairs; [species adventive and weedy] ....***Macrothelypteris*** (THELYPTERIDACEAE)
19 Leaves 5-25 (-30) cm wide, with scales and minute glands (sometimes also with septate hairs); [native species].
20 Leaves 1-pinnate-pinnatifid; indusium cuplike, attached beneath the sorus and consisting of 3-6 lanceolate to ovate segments.....***Woodsia obtusa*** (WOODSIACEAE)
20 Leaves 2-pinnate-pinnatifid; indusium flaplike or pocketlike, attached at one side of the sorus and arching over it.
21 Leaves 10-30 cm wide, the tip acute to acuminate; indusium flaplike.....***Athyrium*** (ATHYRIACEAE)
21 Leaves 4-9 cm wide, the tip long-attenuate; indusium pocketlike or hoodlike..... .....***Cystopteris bulbifera*** (CYSTOPTERIDACEAE)

Key G – Medium to large pteridophytes, terrestrial, growing in soil, not associated with rock outcrops

1 Leaves vine-like, 0.3-10 m long, the branching dichotomous, 1 branch of each dichotomy terminating in a pair of pinnae, the pinnae often widely spaced (> 10 cm apart)
2 Vine-like leaves scrambling or trailing; sporangia borne 6-12 per sorus .....***Dicranopteris*** (GLEICHENIACEAE)
2 Vine-like leaves twining; sporangia borne singly, each subtended by an indusium-like flap.....***Lygodium*** (LYGODIACEAE)
1 Leaves not vine-like, 0.3-3 m long, the branching not as described above, the pinnae regularly and more-or-less closely spaced (mostly < 10 cm apart).
3 Leaf blades broadly (about equilaterally) triangular, pentagonal, or flabellate in outline, 0.7-1.3× as long as wide.
4 Leaf blades flabellate or fan-shaped in outline, the petiole branched once dichotomously, each branch bearing 3-7 pinnae in one direction only.....***Adiantum pedatum*** (PTERIDACEAE)
4 Leaf blades pentagonal or broadly triangular in outline, the petiole not branched dichotomously.
5 Leaf blade pentagonal in outline, the terminal pinna the largest; sori submarginal, roundish, the indusium reniform; [alien, rarely naturalized] ..... ***Arachniodes*** (DRYOPTERIDACEAE)
5 Leaf blade broadly triangular in outline, the basal pinnae the largest; sori marginal, linear, indusium absent, protected by the revolute leaf margin and a minute false indusium (*Pteridium*), or sporangia borne in a stalked, specialized, fertile portion of the blade (*Botrychium*); [native, collectively common].
6 Sporangia borne in a stalked, specialized, fertile portion of the blade; texture of mature blades somewhat fleshy; plants solitary from a short underground rhizome with thick, mycorrhizal roots; [primarily of moist forests]....***Botrypus*** (OPHIOGLOSSACEAE)
6 Sporangia borne in marginal, linear sori, indusium absent, protected by the revolute leaf margin and a minute false indusium; texture of mature leaf blades hard and stiff; plants colonial from deep-seated rhizomes; [primarily of moist to dry woodlands and savannas] ..... ***Pteridium*** (DENNSTAEDTIACEAE)
3 Leaves elongate in outline, mostly ovate, lanceolate, oblanceolate, or narrowly triangular, 1.5-10× or more as long as wide.
7 Leaves 2-pinnate or more divided, the pinnae divided to their midribs.
8 Leaf blade divided into sterile and fertile portions, the fertile pinnae basal, the sterile pinnules 30-70 mm long and 8-23 mm wide, serrulate, rounded basally, rounded to somewhat acute apically, the fertile pinnae terminal and greatly reduced in size, the fertile pinnules 7-11 mm long and 2-3 mm wide..... ***Osmunda regalis*** *var.* ***spectabilis*** (OSMUNDACEAE)
8 Leaf blade not divided into sterile and fertile portions (though often not all pinnules on a leaf bearing sporangia), the pinnules bearing sporangia only slightly if at all reduced in size, both fertile and sterile pinnules usually 4-20 mm long and 2-10 mm wide.
9 Rhizomes long-creeping, leaves scattered, forming clonal patches; vascular bundles in the petiole **either** 1, U-shaped (even in the lower petiole) **or** > 3; sori very small, marginal in sinuses, the indusium cuplike, 2-parted, the outer part a modified tooth of the leaf blade; leaf blades conspicuously puberulent with septate hairs (*Dennstaedtia*) or glabrous to puberulent with glandular trichomes (*Hypolepis*).
10 Leaves 2-pinnate-pinnatifid; indusium tubular or cuplike; leaves generally < 1 m long; petiole and rachis unarmed; [of n. GA and n. AL northward] .....***Dennstaedtia*** (DENNSTAEDTIACEAE)
10 Leaves 3-4-pinnate-pinnatifid; indusium flap-like; leaves generally > 1 m long; petiole and rachis with prickles; [of n. FL southward] .....***Hypolepis*** (DENNSTAEDTIACEAE
9 Rhizomes short-creeping, the leaves clustered, not forming clonal patches; vascular bundles in the lower petiole 2-7 (sometimes uniting to 1 in the upper petiole); sori mostly larger, mostly not marginal, the indusium not as above (though cuplike in *Woodsia obtusa*); leaf blades either glabrous, glabrescent, with flattened scales, or puberulent with glandular trichomes.
11 Vascular bundles (3-) 5 (-7) in the petiole.
12 Indusia reniform; leaf blade (at least of larger leaves on mature plants) usually > 40 cm long..... .....***Dryopteris*** (DRYOPTERIDACEAE)
12 Indusia peltate; leaf blade < 40 cm long.....***Rumohra*** (DRYOPTERIDACEAE)
11 Vascular bundles 2 in the petiole (or uniting near the leaf blade into 1).
13 Leaves 25-65 cm wide, with whitish, straight, acicular hairs; [species adventive and weedy]..... .....***Macrothelypteris*** (THELYPTERIDACEAE)
13 Leaves 5-25 (-50) cm wide, with scales and minute glands (sometimes also with septate hairs); [native species, widespread].
14 Leaves 1-pinnate-pinnatifid; indusium cuplike, attached beneath the sorus and consisting of 3-6 lanceolate to ovate segments .....***Woodsia obtusa*** (WOODSIACEAE)
14 Leaves 2-pinnate-pinnatifid; indusium flaplike or pocketlike, attached at one side of the sorus and arching over it.
15 Leaves 4-9 cm wide, the tip long-attenuate; indusium pocketlike or hoodlike ....***Cystopteris bulbifera*** (CYSTOPTERIDACEAE)
15 Leaves 10-30 cm wide, the tip acute to acuminate; indusium flaplike
16 Veins free, simple or forked.....***Athyrium*** (ATHYRIACEAE)

16 Veins anastamosing ..... ***Diplazium*** (ATHYRIACEAE)

7 Leaves 1-pinnate-pinnatifid or less divided, the pinnae entire, toothed, lobed or pinnatifid.
17 Leaves 1-pinnatifid, most of the pinnae not fully divided from one another (the rachis winged by leaf tissue most or all of its length); leaves dimorphic, the fertile much modified, stiff and/or woody.
18 Fertile leaf woody, with bead-like segments; pinnae margins entire, often wavy or the lowermost even somewhat lobed; pinnae mostly with obtuse apices, tending to be borne opposite ..... ***Onoclea*** (ONOCLEACEAE)
18 Fertile leaf stiff but herbaceous, the pinnae linear, not at all bead-like; pinnae margins finely serrulate, otherwise slightly wavy or straight; pinnae mostly with acute apices, tending to be borne alternate ..... ***Woodwardia areolata*** (BLECHNACEAE)
17 Leaves 1-pinnate or 1-pinnate-pinnatifid, the pinnae fully divided from one another (the rachis naked for most of its length, often winged in the terminal portion); leaves dimorphic or not.
19 Rhizomes long-creeping, leaves scattered, forming clonal patches.
20 Sori elongate, borne end to end along either side of the main veins; pinna lobes of sterile leaves with reticulate, chain-like venation along the central vein ..... ***Woodwardia virginica*** (BLECHNACEAE)
20 Sori roundish, borne away from the main veins; pinna lobes of sterile leaves with the lateral veins free and pinnately arranged (the lowermost lateral vein sometimes joining that of the adjacent pinna lobe just below the sinus, but the remainder of the lateral veins all free) ..... ***Thelypteris*** (THELYPTERIDACEAE)
19 Rhizomes short-creeping, the leaves clustered, not forming clonal patches (or rhizomes of both types, but leaves borne only in clusters on the short erect ones, in *Matteuccia*)
21 Plants moderately to very robust, the leaves typically 6-50 dm tall; leaves **either** strongly dimorphic, the fertile leaves very unlike the sterile, brown at maturity (*Matteuccia* and *Osmundastrum cinnamomeum*), **or** the fertile pinnae very unlike the sterile, brown at maturity, borne as an interruption in the blade, with normal green pinnae above and below (*Osmunda claytoniana*), or the fertile pinnae towards the tip of the leaf and with sporangia entirely covering the lower surface (*Acrostichum*); rachises scaleless, petioles scaleless (except at the base in *Matteuccia*).
22 Leaves 1.5-5 m long; fertile pinnae with sporangia covering the lower surface; [of n. FL southward] ..... ***Acrostichum*** (PTERIDACEAE)
22 Leaves 0.6-2.5 m long; fertile portions otherwise.
23 Leaves strongly tapering to the base from the broadest point (well beyond the midpoint of the blade), the basalmost pinnae much < ½ as long as the largest pinnae ..... ***Matteuccia*** (ONOCLEACEAE)
23 Leaves slightly if at all tapering to the base, about equally broad through much of their length, the basalmost pinnae much > ½ as long as the largest pinnae.
24 Leaves hemidimorphic (juvenile leaves with only sterile pinnae, leaves bearing sporangia with sterile and fertile pinnae, the fertile pinnae borne medially); photosynthetic pinnae lacking tufts of hairs .. ***Osmunda*** (OSMUNDACEAE)
24 Leaves dimorphic (each leaf normally either completely photosynthetic or completely fertile); photosynthetic pinnae with tufts of reddish hairs near the junction with the rachis ..... ***Osmundastrum*** (OSMUNDACEAE)
21 Plants mostly less robust, the leaves 3-10 dm tall (except *Dryopteris ludoviciana*, *D. celsa*, *D. goldiana*, and *Nephrolepis exaltata* to 15 dm); leaves not at all or only slightly dimorphic, the fertile differing in various ways, such as having narrower pinnae (as in *Dryopteris ludoviciana*, *Polystichum acrostichoides*, *Diplazium*, and *Thelypteris palustris*) or the fertile leaves taller and more deciduous (as in *Asplenium platyneuron* and *Dryopteris cristata*), but not as described in the first lead; rachises and petioles variously scaly or scaleless, but at least the petiole and often also the rachis scaly if the plants over 1 m tall.
25 Sori elongate, the indusium elongate, attached along one side as a flap.
26 Petiole and rachis lustrous brownish-black; fertile leaves 2-8 (-12) cm wide .. ***Asplenium platyneuron*** (ASPLENIACEAE)
26 Petiole and rachis green; fertile leaves 10-20 (-30) cm wide.
27 Leaves 1-pinnate-pinnatifid (the pinnae pinnatifid) ..... ***Deparia*** (ATHYRIACEAE)
27 Leaves 1-pinnate (the pinnae entire) ..... ***Homalosorus*** (DIPLAZIOPSIDACEAE)
25 Sori roundish, the indusium kidney-shaped or roundish, attached by a central stalk.
28 Leaves 1-pinnate, the pinnae toothed and each with a slight to prominent lobe near the base on the side toward the leaf tip (except *Nephrolepis exaltata*); indusia peltate (*Polystichum*) or reniform or crescent-shaped (*Nephrolepis*).
29 Leaves pale green, thin in texture; pinnae articulate to rachis, deciduous with age; thin, rhizome bearing elongate, thin, wiry stolons; [mostly, if not entirely, alien in our area, rare] ..... ***Nephrolepis*** (NEPHROLEPIDACEAE)
29 Leaves dark-green, subcoriaceous to coriaceous; pinnae not articulate and deciduous with age; rhizome not producing stolons; [native, common] ..... ***Polystichum*** (DRYOPTERIDACEAE)
28 Leaves 1-pinnate-pinnatifid, the pinnae pinnatifid, generally lacking a prominent basal lobe; indusia reniform.
30 Vascular bundles in the petiole 4-7 ..... ***Dryopteris*** (DRYOPTERIDACEAE)
30 Vascular bundles in the petiole 2, uniting above ..... ***Thelypteris*** (THELYPTERIDACEAE)

KEY TO THE GENERA AND FAMILIES OF GYMNOSPERMS

The gymnosperms are a likely artificial grouping of about 16 families, about 86 genera, and about 850 species. References: Kramer & Green (1990).

Standard Key to Families

1 Leaves pinnately compound ..... ***ZAMIACEAE***
1 Leaves simple.
2 Leaves fan-shaped, dichotomously-veined, deciduous ..... ***GINKGOACEAE***
2 Leaves needle-like or scale-like, not dichotomously veined, evergreen (rarely deciduous).
3 Seeds 2-many, borne in a woody or fleshy cone (sometimes resembling a rather hard berry).
4 Foliage leaves needle-like or scale-like, alternate, opposite, or whorled; cone scales valvate or imbricate (if imbricate, the leaves scale-like and opposite) ..... ***CUPRESSACEAE***
4 Foliage leaves needle-like, alternate or fascicled; cone scales imbricate ..... ***PINACEAE***
3 Seeds borne singly in a soft fleshy to leathery aril
5 Leaves opposite ..... ***CEPHALOTAXACEAE***

5 Leaves alternate to irregularly subopposite ..... ***TAXACEAE***

Key to genera of gymnosperms, emphasizing vegetative characters

1 Leaves 1-pinnately compound ..... ***Zamia*** (ZAMIACEAE)
1 Leaves simple.
2 Leaves broad and fan-shaped, > 30 mm wide, with conspicuous dichotomous venation, seasonally deciduous ..... ***Ginkgo*** (GINKGOACEAE)
2 Leaves needle-like or scale-like, < 5 mm wide, evergreen (seasonally deciduous in *Larix* and *Taxodium*).
3 Leaves opposite or in whorls of 3.
4 Leaves linear, 15-45 mm long; mature female cones fleshy and berrylike, > 15 mm in diameter
5 Leaves with distinct midrib on the upper surface; 2 stomatal bands on the lower surface each ca. 1 mm wide; berrylike “cone” stalked ..... ***Cephalotaxus*** (CEPHALOTAXACEAE)
5 Leaves without distinct midrib; 2 stomatal bands on the lower surface each ca. 0.5 mm wide; berrylike “cone” sessile ..... ***Torreya*** (TAXACEAE)
4 Leaves scalelike or acicular and <16 mm long; mature cones either dry and conelike, or fleshy and and less than 9 mm in diameter.
6 Branchlets not disposed in one plane, thus bushy and not fan-like; plants dioecious, male and female cones on separate plants; mature female cones fleshy and berry-like, with smooth surfaces, indehiscent; leaves opposite (decussate) or in whorls of 3 ..... ***Juniperus*** (CUPRESSACEAE)
6 Branchlets disposed in one plane, thus flattened and fan-like; plants monoecious, male and female cones on the same plant; mature female cones woody or leathery, with irregular surfaces, dehiscent; leaves opposite (decussate).
7 Leaves acute; female cones globose and woody, the hard scales peltate, not imbricate; ultimate branchlets (including the scale leaves) about 1 mm broad ..... ***Chamaecyparis*** (CUPRESSACEAE)
7 Leaves obtuse; female cones ellipsoid and leathery, the pliable scales basally attached, imbricate; ultimate branchlets (including the scale leaves) about 1.5 mm broad
8 Branchlets flattened in vertical planes; seeds wingless; [planted tree, sometimes persistent] ..... ***Platycladus*** (CUPRESSACEAE)
8 Branchlets flattened in horizontal planes; seeds winged; [native tree, but also sometimes planted] ..... ***Thuja*** (CUPRESSACEAE)
3 Leaves alternate, **or** in fascicles of 2-5, **or** on short shoots in clusters of many leaves in apparent whorls.
9 Leaves borne in fascicles of 2-5 (basally bound by a scarious sheath) or on short shoots in clusters of many leaves in apparent whorls.
10 Leaves borne in fascicles of 2-5 (basally bound by a scarious sheath) ..... ***Pinus*** (PINACEAE)
10 Leaves borne on short shoots in clusters of many (>10) leaves in apparent whorls.
11 Leaves evergreen; cones 6-12 cm long ..... ***Cedrus*** (PINACEAE)
11 Leaves deciduous; cones 1-2 cm long ..... ***Larix*** (PINACEAE)
9 Leaves alternate.
12 Leaves 4-angled in cross-section ..... ***Picea*** (PINACEAE)
12 Leaves distinctly flattened (2-sided) in cross-section.
13 Leaves very soft in texture, seasonally deciduous as twiglets ..... ***Taxodium*** (CUPRESSACEAE)
13 Leaves stiffer in texture, evergreen.
14 Leaves tapering from base to a long-acuminate tip ..... ***Cunninghamia*** (CUPRESSACEAE)
14 Leaves with parallel margins for most of their length, or widest near middle and gradually tapering to base and apex, the apex acute, obtuse, or retuse.
15 Cone dry and brown at maturity.
16 Leaves attached directly to twig; cones 4-15 cm long, erect ..... ***Abies*** (PINACEAE)
16 Leaves jointed, on short, persistent base; cones 1-3.8 cm long, pendant ..... ***Tsuga*** (PINACEAE)
15 ”Cone” fleshy, red or purplish at maturity.
17 Leaves flexible, the tips pointed but not piercing to the touch; fleshy "cone" ca. 5 mm long, ca. 5 mm in diameter, red when ripe, the seed exposed at the top by a gap in the aril ..... ***Taxus*** (TAXACEAE)
17 Leaves stiff, the tips piercing to the touch; fleshy "cone" 2.5-3 cm long, ca. 2 cm in diameter, dark green to purple when ripe, seed entirely surrounded by fleshy tissue ..... ***Torreya*** (TAXACEAE)

THE FLORA

SECTION 1: LYCOPODIOPHYTA (CLUBMOSSES)

L1. LYCOPODIACEAE Palisot de Beauvois 1802 (Clubmoss Family) [in LYCOPODIALES]

A family of 10-15 genera and about 400 species. Lycopodiaceae, along with Selaginellaceae and Isoetaceae, have now been shown to be only distantly related to other extant pteridophytes and seed plants (Pryer et al. 2001). The division of North American *Lycopodium* into three or more genera has been strongly advocated by Wagner & Beitel (1992), Wagner & Beitel in FNA (1993), Haines (2003a), and nearly all other recent authors. The traditionally broad *Lycopodium* appears to include a number of natural groups which are strikingly different from one another and have constituted separate lineages for tens to hundreds of millions of years. These natural groups are separable by numerous morphological, developmental, and anatomical characters, karyotype, and inability to hybridize. Wagner & Beitel (1992) divide *Lycopodium (sensu latissimo)* of our area into six genera in three subfamilies, as follows: *Huperzia* in Subfamily Huperzioideae, *Lycopodium* and *Diphasiastrum* in Subfamily Lycopodioideae, and *Lycopodiella, Palhinhaea,* and *Pseudolycopodiella* in Subfamily Lycopodielloideae. Haines (2003a) further divides *Lycopodium (sensu lato)* into three genera: *Dendrolycopodium*, *Spinulum*, and *Lycopodium (sensu stricto).* The reasoning behind this division is very strong, and it is here followed. Profound differences in anatomy, morphology, reproduction, gametophyte morphology, and karyotype support this separation. The chromosome numbers of our genera: *Dendrolycopodium* (x=34), *Diphasiastrum* (x=23), *Huperzia* (x=67, 68), *Lycopodiella* (x=78), *Lycopodium* (x=34), *Palhinhaea* (x=55), *Pseudolycopodiella* (x=35), and *Spinulum* (x=34). Øllgaard in Kramer & Green (1990) and Wikström & Kenrick (2000) follow a somewhat broader coarse, recognizing three3 genera for our species (corresponding to the subfamilies of Wagner & Beitel 1992), and recognizing as sections the genera of Wagner & Beitel (1992). Øllgaard states that the "genera are very distinct, and also the sections within *Lycopodiella* and *Lycopodium* seem to represent ancient, independent evolutionary lines." Wikström & Kenrick (2000, 2001) suggest that the phylogenetic separation of *Lycopodium* (including *Diphasiastrum*) and *Lycopodiella* (including *Pseudolycopodiella* and *Palhinhaea*) occurred at least as long ago as the early Jurassic (208 million years before present), and the divergence of *Huperzia* from *Lycopodium* and *Lycopodiella* still longer ago. Based on this deep division between *Huperzia* and the other genera, some authors additionally advocate the recognition of *Huperzia* in a separate family, Huperziaceae, a suggestion which is by no means outlandish (though not followed here). References: Lellinger (1985); Mickel (1979); Wagner and Beitel (1992); Beitel (1979); Snyder & Bruce (1986); Wagner & Beitel in FNA (1993b); Øllgaard in Kramer & Green (1990); Wikström & Kenrick (2000, 2001); Øllgaard (1987); Haines (2003a). Key based in part on Haines (2003a).

1 Leafy stems erect, simple or dichotomously branched, the ultimate branches vertically oriented; sporophylls like the sterile leaves or only slightly reduced, in annual bands along the stem; vegetative reproduction by leafy gemmae near the stem apex; [subfamily *Huperzioideae*] .... ***1. Huperzia***

1 Leafy stems prostrate or erect, if erect then generally branched, the ultimate branches spreading (horizontal) or ascending; sporophylls differing from sterile leaves, either broader and shorter, or more spreading, aggregated into terminal cones; lacking vegetative reproduction by gemmae.

2 Leaves herbaceous, pale or yellow-green, dull, deciduous; principal leafy stems creeping (except erect and repeatedly branched in *Palhinhaea*); rhizome dying back annually to an underground vegetative tuber at apex; spores rugulate; [of wetlands, mostly on moist or wet sands or peats]; [subfamily *Lycopodielloideae*].

3 Upright shoots repeatedly branched; strobili nodding at the ends of the branches; [known to occur from se. SC southward] ..... ***4. Palhinhaea***

3 Upright shoots not branched; strobili erect on upright shoots; [widespread in our area].

4 Leaves of the prostrate stems 0.5-1.2 mm wide, ciliate-toothed or not toothed; leaves of the erect stem many, overlapping, spiral; leaves of the strobilus (sporophylls) resembling leaves of the prostrate and upright stems in size and shape; upright stems 1.5-15 mm in diameter (including the leaves) ..... ***2. Lycopodiella***

4 Leaves of the prostrate stems 1.3-2.1 mm wide, not toothed; leaves of the erect stem few, not overlapping, whorled; leaves of the strobilus (sporophylls) much reduced relative to leaves of the prostrate and upright stems; upright stems 1.5-3 mm in diameter (including the leaves)..... ***3. Pseudolycopodiella***

2 Leaves rigid, bright to dark green, shiny, evergreen; principal leafy stems mainly erect, treelike, fanlike, or creeping (if creeping, then the leaves with elongate, hyaline hair-tips); rhizome perennial, elongate, surficial or subterranean; spores reticulate; [of uplands, mostly in moist to dry soils]; [subfamily *Lycopodioideae*].

5 Branches 1-5 mm wide (including the leaves), compressed to quadrangular, with 4 ranks of leaves; branching of strobilus stalks dichotomous ..... ***6. Diphasiastrum***

5 Branches 4-12 mm wide, terete (to somewhat compressed in *Dendrolycopodium obscurum*), with 6 or more ranks of leaves; branching of strobilus stalks (when present), pseudomonopodial (falsely appearing to have a main axis from which branches arise).

6 Strobili borne on elongate, sparsely leafy peduncles borne at the tips of leafy, ascending branches; leaves with attenuate, hyaline hair-tips ..... ***8. Lycopodium***

6 Strobili sessile, borne directly above densely leafy portions of upright branches; leaves acuminate to acute.

7 Erect leafy stems 3-8 mm in diameter (including the leaves), treelike or fanlike, with a definite main axis; leaves acute at the apex; horizontal shoots subterranean, without winter bud constrictions ..... ***5. Dendrolycopodium***

7 Erect leafy stems 10 mm or more in diameter (including the leaves), branched 1-4 × sub-dichotomously; leaves with a 0.4-1.0 mm long stiff spinule; horizontal shoots at or near the ground surface, with winter bud constrictions ..... ***7. Spinulum***

1. Huperzia Bernhardi (Firmoss, Clubmoss)

A genus of about 10-15 species, north temperate and arctic (and tropical mountains of Asia). Within the Lycopodiaceae, *Huperzia* has "an isolated position", basal to the remainder of the family, and is sometimes separated in a separate family, the Huperziaceae (Haines 2003a). References: Wagner & Beitel in FNA (1993b); Haines (2003a)=Z; Øllgaard in Kramer & Green (1990); Wikström & Kenrick (2000).

Identification notes: Several hybrids are known from our area; they usually occur in intermediate habitats (such as in thin soil at the base of cliffs) and generally are found in proximity to both parents, but sometimes occur in the absence of one or both parents. Hybrids can be recognized by their intermediate morphology. In addition, *Huperzia selago* (Linnaeus) Bernhardi ex Martius & Schrank, Northern Firmoss, is circumboreal, ranging south in North America to NY, New England, and the Great Lakes region, and disjunct to OH. It could easily occur as a disjunct in our area, and should be sought in the high mountains.

1 Leaves oblanceolate, the apical portion toothed with 1-8 large, irregular teeth; leaves 6-15 mm long, 1.0-2.5 mm wide; stomates on lower leaf surface only (visible at 10×, or preferably 20-40×, magnification); spores 23-29 µm in diameter; [mainly of forest soils] ..... ***H. lucidula***

1 Leaves lanceolate (awl-shaped), margins not toothed, or minutely toothed in the apical portion only with 1-3 low teeth; leaves 3-9 mm long, 0.6-1.3 mm wide; stomates on both leaf surfaces (visible at 10×, or preferably 20-40×, magnification); spores 29-38 µm in diameter; [mainly of rock outcrops].

2 Leaves spreading, (3-) 5-9 mm long, ca. 1 mm wide, usually sparsely toothed; stomates relatively few on the upper leaf surface (1-25 on each side of midrib); [of outcrops at low to medium elevations] ..... ***H. porophila***

2 Leaves ascending to spreading, 2-7.5 mm long, 0.6-0.8 (-1.0) mm wide, not toothed (though sometimes with minute, single cell bumps); stomates relatively many on the upper leaf surface (30-90 on each side of midrib); [of high to medium elevations].

3 Leaves dimorphic, those at the base longer and spreading wider from the shoot axis than those from the apical portion of the plant; gemma-bearing branches borne throughout the apical portion of mature shoots; lateral leaves of gemmae 0.5-1.1 mm wide ..... ***H. appressa***

3 Leaves relatively monomorphic; gemma-bearing branches, if present at all, borne in 1 pseudowhorl at the apex of seasonal growth; lateral leaves of gemmae 1.3-2.5 mm wide ..... ***[H. selago]***

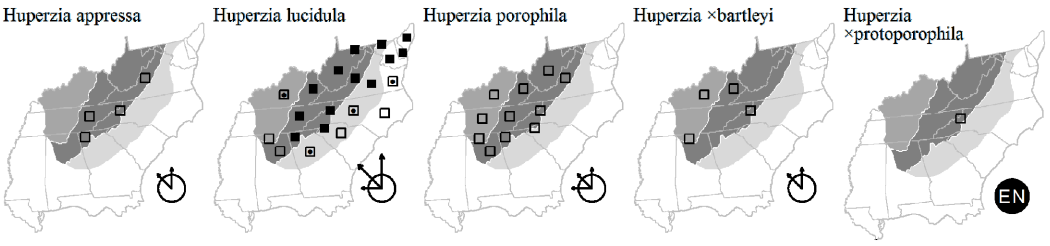
Huperzia appressa (Desvaux) A. Löve & D. Löve, Appalachian Firmoss. Rock outcrops at high elevations (very rarely at middle elevations), rarely also in seepage or along banks of small streams at high elevations, and in fens (on hummocks). June-August. N. QC and NL (Newfoundland) west to ON, MI, and MN and south along the Appalachians to w. NC, e. TN, and ne. GA. This species was named in 1992 as *H. appalachiana* (Beitel & Mickel 1992), but *H. appressa* (Desvaux) A. Löve & D. Löve is an older combination that applies to the same species (Haines 2003a). Though morphologically only subtly differentiated from the circumboreal *H. selago* (for distinctions see Beitel & Mickel 1992; Brunton, Wagner, & Beitel 1992; Haines 2003a), the case for the distinctness of *H. appressa* is confirmed by the production of sterile (abortive-spored) hybrids where it co-occurs with *H. selago*. [= Z; = *H. appalachiana* Beitel & Mickel – FNA, K; < *Lycopodium selago* Linnaeus – RAB, S, W; >< *Lycopodium selago* Linnaeus var. *appressum* (Desvaux) Petrovic – C, F; >< *Lycopodium selago* var. *selago* – C, G]

Huperzia lucidula (Michaux) Trevisan, Shining Firmoss, Shining Clubmoss. Moist forests and ravines. June-August. NL (Newfoundland) to MB, south to nw. SC, n. GA, n. AL, s. IL, and nw. AR. [= FNA, K, Z; = *Lycopodium lucidulum* Michaux – C, F, G, Md, RAB, S, W, WV]

Huperzia porophila (Lloyd & Underwood) Holub, Rock Clubmoss. Rock outcrops and cliffs, especially in the spray of waterfalls, at low to medium elevations. June-August. Centered in the sedimentary Central Appalachians, *H. porophila* ranges from ne. PA, WV, OH, WI, and MN south to w. NC, nw. SC, ne. GA, nw. AL, and e. MO. Waterway (1986) clarified the distinctions between *H. porophila* and *H. lucidula*. [= FNA, K; = *Lycopodium porophilum* Lloyd & Underwood – RAB, C, F, S, W, WV; < *Lycopodium selago* var. *patens* (Palisot de Beauvois) Desvaux – G, misapplied]

Huperzia ×*bartleyi* (Cusick) Kartesz & Gandhi [*H. lucidula* × *porophila*]. Rock outcrops. Reported for NC by Waterway (1986). This hybrid can be told from its parents by the presence of stomates on both surfaces of the leaf (unlike *H. lucidula*), but their marked lower density on the upper surface (unlike *H. porophila*). [= K, Z]

Huperzia ×*protoporophila* A. Haines [*H. appressa* × *lucidula*]. Rock outcrops and cliff bases. Known from Chimney Rock Park, Rutherford County, NC (the lowest elevation occurrence of *H. appressa* in NC) and from Roan Mountain, Mitchell County, NC, and Grandfather Mountain, Avery County, NC. Expected at other cliff bases where the two parents are in proximity. This hybrid can be told from its parents by the presence of stomates on both surfaces of the leaf (unlike *H. lucidula*), but their marked lower density on the upper surface (unlike *H. appressa*). An additional useful character is the distribution of gemma-bearing branches: those of *Huperzia appressa* are abundantly distributed throughout the apical portion of mature plants, while those of the hybrid are confined to 1 or 2 pseudowhorls at the apex of annual growth (i.e., there are large gaps between the pseudowhorls of gemma-bearing branches). [= Z]



2. Lycopodiella Holub 1964 (Bog Clubmoss)

A genus of about 15-20 species, temperate and tropical. Additional research on this genus in our area is needed. Two fertile tetraploid species were recently named from MI (Bruce, Wagner, & Beitel 1991), and additional cryptic or semicryptic species

may be found in the Southeastern Coastal Plain. This group is variously treated as genus *Lycopodiella*, or as *Lycopodiella* section *Lycopodiella* (Øllgaard in Kramer & Green 1990, Wikström & Kenrick 2000). References: Wagner & Beitel in FNA (1993b); Øllgaard in Kramer & Green (1990); Wikström & Kenrick (2000); Haines (2002a, 2003a, 2003b)=Z. [also see *Pseudolycopodiella*]

Identification notes: Species of this genus are difficult to identify. They often grow together; it is not uncommon to find two or more species at a single site in the Coastal Plain. Hybrids occur. Juvenile plants, resprouting in spring or after fire, are especially difficult to identify. In contrast to the other species, *Pseudolycopodiella caroliniana* and, to a lesser degree, *L. prostrata*, are dorsiventrally flattened (or apparently distichous), but it seems that juvenile sprouts of all species are somewhat flattened.

1 Leaves of the horizontal shoots entire (rarely those toward the shoot apex with a few teeth); horizontal shoots, excluding the leaves, 0.5-0.9 (-1.0) mm in diameter; each horizontal shoot segment commonly producing a single upright shoot; [in our area, a plant of the Mountains] ..... ***L. inundata***

1 Leaves of the horizontal shoots toothed (except when inundated); horizontal shoots, excluding the leaves, 1.5-5.0 mm in diameter; each horizontal shoot segment producing 2-6 upright shoots; [collectively primarily of the Coastal Plain, with some disjunctions inland into the Piedmont and Mountains].

2 Fertile leaves (sporophylls) 2.9-5.0 (-5.2) mm long, appressed at maturity, entire or with short teeth < 0.3 mm long; strobili 3-6 mm in diameter at maturity ..... ***L. appressa***

2 Fertile leaves (sporophylls) 5.5-9 mm long, spreading, with 1-8 teeth per margin, some or all of the teeth exceeding 0.3 mm in length; strobili 10-20 mm in diameter at maturity.

3 Prostrate stems arching, not in contact with the ground (and rooting) all along their length, 8-11 mm wide (including leaves), the stem (stripped of leaves) 2-4 mm in diameter; leaves of the prostrate stem of one size and shape, spreading to ascending, 5-7 mm long, 0.5-0.7 mm wide; erect stems many, equally spaced along the prostrate stems, progressively shorter and sterile toward the apex of the prostrate stems ..... ***L. alopecuroides***

3 Prostrate stems creeping, in contact with the ground (and rooting) all along their length, 12-19 mm wide (including leaves), the stem (stripped of leaves) 1-2.2 mm in diameter; leaves of the prostrate stems dimorphic, spreading to reflexed, the upper leaves smaller (4-5 mm long, 0.4-0.6 mm wide) than the lateral leaves (7-8 mm long, 0.7-1.8 mm wide); erect stems few, clustered well behind the apex of the prostrate stems, mostly fertile and subequal in length ..... ***L. prostrata***

Lycopodiella alopecuroides (Linnaeus) Cranfill, Foxtail Clubmoss. Savannas, seepages, and other wet, sandy sites. July-September. Primarily Southeastern Coastal Plain: se. MA south to FL and west to e. TX, and disjunct in the Cumberland Plateau of KY, TN, and VA, the Allegheny Mountains of WV (Morton et al. 2004), the e. Highland Rim of TN, and in ME (Haines 2001); s. Mexico south through Central America to n. South America; Cuba. [= FNA, K, Z; < *Lycopodium alopecuroides* Linnaeus – RAB; = *Lycopodium alopecuroides* Linnaeus – C, F, G, Md, S, W]

Lycopodiella appressa (Chapman) Cranfill, Southern Bog Clubmoss. Savannas, seepages, bogs. July-September. Primarily Southeastern Coastal Plain: se. NL (Newfoundland) and MA, south to FL, west to OK, AR, and TX, and disjunct in the mountains of KY, TN, NC, WV, and in sw. MI. [= FNA, K, Z; = *Lycopodium appressum* (Chapman) Lloyd & Underwood – RAB, C, S, W; = *Lycopodium inundatum* Linnaeus var. *bigelovii* Tuckerman – F, G]

Lycopodiella inundata (Linnaeus) Holub, Northern Bog Clubmoss. Gravelly or sandy seepage areas, bogs. July-September. A circumboreal species, ranging south in the Appalachians to NC, where it was first found in 1986 (Weakley, *in prep.*). [= FNA, K, Z; = *Lycopodium inundatum* Linnaeus – C, Md, W, WV; = *Lycopodium inundatum* var. *inundatum* – F, G]

Lycopodiella prostrata (Harper) Cranfill, Featherstem Clubmoss, Prostrate Bog Clubmoss. Savannas, seepages. July-September. A Southeastern Coastal Plain endemic: se. NC south to FL and west to TX, with scattered occurrences disjunct inland (as in n. GA and n. AL). [= FNA, K; < *Lycopodium alopecuroides* – RAB; = *Lycopodium prostratum* Harper – C, S]

All pairwise combinations of sympatric species form fertile hybrids (only *L. inundata* and *L. prostrata* are entirely allopatric and not known to hybridize). The following hybrids should be expected where the parents grow together.

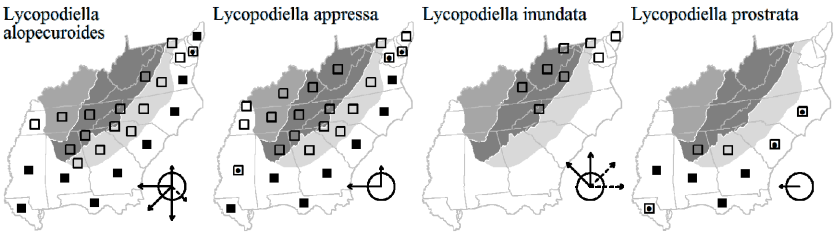
Lycopodiella alopecuroides × *appressa*. [= *Lycopodiella* ×*copelandii* (Eiger) Cranfill – K, Z; *Lycopodium* ×*copelandii* Eiger]

Lycopodiella alopecuroides × *inundata*. [= *Lycopodiella* ×*robusta* (R.J. Eaton) A. Haines – Z]. See Haines (2002a) for additional information.

Lycopodiella alopecuroides × *prostrata*. [= *Lycopodiella* ×*brucei* Cranfill – K; = *Lycopodium* ×*brucei* (Cranfill) Lellinger]

Lycopodiella appressa × *inundata*. [*Lycopodiella* ×*gilmanii* A. Haines – Z]. Earlier tentative reports of *Lycopodiella margueritiae* J.G. Bruce, W.H. Wagner, & Beitel for the Mountains of Virginia are apparently based on this hybrid. See Haines (2003a, 2003b) for additional information. [= *Lycopodiella margueritiae* J.G. Bruce, W.H. Wagner, & Beitel – K, misapplied; = *Lycopodiella* ×*gilmanii* A. Haines – Z]

Lycopodiella appressa × *prostrata.*



3. Pseudolycopodiella Holub 1983 (Carolina Bog Clubmoss)

A genus of about 12 species, sub-cosmopolitan. This group has often been treated as section of *Lycopodium* (or of *Lycopodiella*); it appears to warrant status as a genus separate from *Lycopodiella*. In addition to the morphologic distinctions, this species has considerable anatomical differences, a different base chromosome number than the four species of *Lycopodiella* (x = 35 vs. x = 78), and does not hybridize with *Lycopodiella* (Wagner & Beitel 1992). Øllgaard in Kramer & Green (1990) and Wikström & Kenrick (2000) retain it as *Lycopodiella* section *Carolinianae*. References: Wagner & Beitel in FNA (1993b); Haines (2003a)=Z; Øllgaard in Kramer & Green (1990); Wikström & Kenrick (2000).

Pseudolycopodiella caroliniana (Linnaeus) Holub, Carolina Bog Clubmoss, Slender Clubmoss. Savannas, seepages. July-September. This species occurs in se. North America, the West Indies, and is widespread in the Southern Hemisphere; in North America, it ranges from MA south to s. FL and west to e. TX. [= FNA, Z; = *Lycopodium carolinianum* Linnaeus – C, F, G, Md, RAB, S; > *Lycopodiella caroliniana* (Linnaeus) Pichi Sermolli var. *caroliniana* – K]

4. Palhinhaea Vasconcellos & Franco 1967 (Nodding Clubmoss)

A genus of 10-15 species, tropical and subtropical. This group is variously treated as the genus *Palhinhaea* or as *Lycopodiella* section *Campylostachys* (Øllgaard in Kramer & Green 1990, Wikström & Kenrick (2000). References: Wagner & Beitel in FNA (1993b); Øllgaard in Kramer & Green (1990); Wikström & Kenrick (2000).

Palhinhaea cernua (Linnaeus) Vasconcellos & Franco, Nodding Clubmoss, Staghorn Clubmoss. Wet savannas, ditches and other disturbed moist areas. This species is pantropical, occurring in the both the Neotropics and the Paleotropics. Some of its occurrences in our area may be adventive. [= FNA; =*? Lycopodiella cernua* (Linnaeus) Pichi Sermolli var. *cernua* – K; = *Lycopodium cernuum* Linnaeus – S]

5. Dendrolycopodium A. Haines 2003 (Tree-clubmoss)

A genus of 4 species, temperate and subarctic. Haines (2003a) makes the case for this genus as distinct from *Lycopodium* s.s. and other relatives. References: Wagner & Beitel in FNA (1993b); Wagner, Beitel, & Moran (1989); Hickey (1977); Øllgaard in Kramer & Green (1990); Haines (2003a)=Z.

1 Leaves of the main vertical axis spreading (30-90° angle to stem) in the vicinity of the lower lateral branches, prickly to the touch; branchlets round in cross-section, the 6 ranks of leaves (2 lateral ranks, 2 adaxial ranks, and 2 abaxial ranks) equal in length and spreading to ascending. ..... ***D. dendroideum***

1 Leaves of the main vertical axis appressed (15-30° angle to stem) in the vicinity of the lower lateral branches, soft to the touch; branchlets slightly to strongly dorsiventrally flattened in cross-section, the 6 ranks of leaves (4 lateral ranks, 1 adaxial rank, 1 abaxial rank) round or slightly to very unequal, the abaxial leaves more appressed and mostly shorter than (to equal to) the spreading lateral leaves.

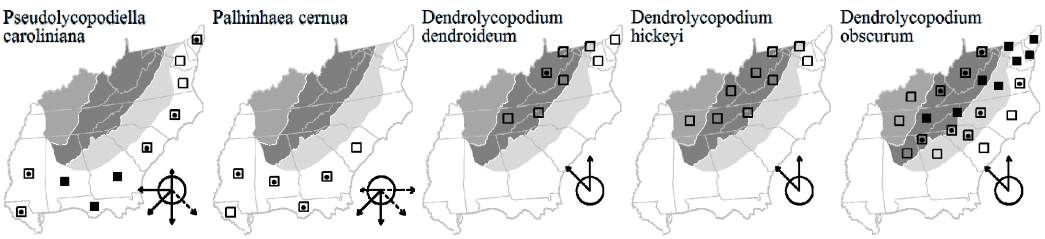
2 Abaxial leaves of the horizontal branchlets about the same length as the lateral leaves; leaves of all the ranks spreading at a (21°-) ca. 27° (-36°) angle from the branchlet, thus the branchlet and leaves together 3.5-6 (-7) mm wide ..... ***D. hickeyi***

2 Abaxial leaves of the horizontal branchlets about one half to two thirds as long as the lateral leaves; leaves of the abaxial and adaxial ranks generally appressed to the branchlet, the lateral 4 ranks spreading at a (27°-) ca. 40° (-59°) angle from the branchlet, thus the branchlet and leaves together ca. 6-9 mm wide ..... ***D. obscurum***

Dendrolycopodium dendroideum (Michaux) A. Haines, Tree Ground-pine, Round-branch Clubmoss, Prickly Tree-clubmoss. Openings, grassy balds, high elevation spruce-fir and northern hardwood forests. July-September. The northernmost of the *L. obscurum* complex, ranging from n. QC and NL (Newfoundland) west to AK, south to s. NJ, w. NC, MO, MN, SD, CO, MT, ID, and WA; also in Asia. [= Z; < *Lycopodium obscurum* var. *dendroideum* (Michaux) D.C. Eaton – RAB, F, G, Md, WV; = *Lycopodium dendroideum* Michaux – FNA, K, W; < *L. obscurum* – C]

Dendrolycopodium hickeyi (W.H. Wagner, Beitel, & R.C. Moran) A. Haines, Pennsylvania Ground-pine, Hickey's Tree-clubmoss. Grassy balds, bog margins, forest openings. July-September. N. QC and NL (Newfoundland) west to MN, south to NJ, sw. NC, and n. IN. [= Z; < *Lycopodium obscurum* var. *dendroideum* (Michaux) D.C. Eaton – RAB, F, G, Md, WV; = *Lycopodium hickeyi* W.H. Wagner, Beitel, & R.C. Moran – FNA, K; = *Lycopodium obscurum* var. *isophyllum* Hickey – W; < *L. obscurum* – C]

Dendrolycopodium obscurum (Linnaeus) A. Haines, Common Ground-pine, Flat-branched Tree-clubmoss. Acidic forests;. July-September. NS and NB west to MI and WI, south to n. GA, ne. AL, s. IN, n. IL, and c. MN. [= Z; = *Lycopodium obscurum* Linnaeus – FNA, K; = *Lycopodium obscurum* var. *obscurum* – F, G, Md, RAB, W, WV; < *L. obscurum* – C, S]



6. Diphasiastrum Holub 1975 (Flat-branched Clubmoss, Running Cedar)

A genus of about 15-20 species, mostly north temperate and subarctic. This group is sometimes treated as *Lycopodium* section *Complanata* (Øllgaard in Kramer & Green 1990, Øllgaard 1987, Wikström & Kenrick 2000). References: Wagner & Beitel in FNA (1993b); Haines (2003a)=Z; Øllgaard in Kramer & Green (1990); Wikström & Kenrick (2000).

1 Foliage dark green, not glaucous; horizontal branchlets 2-4 mm wide (including the leaves); branchlets without conspicuous annual constrictions; rhizomes 0-1 cm deep (which can be determined by pulling up a single upright shoot – the depth to rhizome is approximately the length of the white portion of the vertical stem); abaxial rank of leaves shorter than lateral ranks (thus the branchlets flat in cross-section). ..... ***D. digitatum***

1 Foliage blue-green, glaucous; horizontal branchlets 1-2 mm wide (including the leaves); branchlets with conspicuous annual constrictions; rhizomes (1-) 5-12 cm deep; abaxial rank of leaves as long as lateral ranks (thus the branchlets more-or-less square in cross-section)..... .....***D. tristachyum***

Diphasiastrum digitatum (Dillenius ex A. Braun) Holub, Common Running-cedar, Fan Ground-pine. Dry to mesic, usually acid forests and openings, especially common in disturbed sites, such as successional pine forests. July-September. NL (Newfoundland) west to MN, south to SC, GA, AL, MS, and AR. Hickey & Beitel (1979) and Holub (1975a & 1975b) explain the nomenclatural decision to accept the epithet *'digitatum'* over the more familiar *'flabelliforme.'* [= FNA, Z; = *Lycopodium flabelliforme* (Fernald) Blanch – Md, RAB, S, WV; = *Lycopodium digitatum* Dillenius ex A. Braun – C, K, W; = *Lycopodium complanatum* Linnaeus var. *flabelliforme* Fernald – F, G]

Diphasiastrum ×*habereri* (House) Holub [*D. digitatum* × *tristachyum*]. Mt (KY, NC, VA, WV), Pd (VA): dry forests; rare. Known from widely scattered localities in our area; not always in close proximity to its parents. [= FNA, Z; = *Lycopodium* × *habereri* House – K; = *L.* ×*haberi* – WV, orthographic error] {not keyed; not mapped}

Diphasiastrum tristachyum (Pursh) Holub, Blue Running-cedar, Ground-cedar. Dry forests, glades, balds, barrens, forest openings. July-September. NL (Labrador) west to AB, south to nw. SC, ne. GA, ne. AL, MO, MN, and e. ND. [= FNA, Z; = *Lycopodium tristachyum* Pursh – C, F, G, K, Md, RAB, S, W, WV]

7. Spinulum A. Haines (Bristly Clubmoss)

A genus of 3 species, north temperate and subarctic. References: Wagner & Beitel in FNA (1993b); Wagner, Beitel, & Moran (1989); Hickey (1977); Øllgaard in Kramer & Green (1990); Haines (2003a)=Z.

Spinulum annotinum (Linnaeus) A. Haines, Stiff Clubmoss, Bristly Clubmoss. High elevation hardwood or coniferous forests. August-October. A circumboreal species, south in North America to n. NJ, MN, SD, NM, AZ, and OR, and in the Appalachians to WV, sw. VA, and e. TN (Blount County). Two varieties have been considered to reach our area in VA: var. *acrifolium* Fernald and var. *annotinum*. They are doubtfully distinct but need further study. This species was reported for NC by Lellinger (1985) and FNA, and is apparently indicated as occurring in NC on the range map in Mickel (1979); there is apparently no documentation for these reports, though the species occurs in Grayson County, VA, a county adjacent to NC. [= Z; = *Lycopodium annotinum* Linnaeus – C, FNA, K, W; > *L. annotinum* var. *acrifolium* Fernald – F, G, WV; > *L. annotinum* var. *annotinum* – F, G, Md, WV; > *L. annotinum* var. *pungens* (La Pylaie) Desvaux – WV]

8. Lycopodium Linnaeus 1753 (Running Clubmoss)

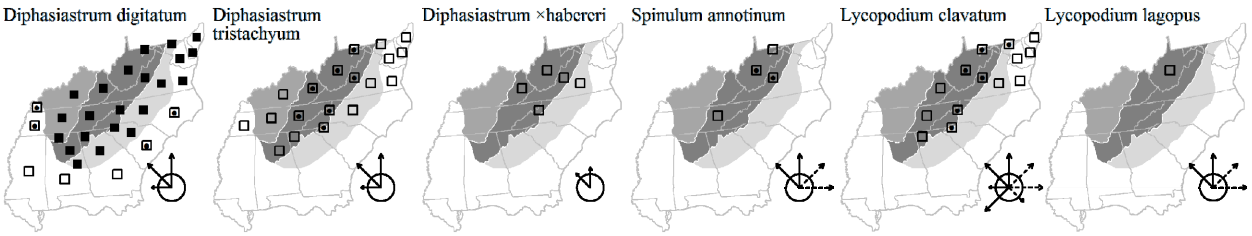
A genus of 5-10 species, mainly temperate and subarctic. The fractionation of *Lycopodium* has resulted in the creation of more natural genera, more comparable to those in other groups of plants. References: Wagner & Beitel in FNA (1993b); Wagner, Beitel, & Moran (1989); Hickey (1977); Øllgaard in Kramer & Green (1990); Haines (2002b, 2003a)=Z. [also see *Dendrolycopodium, Diphasiastrum*, *Huperzia*, *Lycopodiella, Palhinhaea, Pseudolycopodiella,* and *Spinulum*]

1 Strobili (1-) 2-5, borne on alternate "pedicels" branching from the central "peduncle"; leaves 4-6 mm, spreading to loosely ascending; upright shoots each usually bearing 3-6 branches ..... ***L. clavatum***

1 Strobili 1 (rarely 2, if then, the 2 strobili not on separate "pedicels," but sessile and paired at the top of the "peduncle"); leaves 3-5 mm long, ascending to appressed; upright shoots each usually bearing 2-3 branches .....***L. lagopus***

Lycopodium clavatum Linnaeus, Running Clubmoss. Openings, balds, roadbanks, open forests. July-September. Circumboreal, south in e. North America along the Appalachians to NC and n. GA; also c. Mexico south through Central America to n. South America; West Indies. [= RAB, FNA, K, Md, W, Z; < *L. clavatum* – C, WV]; = *L. clavatum* var. *clavatum* – F, G, S]

Lycopodium lagopus (C. Hartman) G. Zinserling ex Kuzeneva-Prochorova. High elevation heathlands. Circumboreal, south in North America to c. PA (Rhoads & Klein 1993), Tucker County, in e. WV (Gottlieb 2002), n. IL, MT, WA, and AK. [= FNA, K, Z; < *L. clavatum* – C, WV; > *L. clavatum* Linnaeus var. *monostachyon* Greville & Hooker – F, G; > *L. clavatum* var. *megastachyon* Fernald & Bissel – F, G; > *L. clavatum* var. *brevispicatum* Peck – F]



L2. ISOETACEAE Reichenbach 1828 (Quillwort Family, Merlin's-grass Family) [in ISOETALES]

A family of a single genus and about 300 species. Isoetaceae, along with Selaginellaceae and Lycopodiaceae, now appear to be only distantly related to other extant pteridophytes and seed plants (Pryer et al. 2001). References: Jermy in Kramer & Green (1990).

Isoetes Linnaeus 1753 (Quillwort, Merlin's-grass)

A genus of about 300 species, cosmopolitan in distribution. References: Taylor et al. in FNA (1993b); Hoot, Napier, & Taylor (2004); Boom (1982); Kott & Britton (1983); Brunton & Britton (1996a, 1996b, 1997, 1998, 1999); Caplen & Werth (2000a, 2000b); Musselman & Knepper (1994); Musselman, Bray, & Knepper (1996, 1997); Musselman et al. (1995); Musselman, Taylor, & Bray (2001); Musselman (2001)=Z; Jermy in Kramer & Green (1990).

Identification notes: Hybrids are possible between many combinations of species.

Key fragment to eastern granite outcrop species by Heafner et al (in prep.)

1 Megaspores black or gray, leaves usually no more than 5.0 cm long.
2 Corms transversely oblong to oblong, roots dichotomously branched, phyllotaxy spiraled ..... ***I. melanospora***
2 Corms horizontally elongate, roots fibrous and not dichotomously branched, phyllotaxy distichous ..... ***I. tegetiformans***
1 Megaspores white, leaves to 18.7 cm long or longer.
3 Plants diploid (2n = 22); [widespread from VA to AL in the Piedmont] ..... ***I. piedmontana***
3 Plants tetraploid (2n = 44); [narrow endemics (as far as is known) to a few counties in the Piedmont of AL and NC].
4 Velum covering 0-10% of the sporangium; leaves (7.9-) avg. 11.5 (-14.9) cm long; [endemic to Franklin County, NC] ..... ***I. species 5 "analogous"***
4 Velum covering approximately 10-20% of the sporangium; [endemic to Randolph County, AL, or Wake County, NC].
5 Leaves (5.9-) avg. 11.9 (-18.9) cm long; [endemic to Randolph County, AL] ..... ***I. species 6 "alabamensis"***
5 Leaves (4.2-) avg. 9.3 (-14.2) cm long; [endemic to Wake County, NC] ..... ***I. species 4 "carolinae-septentrionalis"***

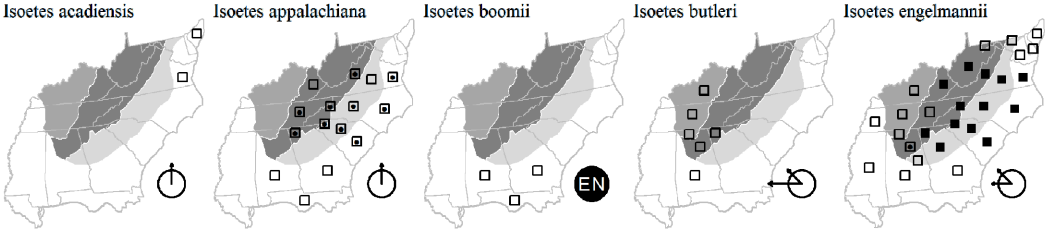
Isoetes acadiensis L. Kott, Acadian Quillwort. Freshwater tidal marshes. A tetraploid species (2n=44). [= FNA, K; < *I. tuckermanii* A. Braun – C, F, G]

Isoetes appalachiana D.F. Brunton & D.M. Britton, Appalachian Quillwort. Seepages, small woodland streams, ephemeral wetlands, backwaters. A tetraploid species (2n=44), apparently derived from a southern *I. engelmannii* entity and *I. valida* (Hoot, Napier, & Turner 2004), genotype=SSVV. See Brunton & Britton (1997) for additional information. [= K, Z; < *I. engelmannii* – RAB, C, FNA, W, WV; < *I. engelmannii* var. *engelmannii* – F, S; > *I. engelmannii* var. *georgiana* Engelmann]

Isoetes boomii N. Luebke, Boom's Quillwort. Shallow water of slow-moving streams. Known from Laurens County, GA, AL, and FL. A hexaploid species (2n=66). [= FNA, K; < *I. boomii* – Z (also see *I. georgiana*)]

Isoetes butleri Engelmann, Butler's Quillwort. Seepage areas on calcareous glades. Occurs in calcareous areas of the Midwest, extending east to c. TN, nw. GA (Jones & Coile 1988), and n. AL. A diploid species (2n=22), genotype=BB. [= C, F, FNA, G, K, S, Z]

Isoetes engelmannii A. Braun. Usually in permanent water bodies with active current. A diploid species (2n=22). Apparently there are 2 cryptic taxa currently comined under the name *I. engelmannii* (Hoot, Napier, & Taylor 2004), genotype NN and genotype SS. [= K, Z; < *I. engelmannii* – RAB, C, G, FNA, W, WV (also see *I. appalachiana, I. hyemalis,* and *I. valida*); < *I. engelmannii* var. *engelmannii* – F, S]



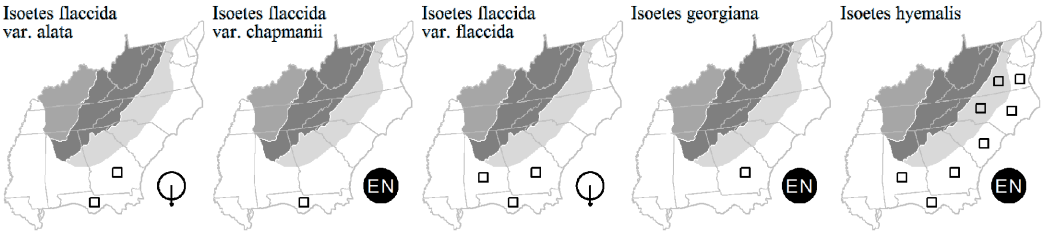
Isoetes flaccida A. Braun *var.* ***alata*** Pfeiffer, Winged Florida Quillwort. Springs, stream bottoms, river bottoms, ditches. S. GA south to s. FL. A diploid species (2n=22). [= K, S; < *I. flaccida* FNA, Z]

Isoetes flaccida A. Braun *var.* ***chapmanii*** Engelmann, Chapman's Florida Quillwort. Springs, stream bottoms, river bottoms, ditches. FL Panhandle. A diploid species (2n=22). [= K, S; < *I. flaccida* FNA, Z]

Isoetes flaccida A. Braun *var.* ***flaccida***, Winged Florida Quillwort. Springs, stream bottoms, river bottoms, ditches. S. GA and se. AL south to s. FL. A diploid species (2n=22). [= K, S; < *I. flaccida* FNA, Z]

Isoetes georgiana N. Luebke, Georgia Quillwort. Streams. Known only from GA (Colquitt, Dodge, Irwin, Tift, Turner, and Worth counties). A hexaploid species (2n=66). See Brunton & Britton (1996b) for additional information. Musselman (2001) indicates that this may be conspecific with *I. boomii*. [= FNA, K; < *I. boomii* – Z]

Isoetes hyemalis D.F. Brunton, Wintergreen Quillwort. Blackwater streams and sandy streambanks. Sc. VA south through e. and c. NC to GA, AL, and FL Panhandle (Nelson 2000), in the Coastal Plain and lower Piedmont. A tetraploid species (2n=44), apparently derived from 2 unknown or extinct species, X and Y (Hoot, Napier, & Taylor 2004). See Brunton, Britton, & Taylor (1994) and Brunton & Britton (1996a) for additional information on this species. [= K, Z; < *I. engelmannii* – RAB, C, G; < *I. engelmannii* var. *engelmannii* – F, S]



Isoetes junciformis D.F. Brunton & D.M. Britton, Rush Quillwort. Ephemeral wetland swales in bottomland hardwood swamps. In sw. GA Coastal Plain (Tift and probably Calhoun counties, GA). A tetraploid species (2n=44). See Brunton & Britton (1999) for additional information. [= Z]

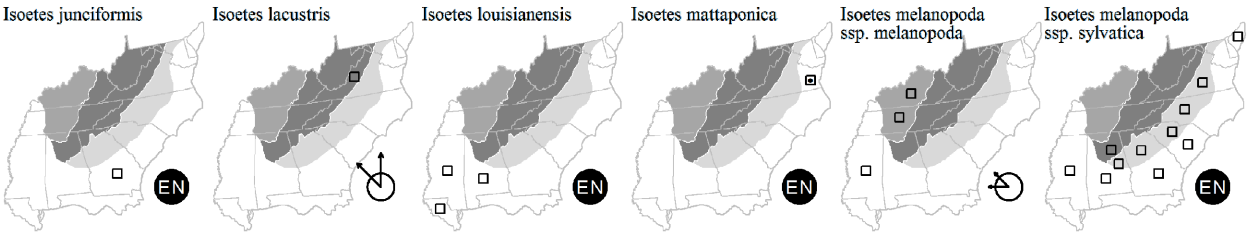
Isoetes lacustris Linnaeus, Lake Quillwort. {hábitat}. July-September. A decaploid species (2n=110). [= FNA, C, K; > *I. macrospora* Durieu – F, G, W]

Isoetes louisianensis Thieret, Louisiana Quillwort. Small streams. S. AL, MS, and LA. [= FNA, K] {add to synonymy}

Isoetes mattaponica L.J. Musselman & W.C. Taylor, Mattaponi River Quillwort. Tidal rivers. Apparently endemic to rivers flowing into the Chesapeake Bay. A diploid relative of *I. acadiensis*. A diploid species (2n=22). See Musselman, Taylor, & Bray (2001) for additional information on this species.

Isoetes melanopoda Gay & Durieu ex Durieu *ssp.* ***melanopoda***, Blackfoot Quillwort. Floodplains. S. IN, IL, and MO south to ne. LA; probably represented eastward to c. TN and s. MS (the available material ambiguous) (Brunton & Britton 2006). [< *I. melanopoda* – FNA, K, C, G, Z]

Isoetes melanopoda Gay & Durieu ex Durieu *ssp.* ***sylvatica*** D.F. Brunton & D.M. Britton, Eastern Blackfoot Quillwort. Clay soils in low woods, seeps on sandstone or granitic rocks, in NJ in clay-based depressions on Cape May. VA south (in the Piedmont and Coastal Plain) to sw. GA, s. and n. AL, and s. MS; disjunct in s. NJ . A diploid species (2n=22), genotype= PP. [< *I. melanopoda* – FNA, K, C, G, Z; < *I. melanopoda* – RAB (also see *I. melanospora, I. virginica, I. piedmontana*)]



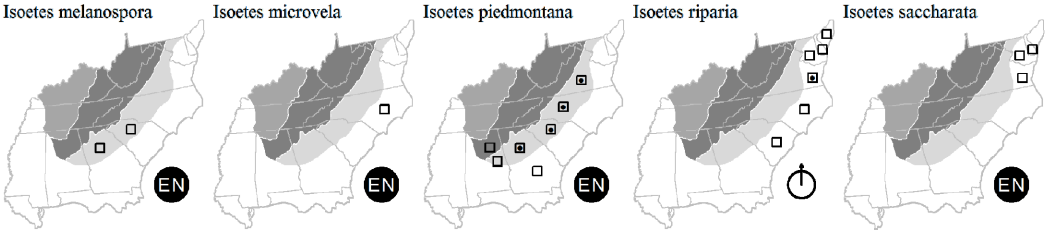
Isoetes melanospora Engelmann, Black-spored Quillwort. In pools on granite flatrocks. A diploid species (2n=22). [= Z, S; < *I. melanospora* – FNA, K; < *I. melanopoda* – RAB]

Isoetes microvela D.F. Brunton. Banks of rivers in the outer Coastal Plain. May-July (-September). See Brunton & Britton (1998) for additional information. [= K]

Isoetes piedmontana (N.E. Pfeiffer) C.F. Reed, Piedmont Quillwort. In seepage on granitic flatrocks and on Altamaha grit. [= K, Z; < *I. melanopoda* – RAB; < *I. virginica* – C, F, FNA, G]

Isoetes riparia Engelmann ex A. Braun, Shore Quillwort. Tidal waters, lakes. A tetraploid species (2n=44), apparently derived from the southern *I. engelmannii* entity and *I. echinospora* (Hoot, Napier, & Taylor 2004). [< *I. riparia* – RAB, C, FNA (also see *I. saccharata*); > *I. riparia* var. *riparia* – G, K; > *I. riparia* var. *amesii* (A.A. Eaton) Proctor – G, K; > *I. riparia* var. *robbinsii* (A.A. Eaton) Proctor – G; > *I. riparia* var. *reticulata* (A.A. Eaton) Proctor – G]

Isoetes saccharata Engelmann. Tidal waters, lakes. {disentangle from *I. riparia*} [= K; < *I. riparia* – C, FNA; = *I. riparia* var. *palmeri* (A.A. Eaton) Proctor – G]



Isoetes species 1. Pools on granite flatrocks. Forty Acre Rock, Lancaster County, SC. Being worked on by W.C. Taylor.

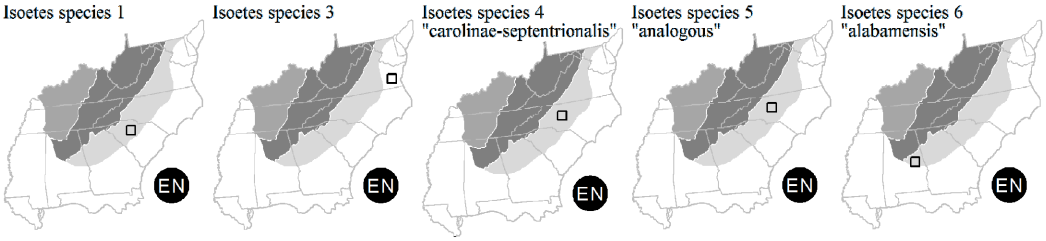
Isoetes species 3. Tidal marshes. A diploid relative of *I. melanopoda*. Being worked on by C. Caplen. A diploid species (2n=22).

Isoetes species 4 "carolinae-septentrionalis". Granite flatrocks

Isoetes species 5 "analogous". Granite flatrocks.

Isoetes species 6 "alabamensis". Granite flarocks.

Isoetes species 7 **"Broxton Rocks"**. Pools on sandstone outcrops; rare. Under study.



Isoetes tegetiformans Rury, Merlin's-grass. In shallow pools on granite flatrocks. Endemic to a few granite flatrocks in ec. GA (notably Heggies Rock), near the SC line. A diploid species (2n=22), genotype=TT. [= FNA, K, Z]

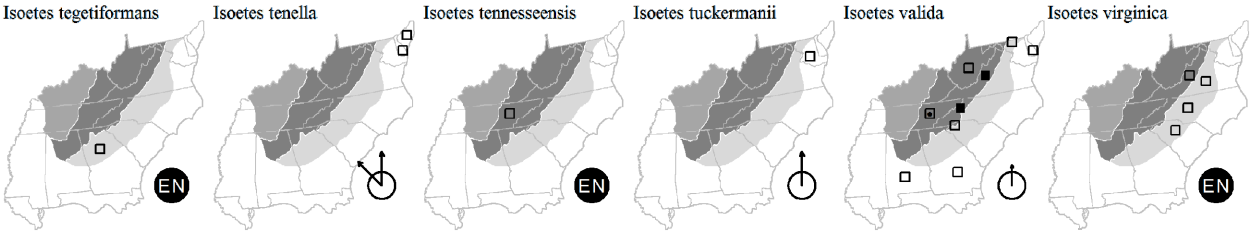
Isoetes tenella Léman, Spiny-spore Quillwort. In acid lakes, ponds, and rivers (submerged to emersed), tidal mud flats. Circumboreal, in North America from Greenland, NL (Labrador), and AK south to DE, n. OH, MI, WI, CO, and CA. South to PA and NJ (Kartesz 1999). [= K; = *I. echinospora* Durieu – FNA; > *I. echinospora* var. *echinospora* – F, G; > *I. echinospora* var. *muricata* (Durieu) Engelmann – C, F, G; > *I. echinospora* var. *braunii* (Durieu) Engelmann – G; > *I. muricata* Durieu] {synonymy incomplete}

Isoetes tennesseensis N.T. Luebke & J.M. Budke. Rocky river shoals. Endemic to Polk County, TN, near the North Carolina-Georgia state line, in the Hiawassee River. An octoploid species. See Luebke & Budke (2003) for additional information. [< *I. lacustris* – FNA, K, formerly misidentified as a southern disjunct population of *I. lacustris*]

Isoetes tuckermanii A. Braun, Tuckerman's Quillwort. South to MD (Kartesz 1999). A tetraploid species (2n-44), apparently derived from hybridization of a northern *I. engelmannii* entity and an unknown or extinct species, Z (Hoot, Napier, & Taylor 2004), genotype=NNZZ. [= FNA, K; < *I. tuckermanii* – C, F, G]

Isoetes valida (Engelmann) Clute, Mountain Quillwort, Carolina Quillwort. Bogs (growing in *Sphagnum*), pools, ponds. A diploid species (2n=22). Genotype=VV. [= K, Z; = *I. caroliniana* (A.A. Eaton) N. Luebke – FNA; < *I. engelmannii* – RAB, C, W, WV; = *I. engelmannii* A. Braun var. *caroliniana* A.A. Eaton – F, S]

Isoetes virginica N.E. Pfeiffer, Virginia Quillwort. In woodland streams. July-September. See Brunton, Britton, & Wieboldt (1996) for additional information. [= C, K; < *I. melanopoda* Gay & Durieu ex Durieu – RAB; < *I. virginica* – C, F, FNA, G, W (also see *I. piedmontana*)]



L3. SELAGINELLACEAE Willkomm 1854 (Spikemoss Family) [in SELAGINELLALES]

A family of a single genus (as currently broadly conceived) and about 700-750 species. References: Valdespino in FNA (1993b); Tryon (1955); Lellinger (1985); Buck (1977); Somers & Buck (1975); Jermy in Kramer & Green (1990). Key adapted in part from Valdespino in FNA (1993b).

Selaginella Palisot de Beauvois 1804 (Spikemoss)

As currently conceived broadly, a genus of about 700-750 species, cosmopolitan, but mostly tropical. It appears likely that *Selaginella* will be subdivided, based on morphology and molecular phylogenetic analyses (Soják 1992; Škoda 1997; Korall, Kenrick, & Therrien 1999). Selaginellaceae, along with Lycopodiaceae and Isoetaceae, now appear to be only distantly related to other extant pteridophytes and seed plants (Pryer et al. 2001). References: Valdespino in FNA (1993b); Tryon (1955); Lellinger (1985); Buck (1977); Somers & Buck (1975); Jermy in Kramer & Green (1990). Key adapted in part from Valdespino in FNA (1993b).

1 Sterile leaves dimorphic, in 4 ranks, the ventral pair spreading laterally, the dorsal pair ascending; leaves acute, mucronate, lacking a white or translucent apical hair-tip; fertile branch tips strongly differentiated (into strobili) from the sterile portions of the stem; [subgenus *Stachygynandrum* or genus *Lycopodioides*].
- 2 Main stems erect, the plants to 5 dm tall ..... ***S. braunii***
- 2 Main stems creeping or ascending.
  - 3 Lateral leaves of the main stems 2.5-4 mm long, elliptic; lateral stems ascending or erect, 2-6 cm long; rhizophores (modified, leafless, root-producing shoots) borne on the upper side of the stem ..... ***S. kraussiana***

3 Lateral leaves of the main stem 1-2.5 (or to 3.6 in *S. uncinata*) mm long, ovate; lateral stems creeping (or the tips sometimes slightly ascending), 0.2-1 cm long; rhizophores axillary.
4 Margins of lateral leaves entire; lateral branches of the stems further branching 2-3 times ..... ***S. uncinata***
4 Margins of lateral leaves dentate-serrate; lateral branches of the stems further branching 1-2 times.
5 Leaves with margins undifferentiated or with 1-2 rows of slightly paler cells stomates distributed over entire upper surface ..... ***S. apoda***
5 Leaves with margins of 3-5 rows of transparent (hyaline) cells; stomates of lateral leaves confined to near the midrib on the upper surface ..... ***S. ludoviciana***

1 Sterile leaves monomorphic, spirally arranged around the stems; leaves acuminate and with a white or translucent apical hair-tip (the hair-tip rarely lost); fertile branch tip only slightly differentiated from the sterile portions of the stems; [subgenus *Tetragonostachys* or genus *Bryodesma*].
6 Apical hair-tip of the leaves twisted-contorted, 1.2-1.7 mm long (sometimes deciduous); strobili 3-6 mm long, 1.5-2 mm wide; leaves 0.15-0.3 mm wide, the marginal cilia absent, toothlike, or as much as 1/6 as wide as the leaf blade; budlike "arrested" branches present..... ***S. tortipila***
6 Apical hair-tip of the leaves straight, 0.3.-1.4 mm long (sometimes deciduous); strobili (5-) 10-35 mm long, 1-1.5 mm wide; leaves 0.2-0.45 mm wide, the marginal cilia 1/4-1/3 as wide as the leaf blade; budlike "arrested" branches present or absent.
7 Stems mostly creeping or turned up at the apex, forming mats 1.5-4 cm high; rhizome or rhizomatous stem absent; aerial roots present all along the stems; budlike "arrested" branches absent..... ***S. rupestris***
7 Stems mostly erect or ascending, forming compact clumps usually > 4 cm high; rhizome or rhizomatous stem present; aerial roots present only at or near the base of the erect stems; budlike "arrested" branches present.
8 Leaves of the underground (rhizomatous) stems not scalelike; rhizophores mostly aerial; sporophyll base pubescent; leaf and sporophyll apices often pubescent..... ***S. acanthonota***
8 Leaves of the underground (rhizomatous) stems scalelike; rhizophores mostly subterranean; sporophyll base glabrous; leaf and sporophyll apices glabrous.
9 Leaves mostly tightly appressed; base conspicuously pubescent; strobili distinctly larger in diameter than the subtending stem; sporophyll apex often recurved..... ***S. arenicola***
9 Leaves mostly loosely appressed; base usually glabrescent; strobili not distinctly larger in diameter than the subtending stem; sporophyll apex usually straight ..... ***S. corallina***

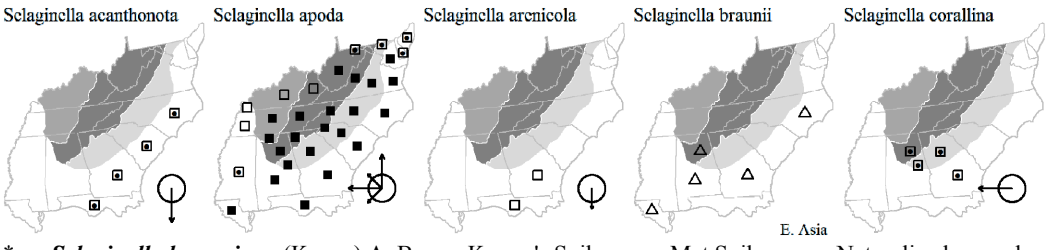
Selaginella acanthonota Underwood, Spiny Spikemoss, Sand Spikemoss. Sandhills, Altamaha Grit glades. June-August. *S. acanthonota* ranges from se. NC south to s. FL, west to w. Panhandle FL. The complex comprising *S. acanthonota*, *S. arenicola*, and *S. riddellii* has been controversial. The complex ranges from se. NC south to s. FL and west to c. TX; see Tryon (1955) and Valdespino in FNA (1993b) for additional information on the complex. [= FNA, K; < *S. arenicola* – RAB; = *S. arenicola* Underwood ssp. *acanthonota* (Underwood) R. Tryon; = ***Bryodesma acanthonota*** (Underwood) Škoda]

Selaginella apoda (Linnaeus) Spring, Meadow Spikemoss. Seepages, bogs, spray cliffs, stream margins, wet meadows, marsh edges, wet spots in lawns, other moist habitats. June-October. S. ME, NY, OH, s. IN, AR, and e. OK south to FL, GA, AL, MS, LA, and e. TX; c. Mexico south to Guatemala. Often overlooked by vascular plant botanists as a moss or liverwort. *S. ludoviciana* of the Gulf Coast east to GA, and *S. eclipes*, more northern, are superficially very similar. [= C, F, FNA, G, K, Md, RAB, W, WV; = *Diplostachyum apodum* (Linnaeus) Beauvois – S; = ***Lycopodioides apodum*** (Linnaeus) Kuntze]

Selaginella arenicola Underwood, Sand Spikemoss. Dry sands. E. GA south to s. FL, se. GA, and e. Panhandle FL. [= *S. arenicola* Underwood ssp. *arenicola* – FNA, K; = *S. arenicola* – S; = ***Bryodesma arenicola*** (Underwood) Soják]

* ***Selaginella braunii*** Baker, Treelet Spikemoss, Braun's Spikemoss. Naturalized around graveyards or gardens; rare, introduced, native of China. [= FNA, K; = ***Lycopodioides species 1***]

Selaginella corallina (Riddell) Wilbur & Whitson, Riddell's Spikemoss. Dry sands, granite outcrops, sandstone outcrops. E. and c. GA west to c. TX and s. OK. See Wilbur & Whitson (2005) for an explanation of the nomenclatural change. [= *S. arenicola* Underwood ssp. *riddellii* (Van Eseltine) R.M. Tryon – FNA, K; = ***Bryodesma arenicola*** (Underwood) Soják *ssp.* ***riddellii*** (Van Eseltine) Škoda]



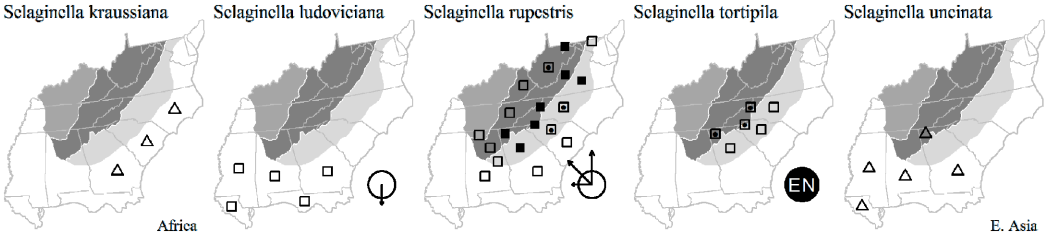
* ***Selaginella kraussiana*** (Kunze) A. Braun, Krauss's Spikemoss, Mat Spikemoss. Naturalized around gardens or lawns; native of s. Africa. [= FNA, K; ***Lycopodioides species 2***]

Selaginella ludoviciana (A. Braun) A. Braun, Gulf Spikemoss, Louisiana Spikemoss. Swamp margins, wet meadows. Gulf Coastal Plain from ne. FL and sw. GA west to e. LA. [= FNA, K; = *Diplostachyon ludovicianum* (A. Braun) Small – S; = ***Lycopodioides ludovicianum*** (A. Braun) Kuntze]

Selaginella rupestris (Linnaeus) Spring, Rock Spikemoss. Granite flatrocks, other, mostly acidic, rock outcrops, occasionally on greenstone or calcareous shales. June-September. S. Greenland and NS west to BC, south to GA, AL, AR, OK, and WY. Valdespino in FNA (1993b) suggests that two or more cryptic or semicryptic species are present within what is currently called *S. rupestris*; additional study is needed. [= C, F, FNA, G, K, Md, RAB, S, W, WV; = ***Bryodesma rupestre*** (Linnaeus) J. Soják]

Selaginella tortipila A. Braun, Twisted-hair Spikemoss. Rock outcrops, mostly at high elevations. July-September. Endemic to the Southern Appalachians (rarely into the Piedmont) of NC, SC, and GA. Occurring close to TN and VA; it should be sought there. [= RAB, FNA, K, S, W; = ***Bryodesma tortipila*** (A. Braun) J. Soják]

* ***Selaginella uncinata*** (Desvaux ex Poiret) Baker, Blue Spikemoss. Moist forests; native of China. Introduced in sw. GA and other places in the Southeastern United States. [= FNA, K; ***Lycopodioides species 3***]



SECTION 2: MONILOPHYTA (FERNS)

Family circumscriptions and sequence follow Christenhusz, Zhang, & Schneider (2011), with relatively minor modifications from Smith et al. (2006). References: Smith et al. (2006); Christenhusz, Zhang, & Schneider (2011).

F4. EQUISETACEAE Michaux ex de Candolle 1804 (Horsetail Family) [in EQUISETALES]

A family with a single genus and about 15 species. References: Hauke in FNA (1993b); Lellinger (1985); Mickel (1979); Hauke in Kramer & Green (1990); Des Marais et al. (2003).

Equisetum Linnaeus 1753 (Horsetail, Scouring Rush)

A genus of about 15 species, nearly cosmopolitan in distribution. References: Hauke in FNA (1993b); Lellinger (1985); Mickel (1979); Hauke in Kramer & Green (1990); Des Marais et al. (2003); Guillon (2004).

1 Stems perennial, evergreen, stiff; sterile and fertile stems monomorphic and either unbranched or with 2-3 short and unequal branches per node; [subgenus *Hippochaete*].
  2 Main erect stems unbranched (rarely branched as a result of injury); stems 3-18 mm in diameter; stomatal lines 1 on each slope of the stem ridges ..... ***E. hyemale*** *ssp.* ***affine***
  2 Main erect stems usually with 2-3 branches at the nodes; stems 1.5-7 mm in diameter; stomatal lines 1-2 on each slope of the stem ridges .. .. ***E. ramosissimum*** *ssp.* ***ramosissimum***
1 Stems annual, deciduous, the sterile stems flexible; sterile and fertile stems dimorphic or monomorphic, usually branched (often copiously so) but sometimes unbranched or sparsely and irregularly branched; [subgenus *Equisetum*].
  3 Sterile and fertile stems monomorphic; sterile and fertile stems sparsely and irregularly branched; stem ridges 12-24, indistinct; diameter of the central cavity of the stem about 4/5's of the stem diameter ..... ***E. fluviatile***
  3 Sterile and fertile stems dimorphic; sterile stems copiously branched and green, fertile stems unbranched or branched, green, tan, brown, or purplish; stem ridges 4-18, distinct; diameter of the central cavity of the stem usually < 3/4's of the stem diameter.
    4 Sheaths of the sterile stems 3-10 mm long, the teeth dark brown with white margins; sterile stems regularly whorled with simple branches (rarely rebranching) ..... ***E. arvense***
    4 Sheaths of the sterile stems 10-30 mm long, the teeth reddish-brown with brown margins; sterile stems regularly whorled with branches which regularly rebranch ..... ***E. sylvaticum***

Equisetum arvense Linnaeus, Field Horsetail. Moist streambanks, bottomlands, moist disturbed sites, road banks, railroad banks. March-April. A circumboreal species, in North America south to c. GA, c. AL, c. MS, n. AR, n. TX, NM, AZ, and south into Mexico. [= RAB, C, FNA, G, K, Md, S, W, WV; > *E. arvense* var. *arvense* – F]

Equisetum ×ferrissii Clute (pro sp.) [= *E. hyemale* × *laevigatum*]. Riverbanks, wet forests. There are old reports, repeated in RAB, S, and FNA, of the occurrence of *E. ×ferrissii* in NC and SC; documentation of these reports is not known; it is reported for Prince George's County, MD (Shetler & Orli 2000) and for KY (Campbell & Medley 2007). *E. ×ferrissii* may be distinguished from *E. hyemale* var. *affine* (to which it will key above) by the failure of its cones to produce spores at all or the production of aborted spores (vs. production of normal spores) and most stem sheaths lacking a blackish band well below the teeth (vs. most stem sheaths with a narrow to broad blackish band well below the teeth). [= C, FNA, K; = *E. ferrissii* Clute – G; = ***Hippochaete ×ferrissii*** (Clute) Škoda & Holub] {not yet keyed}

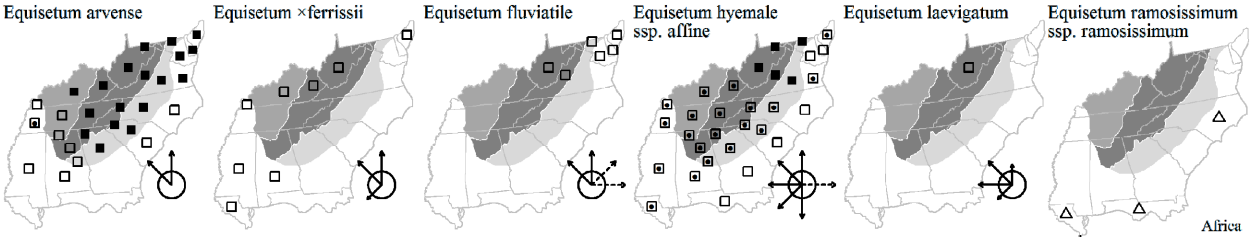
Equisetum fluviatile Linnaeus, Water Horsetail, Pipes. Open calcareous wetlands, wet meadows, river and lake margins. June-August. Circumboreal, south in North America to n. VA, n. WV, PA, OH, IN, IL, IA, and WA. [= C, F, FNA, G, K, Md, W, WV]

Equisetum hyemale Linnaeus *ssp.* ***affine*** (Engelmann) Calder & R.L. Taylor, Tall Scouring Rush, River Scouring Rush. Riverbanks, alluvial floodplains. May-September. Ssp. *affine* occurs nearly throughout North America and in Mexico and Guatemala, and in ne. Asia; ssp. *hyemale* is Eurasian. [= FNA; = *E. hyemale* var. *affine* (Engelmann) A.A. Eaton – C, K, Md, RAB, W; > *E. hyemale var. affine* – F, WV; > *E. hyemale* var. *robustum* (A. Braun) A.A. Eaton – F; > *E. hyemale* var. *pseudohyemale* (Farwell) Morton – G; > *E. hyemale* var. *elatum* (Engelmann) Morton – G, WV; ? *E. praealtum* Rafinesque – S; = ***Hippochaete hyemalis*** (Linnaeus) Bruhin ssp. ***affinis*** (Engelmann) W.A. Weber]

Equisetum laevigatum A. Braun. {habitats}. QC and BC south to NY, w. PA, s. OH, s. IN, s. IL, AR, e. TX, NM, AZ, CA, and n. Mexico. There are old reports, repeated in RAB, and S, of this species further south; documentation of these reports is not known. It will key to *E. hyemale* ssp. *affine* in the above key, but has the strobilus apex rounded (vs. pointed), and aerial stems annual (vs. perennial). [= C, FNA, G, K; > *E. hyemale* Linnaeus var. *intermedium* A.A. Eaton – F; > *E. kansanum* Schaffner – F; = ***Hippochaete laevigata*** (A. Braun) Farwell] {not yet keyed}

Equisetum ×litorale Kühlewein ex Ruprecht (pro sp.) [*arvense* × *fluviatile*] is reported by FNA for VA. It can be distinguished from *E. arvense* by its white, misshapen spores. [= C, F, FNA, K; = *E. litorale* Kühlewein ex Ruprecht – G] {not yet keyed}

* ***Equisetum ramosissimum*** Desfontaines *ssp.* ***ramosissimum***, Branched Scouring Rush. Disturbed areas; native of the Old World, where it is widespread in Europe, Asia, and Africa. This species was apparently introduced long ago on ship's ballast to various old ports, such as Wilmington (New Hanover County, NC), Pensacola (Escambia County, FL) and New Orleans, LA. It is naturalized on the Wilmington waterfront, persisting in disturbed areas, such as in gravel along railroad tracks. Hauke (1979, 1984, 1992) discusses the occurrence of this species in North America. Ssp. *debile* (Roxburgh) Hauke occurs in se. Asia and southern Pacific Islands; it is not known to be naturalized in North America. [= FNA; < *E. ramosissimum* – K; = ***Hippochaete ramosissima*** (Desfontaines) Farwell *ssp.* ***ramosissima***]



Equisetum sylvaticum Linnaeus, Woodland Horsetail. Seepage swamps. Circumboreal, south in North America to MD, n. VA, ec. WV, OH, MI, WI, IA, WY, MT, and WA. [= C, FNA, K; > *E. sylvaticum* var. *sylvaticum* – F, G; > *E. sylvaticum* var. *pauciramosum* Milde – F, G; > *E. sylvaticum* var. *multiramosum* Wherry – Md, WV]

F5. OPHIOGLOSSACEAE (R. Brown) Agardh 1822 (Adder's-tongue Family) [in OPHIOGLOSSALES]

A family of 7-8 genera and about 75-115 species. The Ophioglossaceae is only distantly related to the leptosporangiate ferns; Kuo et al. (2011) and Pryer et al. (2004) indicate that it is most closely related to Psilotaceae. References: Wagner & Wagner in FNA (1993b); Wagner in Kramer & Green (1990).

1 Sterile portion of the leaf simple, unlobed; fertile stalks unbranched, the sporangia embedded in a linear spike ..... ***1. Ophioglossum***
1 Sterile portion of the leaf blade pinnate, pinnatifid, or more divided; fertile stalks branched, the sporangia sessile or stalked.
  2 Fertile stalk joined to stalk of sterile leaf blade near the rhizome, far below the base of the leaf blade, and usually at or below the surface of the ground; leaves evergreen ..... ***3. Sceptridium***
  2 Fertile stalk joined to stalk of sterile leaf blade near the base of the leaf blade, far above the rhizome, and usually well above the surface of the ground; leaves deciduous.
    3 Sterile portion of the leaf blade 1-2-pinnate; plants usually < 20 cm tall; sterile blade fleshy in texture, 1-8 cm long..... ***4. Botrychium***
    3 Sterile portion of the leaf blade 3-pinnate or even more finely divided; plants (9-) 30-50 cm tall; sterile blade herbaceous in texture, 10-40 cm long ..... ***2. Botrypus***

1. Ophioglossum Linnaeus 1753 (Adder's-tongue)

A genus of about 25-30 species, nearly cosmopolitan, primarily tropical. References: Lellinger (1985); Wagner in Kramer & Green (1990).

1 Underground stem globose, nearly spherical, 3-11 mm in diameter; fertile spikes commonly with a conspicuous, acute or attenuate sterile portion (apiculum) at its apex; sterile blade 1-4 cm long, 0.5-2.5 cm wide, borne horizontally near the ground..... ***O. crotalophoroides***
1 Underground stem narrowly cylindrical or irregularly elongate, 2-4 mm in diameter; fertile spikes without a sterile portion at the apex or the sterile portion inconspicuous; sterile blade 0.5-10 cm long, 0.2-5.5 cm wide, borne horizontally, ascending, or vertically.
  2 Sterile blade 0.2-1 cm wide, the polygonal venation areoles usually lacking both smaller areoles and free included veinlets.....***O. nudicaule***
  2 Sterile blade (0.5-) 1.2-5 cm wide, the polygonal venation areoles either with smaller areoles or with free included veinlets.
    3 Large areoles of the of the sterile blade subdivided into smaller areoles, further subdivided into smaller areoles and free veinlets; sterile blade apiculate ..... ***O. engelmannii***
    3 Large areoles of the sterile blade subdivided into smaller areoles, which lack free veinlets; sterile blade obtuse or acute.
      4 Sterile blade ovate-lanceolate, the base obtuse to nearly truncate, broadest < ¼ of the way from the base to the apex; primary areoles mostly > 2 mm wide, without included veinlets .....***O. petiolatum***
      4 Sterile blade ovate to elliptic, the base cuneate to obtuse, broadest between one quarter and one half of the way from the base to the tip; primary areoles mostly < 2 mm wide, with included veinlets.
        5 Sterile blade elliptic, broadest near the middle, acute to attenuate at the base, pale green, dull, herbaceous in texture; basal frond sheath membranaceous and ephemeral; spores 50-60 µ in diameter.....***O. pusillum***
        5 Sterile blade ovate, broadest below the middle, obtuse at the base, dark green, shiny, firm in texture; basal frond sheath leathery and tending to persist; spores 35-45 µ in diameter ..... ***O. pycnostichum***

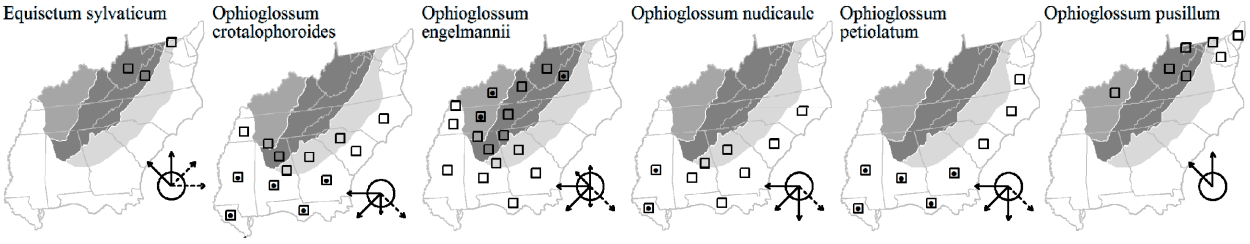
Ophioglossum crotalophoroides Walter, Bulbous Adder's-tongue. Moist ditch banks and grassy roadside flats. March-September. E. NC (Dare County) south to FL and west to TX; also in Mexico, the West Indies, Central America, and South America. [= RAB, FNA, S, WH; > *O. crotalophoroides* var. *crotalophoroides* – K; > *O. crotalophoroides* var. *nanum* Osten ex de Lichtenstein – K]

Ophioglossum engelmannii Prantl, Engelmann's Adder's-tongue, Limestone Adder's-tongue. Dry barrens and glades over calcareous rocks, very rarely on granite. March-June. W. VA, IN, IL, KS, and AZ south to Panhandle FL and TX; also in Mexico and Central America. Ascribed to NC by Wagner & Wagner in FNA (1993b), the documentation unknown. [= C, F, FNA, G, K, S, W, WH]

Ophioglossum nudicaule Linnaeus f., Slender Adder's-tongue. Lawns and other moist, grassy areas. E. NC south to s. FL, west to TX; also in Mexico, the West Indies, Central and South America, Asia, and Africa. First reported from NC by Thomas & Marx (1979). [= RAB, FNA, K, WH; > *O. dendroneuron* E.P. St. John – S; > *O. mononeuron* E.P. St. John – S; > *O. tenerum* Mettenius – S]

Ophioglossum petiolatum Hooker, Long-stem Adder's-tongue. Maritime wet grasslands, moist ditch banks, and grassy roadside flats. March-November. Se. VA south to FL and west to TX and OK; also in the West Indies, Mexico, n. South America, and Asia. First reported for NC by Thomas & Marx (1979). Wagner & Wagner in FNA (1993b) suggest that this species is likely introduced in North America. [= RAB, FNA, K, WH; > *O. floridanum* E. St. John – S]

Ophioglossum pusillum Rafinesque, Northern Adder's-tongue. Wet meadows, swamp edges. March-July. NS west to ND and BC, south to w. VA, n. IN, n. IL, and w. NE, w. WY, w. MT, and CA. [= FNA, K; = *O. vulgatum* Linnaeus var. *pseudopodum* (Blake) Farwell – C, F, WV; < *O. vulgatum* – G]



Ophioglossum pycnostichum (Fernald) A. & D. Löve, Southern Adder's-tongue. Bottomland forests, moist loamy soils of successional forests and old fields. March-July. S. NJ, IN, IL, and s. MI south to GA, MS, and e. TX; s. Mexico. *O. vulgatum* (defined narrowly) is Eurasian. The best treatment of this complex remains uncertain. [= W; = *O. vulgatum* Linnaeus var. *pycnostichum* Fernald – RAB, C, F, WV; < *O. vulgatum* Linnaeus – FNA, G, K, S]

2. Botrypus Richard 1801 (Rattlesnake Fern)

A genus of 1-2 species, semicosmopolitan. References: Hauk, Parks, & Chase (2003).

Botrypus virginianus (Linnaeus) Holub, Rattlesnake Fern, Sang-find. In a wide range of fairly dry, mesic, and wet forests, cove forests, especially in nutrient-rich, moist bottomlands and slopes. April-June. NL (Newfoundland) and BC south to n. peninsular FL and CA, and Mexico south through Central America and n. South America; West Indies; Asia; Australia; scattered in Europe. [= *Botrychium virginianum* (Linnaeus) Swartz – RAB, C, FNA, G, K, W, WH, WV; = *B. virginianum* var. *virginianum* – F; = *Osmundopteris virginiana* (Linnaeus) Small – S]

3. Sceptridium Lyon 1905 (Grape Fern)

A genus of ca. 14 species, nearly cosmopolitan. References: Hauk, Parks, & Chase (2003); Hauk (1996).

1 Sterile leaf 4-pinnate-pinnatifid, finely divided, the ultimate segments lacerate and linear, < 3 mm wide ..... ***S. dissectum***
1 Sterile leaf 2-pinnate to 4-pinnate, not finely divided, the ultimate segments ovate or oblong, > 8 mm wide.
  2 Sterile pinnae entirely divided into short, round or acute pinnules; lateral pinnules with an inconspicuous and poorly-developed central vein; plant producing 1 or 2 leaves per season.
    3 Sterile pinna and pinnule apices obtuse to acute (rarely round); ultimate segments mostly rounded at the base, not fan-shaped, ovate or oblong; ultimate segments often crowded and overlapping ..... ***S. multifidum***
    3 Sterile pinna and pinnule apices round to obtuse; ultimate segments cuneate, rounded, or truncate at the base; ultimate segments remote or overlapping.
      4 Stalk of the basal sterile pinnae (10-) 15-70 mm long; roots irregularly ribbed, blackish; ultimate leaf segments fan-shaped, obovate, longer than wide, pinnately veined, the midrib weakly developed; sporulating August-October ..... ***S. jenmanii***
      4 Stalk of the basal sterile pinnae 4-15 (-20) mm long; roots smooth, yellowish; ultimate leaf segments about as long as wide, subflabellately veined, lacking a midrib; sporulating January-April ..... ***S. lunarioides***
  2 Sterile pinnae (or their terminal portion) elongate (the sides often nearly parallel), entire to shallowly lobed, not divided into pinnules; lateral pinnules with a conspicuous and well-developed central vein; plant producing 1 leaf per season.
    5 Sterile pinna and pinnule apices obtuse to rounded (to somewhat acute); ultimate segments mostly ovate, narrowly ovate, or oblong, mostly about 2× as long as broad or less; overwintering leaves green, not bronze ..... ***S. oneidense***
    5 Sterile pinna and pinnule apices acute; ultimate segments mostly oblong or lanceolate-oblong, often > 2× as long as broad; overwintering leaves bronze (or green if covered by leaves).
      6 Sterile blade mostly 2-pinnate, the segments sharply serrulate ..... ***S. biternatum***
      6 Sterile blade mostly 3-pinnate (or more divided, those forms keyed above), the segments entire to obscurely serrulate or crenulate ..... ***S. dissectum***

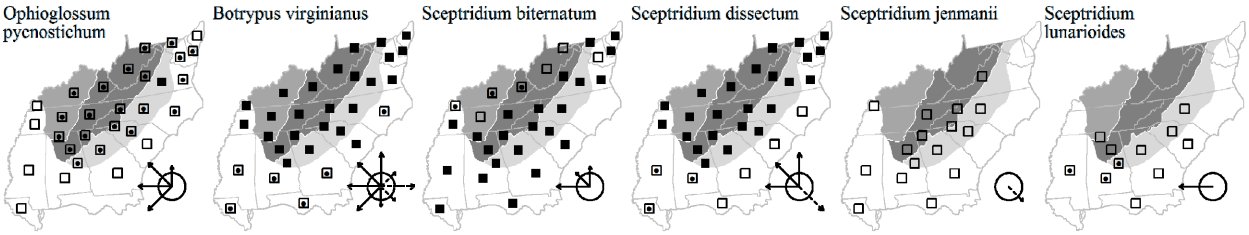
Sceptridium biternatum (Savigny) Lyon, Southern Grapefern. Moist forests, clearings, old fields. August-October. MD, PA, s. IN, s. IL, and c. OK south to s. FL and e. TX. [= *Botrychium biternatum* (Savigny) Underwood – RAB, C, FNA, K, S, W; = *B. dissectum* var. *tenuifolium* (Underwood) Farwell – F, G; < *B. dissectum* (Sprengel) Lyon – WH]

Sceptridium dissectum (Sprengel) Lyon, Cut-leaf Grape Fern, Dissected Grapefern. Moist forests, clearings, old fields. August-October. NS and QC west to ON and MI, south to Panhandle FL and e. TX; also in the West Indies. The two forms have caused much confusion. In our area, forma *obliquum* is much more common and widely distributed, often confused with *B. biternatum*. Forma *dissectum* is fairly common in our area only in VA (rare in GA, NC, and SC), occurring primarily in the Mountains. The different distributions of the 2 forms suggest that further research is needed. [= *Botrychium dissectum* Sprengel – RAB, C, FNA, K, W, WV; < *B. dissectum* var. *dissectum* – F (also see *S. oneidense*); > *B. dissectum* var. *obliquum* (Muhlenberg ex Willdenow) Clute – G; > *B. dissectum* var. *dissectum* – G; > *B. dissectum* – S; > *B. obliquum* Muhlenberg ex Willdenow – S; < *B. dissectum* (Sprengel) Lyon – WH]

Sceptridium jenmanii (Underwood) Lyon, Alabama Grapefern. Moist to dryish forests and disturbed areas. August-October. C. and sw. VA and w. KY south to Panhandle FL, s. AL, and e. LA; also in the West Indies. This species probably

arose as a hybrid between *B. biternatum* and *B. lunarioides* (Michaux) Swartz, followed by polyploidization, resulting in a fertile taxon functioning as a species. [= *Botrychium jenmanii* Underwood – C, FNA, K, W, WH; = *B. alabamense* Maxon – RAB, S]

Sceptridium lunarioides (Michaux) Holub, Winter Grapefern. Old fields, pastures, young forests, granitic flatrocks, juniper-oak-blue ash woodlands over limestone. January-April. W. NC, c. TN, and s. SC south to n. FL, and west to e. TX and se. OK. Wagner (1992) proposes that *B. lunarioides* be treated in a new monotypic section, *Hiemobotrychium*, of *Botrychium*, subgenus *Sceptridium*. The species is hard to spot, and all the more difficult to find because of its phenology; the leaves appear in late fall and die by early spring. [= *Botrychium lunarioides* (Michaux) Swartz – RAB, FNA, K, WH; = *Holubiella lunarioides* (Michaux) Škoda; = *Botrypus lunarioides* Michaux]



Sceptridium multifidum (S.G. Gmelin) M. Nishida, Leather Grapefern. Grassy balds and high elevation meadows; moist forests. August-September. NL (Labrador) and AK south NJ, PA, OH (and in the mountains to VA and NC), IN, IL, IA, NE, CO, NM, and CA. [= *Botrychium multifidum* (S.G. Gmelin) Treviranus – C, FNA, K, W; > *B. multifidum* var. *multifidum* – F, G; > *B. multifidum* var. *intermedium* (D.C. Eaton) Farwell – F, G]

Sceptridium oneidense (Gilbert) Holub, Bluntlobe Grapefern. Moist or boggy forests, foodplain forests, bogs. July-October. Local in occurrence from NB, QC, and ON south to NC, TN, KY, IN, and WI. Recent studies by Warren Hauk suggest that *B. oneidense* may not be distinct from *B. dissectum*. [= *Botrychium oneidense* (Gilbert) House – RAB, C, FNA, K, W, WV; < *B. dissectum* var. *dissectum* – F ("forma *oneidense* (Gilbert) Clute – embarrassingly transitional"); = *B. multifidum* var. *oneidense* (Gilbert) Farwell – G]

*4. **Botrychium*** Swartz 1801 (Moonwort)

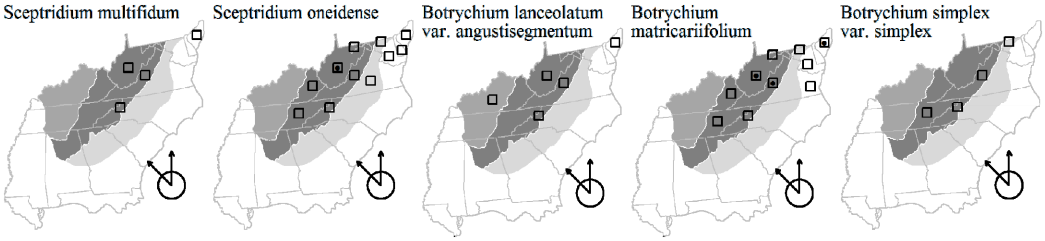
A genus of 25-30 species, nearly cosmopolitan, but primarily temperate and concentrated in North America and e. Asia. *Botrychium* as traditionally circumscribed to include *Botrypus* and *Sceptridium* is very heterogeneous (Hauk, Parks, & Chase 2003); I have here accepted the arguments of Hauk (1996), Hauk, Parks, & Chase (2003), and others recommending recognition of the anciently divergent and molecularly and morphologically distinctive segregates as genera. References: Wagner in Kramer & Green (1990); Hauk, Parks, & Chase (2003). [also see *Botrypus* and *Sceptridium*]

1 Sterile pinnae contracted at the base, thus cuneate or wedge-shaped; leaf blades pinnate to nearly simple, 1-6 cm long, 0.3-2 cm wide; pinna margins entire, the apices round; [section *Simplex*].....***B. simplex* *var.* *simplex***
1 Sterile pinnae (or pinnules of 2-pinnate blades) not contracted at the base, thus oblong or elongate; leaf blades pinnate, pinnate-pinnatifid, or 2-pinnate, 1-8 cm long, 0.8-6 cm wide; pinna or pinnule margins entire, lobed, or incised, the pinna apices round, obtuse, or acute; [section *Lanceolatum*].
  2 Sterile pinnae apices obtuse to round at the apex, their segments (and undivided pinnae) about as long as wide, round, obtuse, or truncate at the apex; leaf blade mostly short-petioled (rarely sessile), the petiole (0-) 1-3 cm long; leaf blade pinnate to pinnate-pinnatifid.....***B. matricariifolium***
  2 Sterile pinnae acute at the apex, their segments (and undivided pinnae) at least twice as long as wide, mostly lanceolate, acute at the apex; leaf blade sessile, leaf blade pinnate-pinnatifid to 2-pinnate .....***B. lanceolatum* *var.* *angustisegmentum***

Botrychium lanceolatum (S.G. Gmelin) Angström *var.* ***angustisegmentum*** Pease & A.H. Moore, Lanceleaf Moonwort, Narrow Triangle Moonwort. Forests and grassy balds. July-August. Var. *angustisegmentum* ranges from NL (Newfoundland) and ON south to VA, WV, NC, OH, MI, and MN, and in the Rocky Mountains of Canada and MT. Var. *lanceolatum* is widespread in w. North America. The two varieties are genetically distinct (Farrar & Wendel 1996). [= C, F, G, K, W, WV; = *B. lanceolatum* ssp. *angustisegmentum* (Pease & A.H. Moore) R.T. Clausen – FNA]

Botrychium matricariifolium (A. Braun ex Duwell) A. Braun ex W.D.J. Koch, Daisyleaf Moonwort. Dry to moist forests (often successional), old fields, grassy balds, northern hardwood forests. June-August. NL (Newfoundland) and AB south to w. NC, TN, KY, WV, OH, IL, WI, MN, and ND. [= FNA, K, W; = *B. matricariaefolium* – F, G, WV (orthographic variant); > *B. matricariaefolium* var. *matricariaefolium* – C]

Botrychium simplex E. Hitchcock *var.* ***simplex***, Least Moonwort. Disturbed gravelly areas in spruce-fir forests, northern hardwoods forests, grassy balds. May-June. NL (Newfoundland) and BC south to NJ, VA, NC, MI, IN, WI, IA, SD, WY, CO, NM, UT, NV, and CA. Wagner & Wagner in FNA (1993b) discuss variation within *B. simplex*. Farrar & Wendel (1996) indicate that 3 varieties of *B. simplex* have strong genetic divergence, comparable to that usually distinguishing species. [= C, F, G; < *B. simplex* – FNA, K, W, WV]



F6. PSILOTACEAE Kanitz 1887 (Whiskfern Family) [in PSILOTALES]

A family of 2 genera and 4-12 species, pantropical and warm temperate. References: Lellinger (1985); Thieret in FNA (1993b); Kramer in Kramer & Green (1990)

Psilotum Swartz 1800 (Whiskfern)

A genus of 2-3 species, tropical and warm temperate. *Psilotum* lacks roots and true leaves. Other than the Australasian genus *Tmesipteris*, *Psilotum* has no close living relatives, and the 2 genera are usually considered to comprise a distinct class (Wagner 1977). The stem is chlorophyllose. Fungal cells interspersed in the outer layers of the rhizome aid in the absorption of nutrients. References: Lellinger (1985); Thieret in FNA (1993b); Kramer in Kramer & Green (1990).

Identification notes: The stiff, dichotomously-branched habit of *Psilotum* is unmistakable.

Psilotum nudum (Linnaeus) Palisot de Beauvois, Whiskfern. In moist bottomland forests, on soil, stumps, and tree bases, along building foundations (where introduced). April-September. S. SC south to s. FL, west to e. TX, disjunct (and apparently native) in ne. NC (Perry & Musselman 1994), rarely naturalized around buildings in c. NC; also in sw. United States and in the tropics of Central and South America, Africa, and Asia. [= RAB, FNA, K, S]

F8. OSMUNDACEAE Martinov 1820 (Royal Fern Family) [in OSMUNDALES]

A family of 4 genera and about 15-25 species. References: Metzgar et al. (2008)=Z; Lellinger (1985); Whetstone & Atkinson in FNA (1993b); Kramer in Kramer & Green (1990); Yatabe, Nishida, & Murakami (1999).

1 Leaves hemidimorphic (juvenile leaves with only sterile pinnae, leaves bearing sporangia with sterile and fertile pinnae, the fertile pinnae either borne medially or terminally); photosynthetic (sterile) pinnae lacking tufts of hairs ..... ***2. Osmunda***
1 Leaves dimorphic (each leaf normally either completely photosynthetic or completely fertile); photosynthetic (sterile) pinnae with tufts of reddish hairs near the junction with the rachis ..... ***1. Osmundastrum***

1. Osmundastrum C. Presl (Cinnamon Fern)

A monotypic genus, of the Americas and e. Asia. "When the *rbcL* trees, the fossil and morphological evidences are all taken into account, it can be concluded that the extant *Osmunda cinnamomea* has no closely related living species in Osmundaceae, and it has evolutionarily very static morphology with no significant modification for more than 200 million years. Thus we can call extant *Osmunda cinnamomea* a 'living fossil' " (Yatabe, Kishima, & Murakami 1999); Metzgar et al. (2008) confirmed the opinion that cinnamon fern is an outlier and warrants generic status. References: Metzgar et al. (2008)=Z; Lellinger (1985); Whetstone & Atkinson in FNA (1993b); Kramer in Kramer & Green (1990); Yatabe, Nishida, & Murakami (1999).

Identification notes: Sterile plants of *Osmundastrum cinnamomeum* are sometimes confused with *Woodwardia virginica*, which also has rather coarse, pinnate-pinnatifid leaves and grows in similar wet, acid places. *Osmundastrum* is coarser (to 2 m tall, vs. to 1 m tall), has cinnamon tufts of tomentum present in the axils of the pinnae (vs. absent), has the rachis greenish and rather fleshy in texture (vs. brown and wiry), and bears fronds clumped or tufted from a massive, woody, ascending rhizome covered with old petiole bases (vs. fronds borne scattered along a thick, horizontal, creeping rhizome).

Osmundastrum cinnamomeum (Linnaeus) C. Presl, Cinnamon Fern. Bogs, peatlands, pocosins, wet savannas, floodplains, blackwater stream swamps, and other wetlands. March-May. NL (Labrador) west to MN, south to s. FL, c. TX; Mexico south through Central America to n. South America; West Indies; e. Asia. The species also occurs in e. Asia, where sometimes treated as a separate variety (but the combination is not available in *Osmundastrum*). The taxonomic significance of the densely glandular pubescent *Osmunda cinnamomea* var. *glandulosa* needs additional evaluation; it is reported from scattered locations in e. North America, including SC and VA. Because of its geographic incoherence it is here regarded as a form. [= Z; = *Osmunda cinnamomea* Linnaeus – RAB, FNA, G, S, W, WV; > *Osmunda cinnamomea* var. *cinnamomea* – C, F, K; > *Osmunda cinnamomea* Linnaeus var. *glandulosa* Waters – F, K]

2. Osmunda Linnaeus (Royal Fern, Cinnamon Fern, Interrupted Fern)

A genus of 3-7 species, if circumscribed (as here) to exclude *Todea*, *Leptopteris*, and *Osmundastrum*, following Metzgar et al. (2008). References: Metzgar et al. (2008)=Z; Lellinger (1985); Whetstone & Atkinson in FNA (1993b); Kramer in Kramer & Green (1990); Yatabe, Nishida, & Murakami (1999).

1 Leaves pinnate-pinnatifid, each pinna pinnatifid but not divided into distinct pinnules; spores borne on modified pinnae in the middle of the leaf blade; veins mostly 1-forked; [subgenus *Claytosmunda*] ..... ***O. claytoniana* *var.* *claytoniana***
1 Leaves bipinnate, each pinna fully divided into distinct pinnules, the larger pinnules 3-7 cm long and 0.7-2.0 cm wide; spores borne on modified pinnae in the terminal portion of the leaf blade; veins mostly 2-forked; [subgenus *Osmunda*] ..... ***O. spectabilis***

Osmunda claytoniana Linnaeus *var.* ***claytoniana***, Interrupted Fern. Upland forests, woodlands, and balds, moist to rather dry. March-June. NL (Newfoundland) west to MN, south to n. GA, TN, and AR; another variety occurs in e. and sc. Asia. A fossil from the Triassic is seemingly indistinguishable from this species and suggests "that *O. claytoniana* has perhaps been in morphological stasis for at least 200 million years and also that the genus *Osmunda* is at least this old" (Metzgar et al. 2008). [= C, F; < *O. claytoniana* – RAB, FNA, G, K, S, W, WV; = *Osmundastrum claytoniana* (Linnaeus) Tagawa]

Osmunda spectabilis Willdenow, American Royal Fern. Bogs, marshes (including tidal), moist forests, floodplains, swamp forests, and other wetlands. March-June. NL (Newfoundland) west to MB, south to s. FL, e. TX; Mexico south through Central America south to n. South America; West Indies. The taxonomy of *O. regalis* and relatives needs additional reassessment (Metzgar et al. 2008); preliminary results suggest that e. North American *O. spectabilis* is more closely related to Asian *O. japonica* (=*O. regalis* var. *japonica*) and *O. lancea* than to European, African, and sw. Asian (typic) *O. regalis*. [= ***O. regalis*** Linnaeus *var.* ***spectabilis*** (Willdenow) A. Gray – RAB, C, F, FNA, G, K, W, WV; < *O. regalis* – S]

F9. HYMENOPHYLLACEAE Link 1833 (Filmy Fern Family) [in HYMENOPHYLLALES]

A family of 6-10 (or many more) genera and about 600 species. This treatment follows the generic interpretation of Ebihara et al. (2006), which splits *Trichomanes* (as both polyphyletic and morphologically diverse) and retains a broad and monophyletic *Hymenophyllum*. See Moran (1998) for an interesting discussion and overview of independent fern gametophytes in e. North America. References: Farrar in FNA (1993b); Ebihara et al. (2006, 2007); Iwatsuki in Kramer & Green (1990); Morton (1968).

1 Gametophytes only present, not in association with or in close proximity to filmy-fern sporophytes.
  2 Gametophytes filamentous, no portion flattened and planar, forming felt-like mats ..... ***4. Crepidomanes***
  2 Gametophytes thalloid, flattened ..... ***1. Hymenophyllum***
1 Sporophytes present.
  3 Leaves simple to slightly lobed, < 2 cm long; rhizomes filiform, <0.5 mm in diameter.
    4 Leaves glabrous or with simple hairs; rhizomes densely covered with dark-colored hairs ..... ***2. Didymoglossum***
    4 Leaves stellate pubescent; rhizomes glabrous or with sparse light-colored hairs ..... ***1. Hymenophyllum***
  3 Leaves pinnate-pinnatifid, > 5 cm long; rhizomes filiform or moderately stout.
    5 Rhizomes filiform, <0.5 mm in diameter, glabrous or with sparse light-colored hairs; indusium ("involucre") bivalvate (deeply divided into 2 flaps); receptacle not exserted from between the deeply bilobed indusium ..... ***1. Hymenophyllum***
    5 Rhizomes moderately stout, 0.8-1.5 mm in diameter, densely clad with dark-colored hairs; indusium ("involucre") tubular or funnelform, sometimes slightly 2-lobed; receptacle long and whiplike, exserted from the mouth of the tubular (slightly bilobed) indusium ..... ***3. Vandenboschia***

1. Hymenophyllum J.E. Smith 1793 (Filmy Fern)

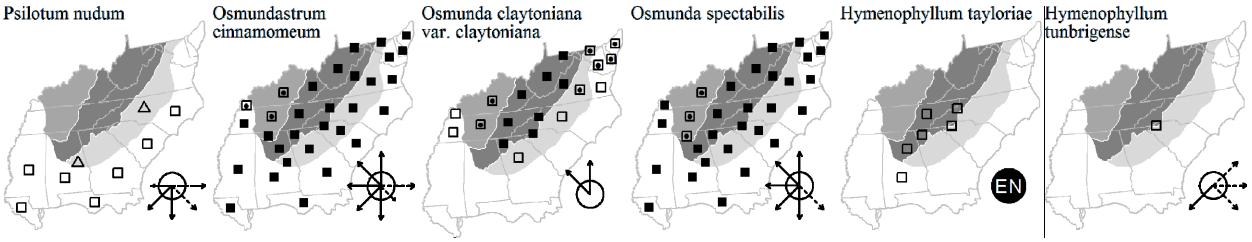
As here broadly circumscribed, a genus of about 250-330 species, almost strictly tropical in distribution, but very rarely expending into humid north temperate regions. *Sphaerocionium* C. Presl and other segregates are often recognized; these segregates may well be warranted. Iwatsuki in Kramer & Green (1990) takes a broad view of the genus, recognizing only *Sphaerocionium* among the potential segregates. If this distinction is recognized, *H. tunbrigense* is in *Hymenophyllum* and *H. tayloriae* in *Sphaerocionium* (the combination has not been made). References: Ebihara et al. (2006)=Z; Davison (1997); Raine, Farrar, & Sheffield (1991); Iwatsuki in Kramer & Green (1990); Morton (1968).

1 Sporophytes present.
  2 Leaf blade with stellate hairs; [subgenus *Sphaerocionium*] ..... ***H. tayloriae***
  2 Leaf blade glabrous; [subgenus *Hymenophyllum*] ..... ***H. tunbrigense***
1 Gametophytes only present.
  3 Gemmae present; margin crenate, composed predominantly of cells with concave outer walls; archegonia and antheridia rare; plant forming sprawling, ribbon-like forms; branches filamentous to broad; proliferations abundant, arising marginally and centrally; [subgenus *Sphaerocionium*] ..... ***H. tayloriae***
  3 Gemmae absent; margin entire, composed predominantly of straight-sided cells; archegonia and antheridia common, often present on the same gametophyte; plant typically forming rosettes; branches always broad; proliferations few, always marginal; [subgenus *Hymenophyllum*] ..... ***H. tunbrigense***

Hymenophyllum tayloriae Farrar & Raine, Gorge Filmy Fern. Spray cliffs near waterfalls, permanently moist ceilings of grottoes in escarpment gorges with high rainfall. This species is endemic to the southern end of the Southern Appalachians (Transylvania, Jackson, and Macon counties, NC, Pickens and Oconee counties, SC, Rabun County, GA, Fentress, Scott, and Sevier counties, TN, and Lawrence, Franklin, and Lamar counties, AL). It was recently named (in honor of the first collector), following the demonstration that it represented a gametophyte distinct from the gametophytes of any (sporophytically) known species (Raine, Farrar, & Sheffield 1991), including *H. tunbrigense*, present in the close vicinity. Raine, Farrar, & Sheffield

(1991) point out that "*H. tayloriae* is distinguished from the independent gametophytes of *Vittaria appalachiana* Farrar & Mickel by its 2-dimensional spathulate gemmae (those of *V. appalachiana* are uniseriate), rhizoid attachment only to marginal cells, yellow-green color, and glossy texture. Thalloid liverworts of similar size are generally more than one cell thick or have a distinct midrib, have notched apical meristems, and do not produce spathulate gemmae." An immature sporophyte, collected by Taylor in 1936, has stalked stellate hairs on the margins and midrib of the leaf and was the only sporophytic collection of the species until the recent discovery of additional juvenile sporophytes in AL (FNA 1993b). [= FNA, K, Z; = "a branching ribbon-like gametophyte with marginal rhizoids and small, ovate, plate-like gemmae several cells wide, of the genus *Hymenophyllum*" – RAB; = ***Sphaerocionium species 1***]

Hymenophyllum tunbrigense (Linnaeus) J.E. Smith, Tunbridge Filmy Fern. Moist rock faces in an escarpment gorge with high rainfall. June-September. N. Mexico south through Central America to n. South America; SC; West Indies (Jamaica and Hispaniola); w. Europe; Africa; Australia and New Zealand. The occurrence of this filmy fern in the escarpment gorge of Eastatoe Creek and its tributaries (Pickens County, SC) is remarkable. Overall, *H. tunbrigense* is a "Gulf Stream plant," found in highly humid, climates in the West Indies, and the maritime west coast of the British Isles. *H. tunbrigense* somewhat resembles *Trichomanes boschianum*. This species may yet be found in NC in similarly rugged and humid escarpment gorges. It differs from *T. boschianum* in having the sporangia not extending beyond the deeply 2-lobed involucre (as opposed to having the sporangia exserted beyond the slightly bilobed, funnelform involucre). [= RAB, FNA, K, W, Z]



2. Didymoglossum Desvaux 1827

A genus of 30-40 species, primarily tropical. References: Ebihara, Farrar, & Ito (2008)=Y; Ebihara et al. (2006)=Z; Ebihara et al. (2007); Iwatsuki in Kramer & Green (1990); Morton (1968); Dubuisson et al. (2003).

Didymoglossum petersii (A. Gray) Copeland, Dwarf Filmy Fern. On vertical faces of acidic rock outcrops in humid gorges, primarily of the Savannah River drainage, in the context of the very humid escarpment gorges on relatively dry rocks, not on rocks receiving substantial seepage or spray from waterfalls, also on outcrops of Altamaha Grit in the Coastal Plain, and on tree bark in swamps (in LA and MS). June-August. W. NC, nw. SC, sw and sc. TN, south to n. peninsular FL, c. AL, s. MS, and e. LA; disjunct in the Ozarks and Ouachitas of AR; Mexico (Chiapas, Veracruz, and Puebla) and Guatemala. This diminutive species is often overlooked, except by bryologists and hepaticologists; superficially, it does resemble a moss or liverwort more than a fern. It occurs on tree bark in some parts of its range. [= Z; = *Trichomanes petersii* A. Gray – RAB, FNA, K, S, W]

3. Vandenboschia Copeland 1938

A genus of 15-20 species, of the tropics and extending to north temperate areas of high humidity. References: Ebihara, Farrar, & Ito (2008)=Y; Ebihara et al. (2006)=Z; Ebihara et al. (2007); Iwatsuki in Kramer & Green (1990); Morton (1968); Dubuisson et al. (2003).

Vandenboschia boschiana (Sturm) Ebihara & K. Iwatsuki, Appalachian Filmy Fern. On rock outcrops, usually vertical or overhanging, usually in deeply shaded grottoes receiving seepage or spray from waterfalls. June-September. W. VA, s. OH, s. IN, s. IL south to w. NC and nw. SC, n. GA, n. AL, and ne. MS (Menapace, Davison, & Webb 1998); disjunct in the Ozarks of nw. AR; disjunct in Chihuahua, Mexico. See Belden et al. (2004) for more details on the first documented Virginia occurrence. [= Z; = *Trichomanes boschianum* Sturm – RAB, C, F, FNA, G, K, S, W, WV]

4. Crepidomanes C. Presl 1851

A genus of 30-40 species, tropical and extending to north temperate areas of high humidity; strictly Old World, except for our species. References: Ebihara, Farrar, & Ito (2008)=Y; Ebihara et al. (2006)=Z; Ebihara et al. (2007); Iwatsuki in Kramer & Green (1990); Morton (1968); Dubuisson et al. (2003).

Crepidomanes species 1, Grotto-felt, Appalachian Trichomanes, Weft Fern. On ceilings or back walls of grottoes, especially in humid gorges or near or behind waterfalls. Rather widespread in e. North America, from NH, VT, w. NY, OH, IN, and IL south to NC, nw. SC, n. GA, and n. AL. *Crepidomanes species 1* cannot be morphologically distinguished from gametophytes of *Vandenboschia boschiana* or *Didymoglossum petersii*; the electrophoretic and phytogeographic evidence of Farrar (1992) leave little question, however, that it should be considered a distinct species. Although Farrar (1992) found that 30 of 30 populations of *Trichomanes (s.l.)* gametophytes "east of the Mississippi River that were not within or adjacent to sporophyte populations of *T. boschianum* or *T. petersii*" were "*T. intricatum*," the absence of sporophytes should be considered to

provide only a presumptive or likely identification of gametophytes. Farrar (1992) also showed that independent gametophytes in AR were those of *Vandenboschia boschiana* and *Didymoglossum petersii*. Farrar (1992) points out the "intriguing possibility that somewhere in the Appalachian Mountains sporophytes of this species may yet exist." Probably the most likely area in which to search for the sporophyte generation of *Crepidomanes species 1* is the escarpment gorge region of NC, SC, and GA near Highlands, NC, where topography, waterfalls, and the highest rainfall east of the Cascade Mountains combine to create microclimatic conditions that have favored the relict survival of numerous species of mosses, liverworts, and ferns. Any filmy-fern sporophyte which differs from known eastern North America species of Hymenophyllaceae should be investigated carefully. *Vittaria appalachiana* and *Hymenophyllum tayloriae* gametophytes differ from *Trichomanes intricatum* in being thallose rather than filamentous. Ebihara, Farrar, & Ito (2008) have recently reported that *Crepidomanes species 1* shares its chloroplast genome with the Asian triploid *Crepidomanes schmidtianum* var. *schmidtianum*; further studies are underway to determine the relationship of the two. [= *Trichomanes intricatum* Farrar – FNA, K; = "a filamentous gametophyte, with spindle-shaped gemmae one cell wide but with the cells decreasing in size toward the apices, of the genus *Trichomanes*" – RAB; = *Vandenboschia species 1* – Z; ≈ *Crepidomanes schmidtianum* (Zenker ex Tasch.) K. Iwatsuki var. *schmidtianum* – Y]

F10. GLEICHENIACEAE C. Presl 1825 (Forking-fern Family) [in GLEICHENIALES]

A family of about 6 genera and 125-140 species, pan-tropical and -subtropical. References: Nauman in FNA (1993b).

Dicranopteris Bernhardi 1805 (Forking-fern)

A genus of 8-12 speces, pan-tropical and -subtropical. References: Nauman in FNA (1993b).

* ***Dicranopteris flexuosa*** (Schrader) Underwood, Forked-fern. Wet pine flatwoods, moist disturbed areas; native in New World tropics. FL Panhandle (Bay and Franklin counties) and FL peninsula, s. AL (Mon Louis Island, Mobile County); West Indies; Mexico, Central America, and South America. [= FNA, K, S]

F13. LYGODIACEAE M. Roemer 1840 (Climbing Fern Family) [in SCHIZAEALES]

A family with a single genus and about 40 species, of tropical and temperate regions, particularly equatorial and south temperate. Sometimes included in the Schizaeaceae, but the relationship is remote and unclear. References: Nauman in FNA (1993b).

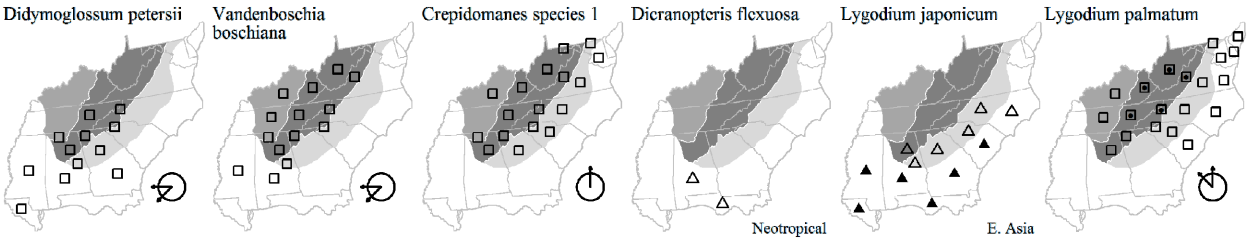
Lygodium Swartz 1800 (Climbing Fern)

A genus of about 40 species, mostly tropical, with a few temperate species.

1 Sterile pinnae pinnately divided into numerous serrate pinnules ..... ***L. japonicum***
1 Sterile pinnae palmately lobed into 4-8 smooth to undulate lobes ..... ***L. palmatum***

* ***Lygodium japonicum*** (Thunberg) Swartz, Japanese Climbing Fern. Disturbed areas; native of Asia. June-September. The leaves (up to 30 m in length!) climbing into the canopy of trees in swamp forests and other wet habitats. [= RAB, FNA, K, S]

Lygodium palmatum (Bernhardi) Swartz, American Climbing Fern, Hartford Fern. Bogs, moist thickets, swamp forests, sandstone outcrops, roadside ditches and roadbanks, in strongly acid soils. July-September. NH, VT, NYand MI south to SC, n. GA, and n. AL, widely scattered except in the Cumberland Plateau of KY, TN, and AL, where it is most common. Garrison (1992) discusses two forms of the species, "one with long appressed hairs scattered over the lower (abaxial) side of the sterile leaflets and the other relatively hair-free." The two forms appear to be geographically differentiated, the pubescent form predominating south and west of Maryland, the glabrous form occurring primarily in the Northeast. Both forms are present in our area. Further research is needed to determine the taxonomic significance of this variation in pubescence. [= RAB, C, F, FNA, G, K, S, W, WV]



F14. SCHIZAEACEAE Kaulfuss 1827 (Curly-grass Family) [in SCHIZAEALES]

A family of 3-4 genera and about 30 species (depending on circumscription). The Lygodiaceae is often combined with the Schizaeaceae. References: Wagner in FNA (1993b); Kramer in Kramer & Green (1990).

Schizaea J.E. Smith 1793 (Curly-grass Fern)

A genus of about 10 species (excluding *Actinostachys*), mostly tropical. References: Wagner in FNA (1993b); Kramer in Kramer & Green (1990).

Schizaea pusilla Pursh, Curly-grass Fern. Moist, peaty oil in Coastal Plain bogs, often associated with *Pseudolycopodiella carolinianana*, *Drosera filiformis*, and *Chamaecyparis thyoides* (though not in dense *Chamaecyparis* stands). May-July. In acid, boggy sites in DE, NJ, NY, NL (Newfoundland), NS, and NB; a similar or possibly identical plant is known from Peru. The leaves are filiform, 1-12 cm long. Spores of *Schizaea* have been identified in Pleistocene organic sediment from Singletary Lake (Bladen County, NC) and Rockyhock Bay (Chowan County, NC) (Whitehead 1963). Its native occurrence in our area as an extant species is plausible. See LeBlond & Weakley (2002) for further information on this species' occurrence in North Carolina. [= C, F, FNA, G, K]

F16. MARSILEACEAE Mirbel 1802 (Water-clover Family) [in SALVINIALES]

A family of 3 genera and about 55-75 species, nearly cosmopolitan. References: Nagalingum, Nowak, & Pryer (2008); Johnson in FNA (1993b); Kramer in Kramer & Green (1990).

1 Leaves clover-like, the 4 cuneate, obovate or wedge-shaped leaflets borne at the summit of the petiole; sporocarps ovoid..... ***Marsilea***
1 Leaves grass-like, linear, the leaf blade absent, the petiole narrowly winged; sporocarps spherical ..... ***Pilularia***

Marsilea Linnaeus 1753 (Water-clover)

A genus of 50-70 species, nearly cosmopolitan. References: Jacono & Johnson (2006)=Z; Johnson in FNA (1993b); Kramer in Kramer & Green (1990); Knepper, Johnson, & Musselman (2002). Key based in part on Z and FNA.

Identification notes: The **raphe** is the portion of the peduncle adnate to the sporocarp. The peduncle ends in a blunt tooth, the **proximal tooth**. Further up on the sporocarp is a second tooth, the **distal tooth**.

1 Leaves strongly bicolored (pale green towards the base of each of the 4 leaflets, darker green towards the tip); aquatic forms with a swollen air bladder just below the leaf ..... ***M. mutica***
1 Leaves unicolored.
  2 Roots present (1-3) between the nodes, as well as at the nodes.
    3 Distal tooth 0.3-0.8 mm long; sporocarps 3.5-5.0 mm long..... ***M. minuta***
    3 Distal tooth absent or < 0.2 mm long; sporocarps 4.5-6.0 mm long ..... ***M. quadrifolia***
  2 Roots present only at the nodes
    4 Distal tooth absent or a very low bump ..... ***M. macropoda***
    4 Distal tooth 0.4-1.2 mm long, sharply acute to pointed, often hooked ..... ***M. vestita***

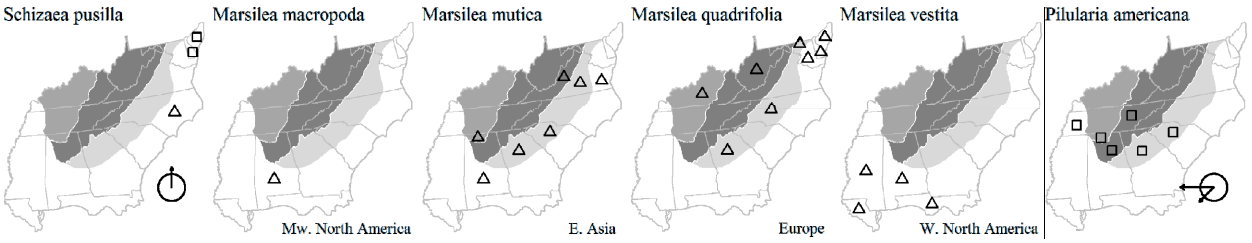
* ***Marsilea macropoda*** Engelmann ex A. Braun, Bigfooted Water-clover. {habitat}; native of s. TX and Mexico. Reported as introduced eastward in AL and c. and s. peninsular FL. [= FNA, K, Z]
* ***Marsilea minuta*** Linnaeus, Small Water-clover. Lakes and streams; native of the Old World. Known in North America from AL, FL, GA, and TN. [= FNA, Z; *M. crenulata* Desv.; *M. crenata* Presl]
* ***Marsilea mutica*** Mettenius, Nardoo, Australian Water-clover. Ditches, ponds; native of Australasia. Apparently spreading rapidly in VA. [= Z]
* ***Marsilea quadrifolia*** Linnaeus, European Water-clover. Shallow water of artificial impoundment; native of Europe. Not seen fertile in NC. Sold in garden stores as an aquatic to be grown in water gardens, and likely to be encountered more widely in the future. [= C, F, FNA, G, K]
* ***Marsilea vestita*** Hooker & Greville, Hairy Water-clover. Wet ditches, old fields; native of w. North America. [= FNA, K, Z]

Pilularia Linnaeus 1753 (Pillwort)

A genus of 2-6 species, nearly cosmopolitan. References: Nagalingum, Nowak, & Pryer (2008); Dennis & Webb (1981); Kramer in Kramer & Green (1990).

Identification notes: *Pilularia* lacks a leaf-blade, the 1-8 cm long petiole is narrowly winged, and looks a bit like an *Isoetes* or *Juncus* leaf. In vegetative condition, it may be recognized as a "fern" by the typical coiled ("fiddlehead") development of young leaves. The primary rhizome produces individual "fronds" at nodes, a short rhizome branch at each node also produces "fronds."

Pilularia americana A. Braun, American Pillwort. Vernal pools and seepage areas on granitic flatrocks, other ponds. This peculiar plant has a puzzling distribution, being known from several disjunct regions: WA to s. CA; NE and MO south to c. TX; SC, GA, TN, AL, and Mexico (Durango and Baja California Norte); similar plants, perhaps conspecific, occur in South America and Africa. The fragmented distribution may be at least partly explainable by the inconspicuous nature of the plant. First reported for SC in 1993 (J. Allison, pers. comm.). [= FNA, K, S]



F17. SALVINIACEAE Martinov 1820 (Floating Fern Family) [in SALVINIALES]

A family of a 2 genera and about 16 species, all floating aquatics. *Azolla* is sometimes separated as a separate family, Azollaceae. References: Nagalingum, Nowak, & Pryer (2008); Nauman in FNA (1993b); Lumpkin in FNA (1993b); Schneller in Kramer & Green (1990).

1 Leaves < 1 mm long, reddish or green, without hairs on the upper surface.....***Azolla***
1 Leaves 5-50 mm long, bright green, with obvious hairs on the upper surface.....***Salvinia***

Azolla Lamarck 1783 (Mosquito Fern)

A small genus of about 6 species, floating aquatics, in tropical and warm temperate regions. Very un-fernlike, this floating aquatic looks superficially more like an aquatic liverwort. In some years and some places it occurs in great abundance, covering the surface of the water with a green or red mass of vegetation. *Azolla* has a symbiotic, nitrogen-fixing cyanobacterium, *Anabaena azollae* Strasburger. The nitrogen-fixing capabilities of *Azolla* have resulted in its use as a fertilizer, green manure, and livestock feed, much promoted in recent years, but used historically in Asian rice paddies for centuries (Lumpkin in FNA 1993b). References: Evrard & Van Hove (2004)=Z; Lumpkin in FNA (1993b).

1 Largest hairs on upper leaf lobe with 2 or more cells; megaspores densely covered with tangled filaments .....***A. caroliniana***
1 Largest hairs on upper leaf lobe with 1 cell; megaspores with raised angular bumps, visible through a sparse layer of filaments .....
.....***A. filiculoides***

Azolla caroliniana Willdenow, Eastern Mosquito Fern, Water fern. Stagnant waters of interdune ponds, limesink ponds, old millponds, beaver ponds, floodplain sloughs, often locally abundant. June-September. Widespread in the se. United States, extending irregularly north (partly from introductions) into s. New England and MN, and south into the tropics. [= RAB, C, F, FNA, G, K, S; < *A. filiculoides* – Z]

* ***Azolla filiculoides*** Lamarck. Freshwater lake; native of w. North America, souty into Mexico, Central America, South Americ, e. Asia. This species is reported for e. GA from a freshwater lake on Sapelo Island, McIntosh Co. (Bates & Browne 1981), presumably as an accidental introduction. [= FNA, K; < *A. filiculoides* – Z]

Salvinia Séguier 1754 (Water Spangles)

A genus of about 10 species, mostly tropical. References: Nauman in FNA (1993b); Lellinger (1985)=Z ; Jacono (1999); Schneller in Kramer & Green (1990).

1 Leaves 5-15 mm long; multicellular hairs of the upper leaf surface with 4 free, spreading branches (use 10× magnification).....***S. minima***
1 Leaves to 50 mm long; multicellular hairs of the upper leaf surface with 4 branches joined at their tips, forming a cage-like structure (use 10× magnification).....***S. molesta***

* ***Salvinia minima*** Baker, Water Spangles. Quiet waters; probably introduced in our area from further south. [= FNA, K, Z; *S. auriculata* – S, misapplied]

* ***Salvinia molesta*** D.S. Mitchell. Still waters of farm ponds, calcareous seepage ponds, and other situations; native of Brazil. *S. molesta* has been found at scattered sites in GA (Gwinnett and Lamar counties) (Carter, Baker, & Morris 2009), NC (Brunswick, Carteret, Craven, Cumberland, Duplin, Durham, Johnston, Jones, Lenoir, Mecklenburg, New Hanover, Onslow, Orange, Person, Pitt, Sampson, and Wake counties), SC (Colleton County), and VA (Shenandoah County), where it has been subjected to extermination efforts; it will likely be reintroduced (Anonymous 1999, D. Patterson, pers. comm.). This species is considered a noxious aquatic weed and has been reported from other southeastern states, such as TX and LA (Jacono 1999). Moran & Smith (1999) support the continued use of the name *S. molesta* for this species, as opposed to the ambiguous name *S. adnata* Desvaux. [= FNA, K, WH, Z; ? *S. adnata* Desvaux]

F30. DENNSTAEDTIACEAE Lotsy 1909 (Bracken Family) [in POLYPODIALES]

A family of about 16 genera and 370 species, of cosmopolitan distribution; the circumscription is very uncertain and controversial, however. References: Lellinger (1985); Cranfill in FNA (1993b); Kramer in Kramer & Green (1990).

1 Leaf blades broadly triangular in outline, about as broad as long, subcoriaceous; sori linear, confluent .....***Pteridium***

1 Leaf blades elongate in outline, at least 2× as long as broad, membranaceous; sori globular, separate
  2 Leaves 2-pinnate-pinnatifid; indusium tubular or cuplike; leaves generally < 1 m long ..... ***Dennstaedtia***
  2 Leaves 3-4-pinnate-pinnatifid; indusium flap-like; leaves generally > 1 m long ..... ***Hypolepis***

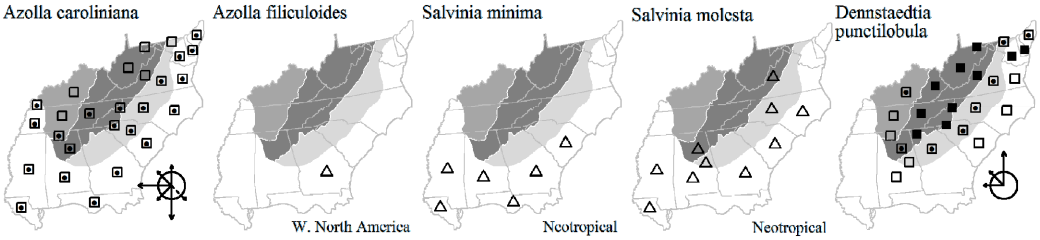
Dennstaedtia Bernhardi 1801 (Cuplet Fern)

A genus of about 45 species, of tropical to temperate distribution; *Dennstaedtia* is poorly known and of uncertain circumscription. Only *D. punctilobula* is temperate in distribution; anatomical evidence suggests that it is not closely related to tropical *Dennstaedtia*, and its separation from that genus may be warranted. References: Nauman & Evans in FNA (1993b); Kramer in Kramer & Green (1990).

Identication notes: *Dennstaedtia punctilobula* can be distinguished from other woodland ferns with deciduous fronds of similar size and shape (such as *Athyrium*, *Dryopteris*, and *Thelypteris*) by the following characteristics: leaves yellow-green or pale-green in color, with whitish-gray glandular trichomes, petioles silvery-pilose, leaves borne scattered (as clonal patches), sori tiny (< 0.5 mm in diameter).

* *Dennstaedtia cicutaria* (Sw.) T. Moore. Reported for AL by Kartesz (1999) on the basis of Dean's (1969) mention of an individual plant of *D. rubiginosa* having been planted in Mobile. This report is rejected, as there is no evidence of naturalization. The species is native of tropical America. [= K; ? *D. rubiginosa* (Kaulfuss) T. Moore] {rejected; not keyed}

Dennstaedtia punctilobula (Michaux) T. Moore, Hay-scented Fern, Pasture Fern, Boulder Fern. Rocky or dry woodlands and forests, rock outcrops, pastures, clearings, roadbanks. June-September. NS and QC west to MI, south to NC, n. GA, n. AL, and AR, progressively more montane southward. [= RAB, C, F, FNA, G, K, S, W, WV]



Hypolepis Bernhardi 1806 (Bramble Fern)

A genus of about 45 species, pantropical. References: Nauman in FNA (1993b).

1 Stipe and rachis bearing numerous small prickles; [native, restricted to FL] ..... ***H. repens***
1 Stipe and rachis smooth, lacking prickles; [alien] ..... ***H. tenuifolia***

Hypolepis repens (Linnaeus) C. Presl, Creeping Bramble Fern. Swamps, wet hammocks. N. FL (Clay County) south to c. FL; West Indies; Mexico, Central America, South America. [= FNA, K, S, WH]

* ***Hypolepis tenuifolia*** (G. Forster) Bernhardi, Spineless Bramble Fern, Soft Ground-fern. Moist disturbed areas, native of tropical e. Asia and South Pacific islands. Rather commonly cultivated, and escaping and establishing vegetatively by rhizome.

Pteridium Gleditsch ex Scopoli 1760 (Bracken)

A genus of 2-11 species, cosmopolitan in distribution. Bracken taxonomy remains provisional; the molecular work of Der et al. (2009) outlines a probable taxonomic structure for the genus. *Pteridium* is a notorious and nearly worldwide weed (though less consequential in our area than in many parts of the world), nearly impossible to eradicate because of its deeply subterranean rhizomes. Bracken fiddleheads are sometimes eaten, but they are poisonous and highly carcinogenic. Bracken is not favored by grazing animals, and increases its abundance under grazing pressure. In overgrazed pastures, however, cattle will graze on bracken, the carcinogenic compound (shikimic acid) then transmittable to humans through milk. References: Thomson, Mickel, & Mehltreter (2008)=Z; Der et al. (2009); Jacobs & Peck in FNA (1993b); Tryon (1941).

1 Leaf segment margins slightly to moderately pubescent; terminal (caudate) tip of the basalmost pinnule of the basal pinna (3-) avg. 12 (-28)% as long as the entire pinna; lower surface of rachis and costae shaggy pubescent; terminal segments of well-developed pinnules generally 2-4× as long as broad, about 3-8 mm wide ..... ***P. aquilinum*** *ssp.* ***latiusculum***
1 Leaf segment margins glabrous or sparsely pilose; terminal (caudate) tip of the basalmost pinnule of the basal pinna (16-) avg. 25 (-45)% as long as the entire pinna; lower surface of rachis and costae glabrous or sparsely pilose; terminal segments of well-developed pinnules generally 6-15× as long as broad, about 2-5 mm wide ..... ***P. aquilinum*** *ssp.* ***pseudocaudatum***

Pteridium aquilinum (Linnaeus) Kuhn *ssp.* ***latiusculum*** (Desvaux) Hultén, Eastern Bracken. Mainly in dry woodlands, forests, and heath balds, up to 1600 m in elevation. July-September. The species is nearly worldwide in distribution. NL (Newfoundland) west to MB, south to Panhandle FL, TX, and n. Mexico. The circumscription of ssp. *latiusculum* follows Thomson, Mickel, & Mehltreter (2008) in excluding Old World material included by many earlier authors. The relationship of the '*latiusculum*' and '*pseudocaudatum*' entities is discussed in detail by Speer & Hilu (1999) and Speer, Werth, & Hilu (1999). [= Z; < *Pteridium aquilinum* (Linnaeus) Kuhn var. *latiusculum* (Desvaux) Underwood ex Heller – RAB, C, F, FNA, G, K, W, WV; = *P. latiusculum* (Desvaux) Hieronymus var. *latiusculum* – S; = *Pteridium latiusculum* (Desvaux) Hieronymus]

Pteridium aquilinum (Linnaeus) Kuhn *ssp.* ***pseudocaudatum*** (Clute) Hultén, Tailed Bracken, Southern Bracken. Mainly in dry sandy woodlands, often locally abundant in sandhills and flatwoods. July-September. Ssp. *pseudocaudatum* is primarily distributed in the Southeastern Coastal Plain (where it is ubiquitous and abundant), but is reported north to MA, OH, IN, s. MI, and MO. [= Z; = *Pteridium aquilinum* (Linnaeus) Kuhn var. *pseudocaudatum* (Clute) Heller – RAB, C, F, FNA, G, K, W, WV; = *P. latiusculum* (Desvaux) Hieronymus var. *pseudocaudatum* (Clute) Maxon – S]

F31. PTERIDACEAE E.D.M. Kirchner 1831 (Maidenhair Fern Family) [in POLYPODIALES]

A family of about 40 genera and about 1000 species. This family may be further subdivided, into families Adiantaceae (*Adiantum, Vittaria*), Sinopteridaceae (*Cheilanthes, Notholaena, Astrolepis, Pellaea*), Cryptogrammaceae (*Cryptogramma*), Pteridaceae (*Pteris*), and Parkeriaceae (*Acrostichum, Ceratopteris*). Here circumscribed to include Vittariaceae (see Smith et al. 2006). References: Lellinger (1985); Windham in FNA (1993b); Tryon, Tryon, & Kramer in Kramer & Green (1990); Kramer in Kramer & Green (1990); Crane (1997).

1 Gametophytes only present; [subfamily *Vittarioideae*] ..... ***10. Vittaria***
1 Sporophytes present.
  2 Leaves linear, 10-60 cm long and 1-3 mm wide; [subfamily *Vittarioideae*] ..... ***10. Vittaria***
  2 Leaves dissected, not linear, > 20 mm wide.
    3 Sori round or oblong, distinct and separate along the pinnule margins; leaves bright-green, glabrous, herbaceous, delicate, and flexible; [subfamily *Vittarioideae*] ..... ***9. Adiantum***
    3 Sori continuous along the pinnule margins (or across the blade in *Acrostichum*); leaves mostly dark-green or glaucous, often pubescent, coriaceous, tough, and stiff (except *Ceratopteris*).
      4 Plant aquatic or subaquatic, pale green, delicate ..... ***3. Ceratopteris***
      4 Plant epipetric or terrestrial (except *Acrostichum*), usually dark green and coriaceous.
        5 Fertile pinnae with entire lower surface covered by sporangia; leaves 1.5-5 m long; [of wetlands, n. FL southward]; [subfamily *Ceratopteridoideae*] ..... ***2. Acrostichum***
        5 Fertile pinnae with sori marginal; leaves < 0.5 m long; [of rocky sites, collectively widespread].
          6 Leaves strongly dimorphic, the fertile leaves obviously longer than the sterile and with narrow elongate ultimate segments; [subfamily *Cryptogrammoideae*] ..... ***1. Cryptogramma***
          6 Leaves essentially monomorphic.
            7 Leaves 2-5-pinnate, the ultimate leaf-segments 1-4 (-8) mm long, more-or-less densely hairy (glabrous in *Cheilanthes alabamensis*) or covered on the undersurface with a whitish powder; [subfamily *Cheilanthoideae*].
              8 Lower leaf surfaces covered with whitish powder, otherwise glabrous or sparsely pubescent ..... ***5. Argyrochosma***
              8 Lower leaf surfaces pubescent (or glabrous in *Cheilanthes alabamensis*), never with conspicuous whitish powder..... ***6. Cheilanthes***
            7 Leaves 1-2-pinnate, the ultimate leaf-segments 8-100 mm long, glabrous or sparsely and inconspicuously hairy.
              9 Leaf undersurface densely covered with stellate and ciliate scales; [subfamily *Cheilanthoideae*] ..... ***7. Astrolepis***
              9 Leaf undersurface glabrous or with non-stellate scales.
                10 Rachis dark-brown or purple; [subfamily *Cheilanthoideae*] ..... ***8. Pellaea***
                10 Rachis green or tan; [subfamily *Pteridoideae*] ..... ***4. Pteris***

1. Cryptogramma R. Brown 1823 (Parsley Fern)

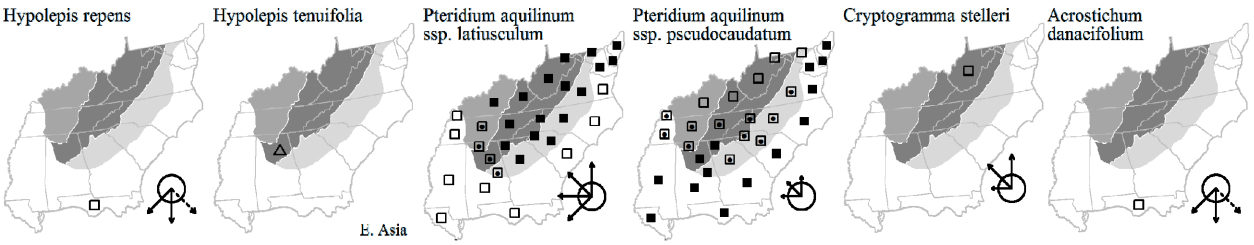
A genus of about 10 species, of temperate Eurasia, North America, and South America. References: Alverson in FNA (1993b); Tryon, Tryon, & Kramer in Kramer & Green (1990).

Cryptogramma stelleri (S.G. Gmelin) Prantl in Engler, Slender Rock-brake. Limestone cliffs. NL (Newfoundland) and AK, south to c. PA, WV (Pendleton and Randolph counties), IL, IA, CO, UT, NV, and OR. [= FNA, C, F, G, K, WV]

2. Acrostichum Linnaeus 1753 (Leather Fern)

A genus of 3 species, pantropical. References: Lloyd in FNA (1993b).

Acrostichum danaeifolium Langsdorff & Fischer, Giant Leather Fern. Freshwater and brackish swamps and marshes. N. peninsular FL (Dixie County) south to s. FL; West Indies; Mexico, Central America and South America. [= FNA, K; = *A. danaeaefolium* – S, orthographic variant]

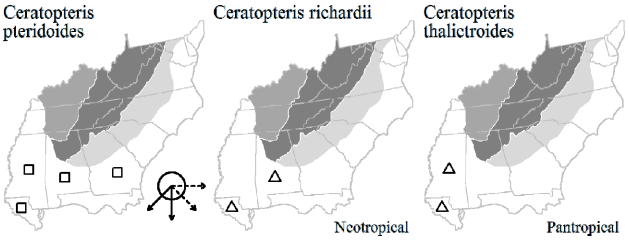


3. Ceratopteris Brongniart 1821 (Antler fern)

A genus of 3 species, widespread in tropical, subtropical, and warm temperate areas. References: Lloyd in FNA (1993b). Key based on FNA.

1 Sterile leaves simple, or palmately to pinnately lobed, or 1-4-pinnately divided, the pinnae (or veins) towards the base of the leaf opposite; petioles often inflated; sporangia with or without an annulus, the annulus with 0-10 (-40) indurated cells ..... ***C. pteridoides***
1 Sterile leaves (1-) 2-3-pinnately divided, the pinnae towards the base of the leaf alternate; petioles usually not inflated; sporangia with an annulus, the annulus with 13-71 indurated cells.
  2 Sporangia with 16 spores ..... ***C. richardii***
  2 Sporangia with 32 spores ..... ***C. thalictroides***

Ceratopteris pteridoides (Hooker) Hieronymus. Ponds and lakes (natural and artificial). S. GA, FL, LA (including Florida parishes); West Indies; Central and South America; se. Asia. [= FNA, K, S, WH]
*? ***Ceratopteris richardii*** Brongniart. Lakes and ponds. Probably only introduced in the southeastern United States. West Indies; Central and South America; Africa. [= FNA, K]
*? ***Ceratopteris thalictroides*** (Linnaeus) Brongniart. Canals, swamps, ditches. Widespread in tropical and subtropical areas of America and Asia. Regarded by some authors as introduced in the se. United States. [= FNA, K; = *C. deltoidea* Benedict –S]



4. Pteris Linnaeus 1753 (Brake)

A genus of about 250-300 species, warm temperate and tropical. References: Nauman in FNA (1993b); Tryon, Tryon, & Kramer in Kramer & Green (1990).

1 Pinnae strictly simple, without lobes or pinnules; outline of leaf blade lanceolate, typically > 3× as long as wide ..... ***P. vittata***
1 Pinnae (at least the basal ones) with 1-several lobes or pinnules; outline of leaf blade ovate to orbicular, typically nearly as wide as long
  2 Pinnae of mature leaves not decurrent or only the terminal pinnae decurrent ..... ***P. cretica***
  2 Pinnae of mature leaves decurrent in the upper half of the leaf onto the rachis ..... ***P. multifida***

* ***Pteris cretica*** Linnaeus, Common Cretan Brake. Limey rocks and soils. Pantropical, the original range unclear. Var. albolineata Hooker is sometimes recognized, seemingly differing only in the broad white central stripe on the pinnae (as opposed to solid green pinnae in var. *cretica*). [= *Pycnodoria cretica* – S; > *Pteris cretica* Linnaeus var. *cretica* – FNA, K; <]
* ***Pteris multifida*** Poiret, Spider Brake. Old walls with lime mortar; native of the Tropics. [= RAB, FNA, K; = *Pycnodoria multifida* (Poiret) Small – S]
* ***Pteris vittata*** Linnaeus, Ladder Brake. Old walls with lime mortar; native of e. Asia. [= RAB, FNA, K; = *Pycnodoria vittata* (Linnaeus) Small – S]

5. Argyrochosma (J. Smith) Windham 1987 (Powdery Cloak Fern)

A genus of about 20 species, of s. North America, Central America, South America, and the West Indies. Traditionally treated as a component of *Notholaena* (or sometimes *Pellaea*) (Tryon, Tryon, & Kramer in Kramer & Green 1990), but best recognized as a separate genus (Windham in FNA 1993b, Windham 1987, Gastony & Rollo 1998). Molecular studies show that this group is more closely related to *Pellaea* and *Astrolepis* than to *Notholaena*. References: Windham in FNA (1993b); Windham (1987); Tryon, Tryon, & Kramer in Kramer & Green (1990); Gastony & Rollo (1998).

Argyrochosma dealbata (Pursh) Windham, Powdery Cloak Fern. Limestone cliffs. IL, MO, and KS south to AR and TX; disjunct in sc. KY. [= FNA, K; = *Notholaena dealbata* (Pursh) Kunze – C, F, G; = *Cheilanthes dealbata* Pursh; = *Pellaea dealbata* (Pursh) Prantl]

6. Cheilanthes Swartz 1806 (Lipfern)

A genus of about 150 species, primarily in the Western Hemisphere. References: Lellinger (1985)=Z; Windham & Rabe in FNA (1993b); Tryon, Tryon, & Kramer in Kramer & Green (1990); Gastony & Rollo (1998). [also see *Argyrochosma* and *Astrolepis*]

1 Leaf surfaces glabrescent; ["*Cheilanthes alabamensis* group"].
  2 Rhizomes short-creeping, usually 4-7 mm in diameter; pinnule midveins green on the upper surface for most of their length; spores 32 per sporangium ..... ***C. alabamensis***

2 Rhizomes long-creeping, usually 1-3 mm in diameter; pinnule midveins black on the upper surface for most of their length; spores 64 per sporangium.....***C. microphylla***

1 Leaf surfaces pubescent (tomentose, villous, or lanose).

3 Petiole and rachis with a mixture of flattened scales (in *C. tomentosa* these very narrow and superficially mistakable for hairs) and jointed hairs (as seen at 10× magnification); plants tufted, without creeping rhizomes; margins of leaf segments strongly under-rolled, modified into a scarious flap (false indusium) that covers the sori; [subgenus *Physapteris*].

4 Leaf blade nearly glabrous above, appearing dark green; scales 0.2-1.0 mm wide, lanceolate; tomentum on the leaf under-surface chestnut-brown (at maturity, whitish when young).....***C. castanea***

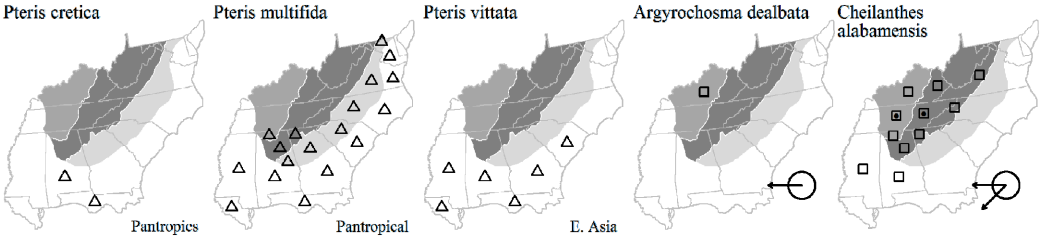
4 Leaf blade villous above, appearing whitish or gray-green; scales ca. 0.1 mm wide, linear, nearly hair-like; tomentum on the leaf under-surface white, tan, or silver-gray.....***C. tomentosa***

3 Petiole and rachis with hairs only (as seen at 10× magnification); plants mat-forming (with leaves scattered along creeping rhizomes) or tufted (without creeping rhizomes); margins of leaf segments under-rolled but not modified into a scarious flap, the sori more-or-less exposed at maturity; [subgenus *Cheilanthes*].

5 Petiole and rachis glabrous to sparsely pubescent with rather straight hairs; leaves 3-pinnate, with 7-12 (-15) pairs of pinnae, the lower surface lanose (the hairs curly); leaf blades 2.5-10 (-15) cm long; ultimate segments 1-3 mm long, beadlike.....***C. feei***

5 Petiole and rachis rather densely pubescent with long jointed hairs; leaves 2-pinnate-pinnatifid (rarely to 3-pinnate), with 12-20 pairs of pinnae, the lower surface tomentose (the hairs straight or bent); leaf blades (4-) 8-24 cm long; ultimate segments 3-5 mm long, elongate .....***C. lanosa***

Cheilanthes alabamensis (Buckley) Kunze, Alabama Lipfern. Dry outcrops of limestone. June-September. VA, w. NC, s. MO, and OK south and west to n. GA, AL, TX, NM, se. AZ, and Mexico (south to Oaxaca). Considering morphology and chromosome number (sharing x = 29 with *Pellaea*, in contrast to x = 30 in the rest of *Cheilanthes*), it has been suggested that *C. alabamensis* and close relatives could be placed equally well in *Pellaea*, as *P. alabamensis* (Buckley) Baker ex Hooker, as done by Cranfill (1980). Windham & Rabe in FNA (1993b) suggest that *C. alabamensis* is uncomfortably placed in either *Cheilanthes* and *Pellaea* and that "it may constitute a natural group worthy of consideration as a distinct genus." A molecular analysis suggests that *C. alabamensis* and close relatives form a monophyletic group sister to the rest of *Cheilanthes*; this could be the basis for status as a separate genus or for inclusion in *Cheilanthes* (but not for inclusion in *Pellaea*) (Gastony & Rollo 1998). Our plants are apparently apogamous triploids. [= RAB, C, F, FNA, G, K, S, W, Z; = ***Myriopteris*** *sp*.]



Cheilanthes castanea Maxon, Chestnut Lipfern. Dry outcrops of sedimentary or metamorphic rocks (including calcareous shales and siltstones). June-September. Sw. TX to s. AZ and south into Mexico, with scattered disjunct occurrences in c. OK, n. AR, e. WV, and c. and w. VA (to be expected elsewhere in our area). The ultimate segments of the pinnules are roundish and closely spaced, so that they overlap the adjacent segments of the pinnule and the segments of the adjacent pinnule. These characters do not match some descriptions (such as in Z). Whether or not *C. castanea* is distinct from or merely a form of *C. eatonii* is controversial. The complex of the 2 taxa includes apogamous triploids and sexual tetraploids. [= W, WV, Z; < *C. eatonii* Baker – C, FNA, K; = ***Myriopteris*** *sp*.]

Cheilanthes feei T. Moore, Slender Lipfern. Dry outcrops of calcareous sedimentary rocks (dolostone). June-September. WI, MN SD, MT, AB, and BC south to AR, TX, NM, AZ, s. CA, and n. Mexico (Chihuahua and Coahuila); disjunct eastward in KY and w. VA. The only known site in our area is on a dolostone cliff in Pulaski County, VA, where disjunct about 450 km east of a population in Bullitt County, KY, and an additional 200 km from other populations in IL (Wieboldt & Bentley 1982, Porter & Wieboldt 1991). The species is an apogamous triploid of unknown parentage. [= C, FNA, G, K, W, Z; = ***Myriopteris*** *sp*.]

Cheilanthes lanosa (Michaux) D.C. Eaton, Hairy Lipfern. Dry outcrops of felsic or intermediate metamorphic and igneous rocks. June-September. CT, NY, PA, s. IL, MO, and KS south to FL, AL, MS, LA, and e. TX, and disjunct in WI and MN. Much the commonest lip-fern in our area, a sexual diploid, and the most "eastern" of a predominantly western genus. [= RAB, C, FNA, G, K, S, W, WV, Z; = *C. vestita* (Sprengel) Swartz – F; = ***Myriopteris*** *sp*.]

Cheilanthes microphylla (Swartz) Swartz, Southern Lipfern. Shell hammocks, limestone outcrops. Ne. FL south through FL; West Indies; Mexico through Central America to n. South America; West Indies. [= FNA, K, S, Z; = ***Myriopteris*** *sp*.]

Cheilanthes tomentosa Link, Woolly Lipfern. Dry outcrops of intermediate or calcareous metamorphic, igneous, or sedimentary rocks (including sandstone outcrops in the Coastal Plain of GA and SC). June-September. Primarily Appalachian, from PA south to KY, GA, and AL, also at scattered localities from AR, OK, and KS south and west to NM, AZ, and Mexico (south to Veracruz). The species is an apogamous triploid. [= RAB, C, FNA, G, K, W, S, Z; = *C. lanosa* – F, misapplied; = ***Myriopteris*** *sp*.]

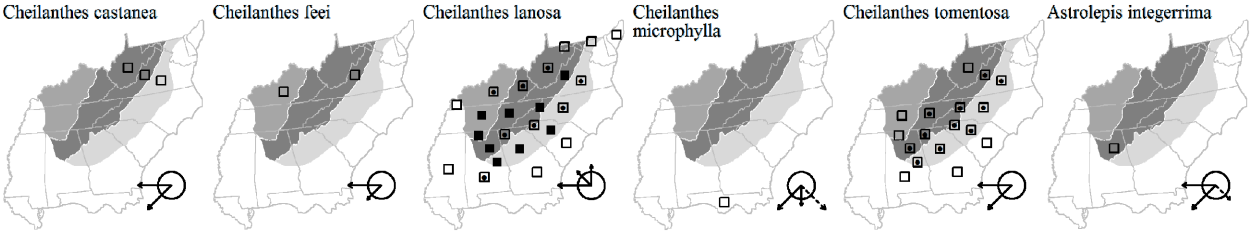
7. ***Astrolepis*** D.M. Benham & Windham 1992 (Star-scaled Cloak Fern)

A genus of about 8 species, of s. North America, Central America, South America, and the West Indies. This group of species has traditionally been placed either in *Notholaena* or *Cheilanthes*, but is best recognized as a separate genus, more closely related

to *Argyrochosma*, *Pellaea*, and *Cheilanthes* than to *Notholaena* (Gastony & Rollo 1998) References: Benham & Windham in FNA (1993b); Tryon, Tryon, & Kramer in Kramer & Green (1990); Gastony & Rollo (1998).

1 Scales of the upper leaf surface dense and usually persistent; largest pinnae asymmetrically lobed or entire; [rare eastern disjunct known from AL].....***A. integerrima***
1 Scales of the upper leaf surface sparse and usually deciduous; largest pinnae usually symmetrically lobed; [rare eastern disjunct known from GA].....***A. sinuata*** *ssp.* ***sinuata***

Astrolepis integerrima (Hooker) D.M. Benham & Windham. Outcrops of Ketona dolostone. OK, NM, AZ, and NV south into Mexico; disjunct to c. AL (Bibb County); also disjunct in Hispaniola. This taxon is apparently an apogamous triploid derived from *Astrolepis cochisensis* (Goodding) D.M. Benham & Windham and an unknown taxon. [= FNA; = *Astrolepis* ×*integerrima* – K; = *Cheilanthes integerrima* (Hooker) Mickel; = *Notholaena integerrima* (Hooker) Hevly; = ***Pellaea*** *sp*.]



Astrolepis sinuata (Lagasca ex Swartz) D.M. Benham & Windham *ssp.* ***sinuata***, Wavy Cloak-fern. Granitic outcrops and boulders. OK, TX, NM, and AZ, south into Central and South America; West Indies; disjunct in GA. Its leaves are pinnate-pinnatifid, with 30-60 pairs of pinnae. [= FNA, K; < *Cheilanthes sinuata* (Lagasca ex Swartz) Domin; < *Notholaena sinuata* (Lagasca ex Swartz) Kaulfuss; = ***Pellaea*** *sp*.]

8. Pellaea Link 1841 (Cliff-brake)

A genus of about 40 species, mostly in the Western Hemisphere. References: Gastony (1988); Gastony, Yatskievych, & Dixon (1992); Windham in FNA (1993b); Tryon, Tryon, & Kramer in Kramer & Green (1990); Gastony & Rollo (1998); Heafner (2001). Key based in part on Heafner (2001). [also see *Argyrochosma, Astrolepis, Cheilanthes*]

1 Petioles terete, glabrous or pubescent; rhizome scales uniformly orangish-brown, entire.
  2 Petioles and rachises sparsely to densely pubescent, dull; pinnae long-stalked, those toward the base of the leaf on stalks 5-15 mm long; [of a variety of substrates, including non-calcareous].....***P. atropurpurea***
  2 Petioles and rachises glabrous to very sparsely pubescent, shiny; pinnae sessile or short-stalked, those toward the base of the leaf on stalks 0-4 (-6) mm long; [strictly of calcareous substrates] .....***P. glabella*** *ssp.* ***glabella***
1 Petioles slightly grooved or flattened, glabrous; rhizome scales with a blackish median stripe and pale brown margins, obscurely toothed.
  3 Ultimate segments thin in texture, not strongly rolled, acute to acuminate at the apex, but lacking a mucro or cusp ..... ***P. viridis***
  3 Ultimate segments leathery, strongly rolled, mucronate at the apex.
    4 Leaves oblong to elliptic in outline; pinnae either ternate toward the base of the leaf and simple toward the tip of the leaf, or all simple; [known from outcrops in the upper Piedmont of SC].....***P. ternifolia*** *ssp.* ***arizonica***
    4 Leaves usually narrowly triangular in outline; pinnae usually pinnate toward the base, becoming ternate to simple toward the tip; [known from outcrops in Piedmont of NC] .....***P. wrightiana***

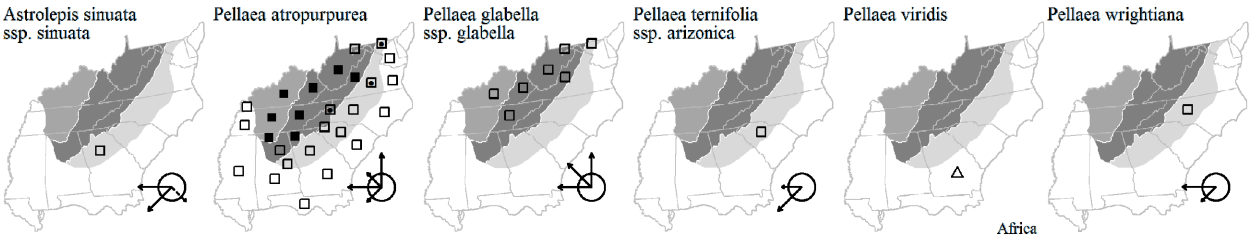
Pellaea atropurpurea (Linnaeus) Link, Purple Cliff-brake. Outcrops of limestone and other rocks (usually either calcareous or mafic), rarely on masonry walls (Wieboldt 1995). May-September. This species is an apogamously-reproducing triploid, either an allopolyploid derived from the hybridization of a sexually-reproducing diploid species and sexually-reproducing tetraploid, or an autopolyploid of an undiscovered or extinct species. Gastony, Yatskievych, & Dixon (1992) provide convincing evidence that modern *P. glabella* is not one of the parental taxa, as indicated by Lellinger (1985). *P. atropurpurea* is widespread in e. North America, from VT, NY, MN, SD, SK, and AB south to FL, AL, TN, AR, TX, NM, AZ, Mexico, and Guatemala. [= RAB, C, F, FNA, K, S, W, WV; = *P. atropurpurea* var. *atropurpurea* – G; = *P.* ×*atropurpurea*]

Pellaea glabella Mettenius ex Kuhn *ssp.* ***glabella***, Smooth Cliff-brake. Dry, exposed outcrops of calcareous rocks (limestone, dolostone), rarely on masonry walls (Wieboldt 1995). May-September. The diploid, sexually-reproducing *P. glabella* ssp. *missouriensis* (Gastony) Windham is (so far as is known) restricted to MO; the apogamously-reproducing autotetraploid derivative, ssp. *glabella*, is more widespread, ranging from VT, ONT, and MN, south to VA, TN, KY, AR, OK, and n. TX. Two additional taxa (both western) have been variously treated as additional subspecies of *P. glabella* or as two subspecies of *P. occidentalis* (E.E. Nelson) Rydberg. [= FNA, K; = *P. glabella* var. *glabella* – C; = *P. atropurpurea* var. *bushii* Mackenzie – G; < *P. glabella* – F, S, W, WV]

Pellaea ternifolia (Cavanilles) Link *ssp.* ***arizonica*** Windham, Arizona Cliff-brake. On granitic outcrops. A remarkable disjunct from sw. United States and Mexico (south to Oaxaca) to w. SC; see Heafner (2001) for additional information. When discovered, it was believed that this was a SC record for *P. wrightiana* (Platt & Townsend 1996), but Heafner (2001) has demonstrated that this actually represents *P. ternifolia* ssp. *arizonica*. [= FNA, K]

* ***Pellaea viridis*** (Forsskål) Prantl, Green Cliffbrake. Outcrop of Altamaha Grit; native of Africa. This species is naturalized on an Altamaha Grit outcrop in Coffee County, GA (J. Allison, pers. comm.). Various infraspecific taxa have been recognized in the native range. [= K; = *Cheilanthes viridis* (Forsskål) Swartz]

Pellaea wrightiana Hooker, Wright's Cliff-brake. South-facing outcrops of Carolina slate or granitic rock with infrequent nutrient-rich seepage. May-September. OK west to se. CO and sw. UT, south to TX, AZ, and n. Mexico (Coahuila, Chihuahua, Soonora, Baja California Norte, and Baja California Sur), with a few, remarkable disjunct occurrences in c. NC. *P. wrightiana* is apparently a sexually-reproducing allotetraploid derivative of hybridization between *P. ternata* (Cavanilles) Link and *P. truncata* Goodding. [= RAB, FNA, K]



9. Adiantum Linnaeus 1753 (Maidenhair Fern)

A genus of 150-200 species, nearly cosmopolitan. References: Paris in FNA (1993b); Tryon, Tryon, & Kramer in Kramer & Green (1990).

1 Petiole and rachises roughly pubescent; [rare introduction]..... ***A. hispidulum***
1 Petiole and rachises glabrous; [collectively common natives].
  2 Leaves longer than broad, pinnately divided, with a main central axis, not fanlike; ultimate segments rhombic, about as long as broad to slightly longer than broad ..... ***A. capillus-veneris***
  2 Leaves broader than long, dichotomously divided at the summit of the petiole, the two main branches pedately branched, fanlike; ultimate segments oblong, > 2× as long as broad.
    3 Ultimate segments at middle of penultimate divisions usually > 3.2× as long as broad, the apices with sharply denticulate, angular lobes, these lobes separated by deep sinuses 0.6-4 mm deep; segment stalks 0.2-0.9 (-1.3) mm long; [disjunct in n. MD and se. PA on serpentine, from a generally more northern and western distribution]..... ***A. aleuticum***
    3 Ultimate segments at middle of penultimate divisions usually < 3.2× as long as broad, the apices with rounded, crenulate, or crenate-denticulate lobes, these lobes separated by shallow sinuses 0.1-2.0 (-3.7) mm deep; segment stalks 0.5-1.5 (-1.7) mm long ... ***A. pedatum***

Adiantum aleuticum (Ruprecht) Paris, Aleutian Maidenhair. Serpentine barrens. NL and QC south at scattered sites to se. PA and MD (Paris in FNA 1993b); also in scattered locations in w. North America, from s. AK south to s. CA, AZ, and Mexico (Chihuahua). [= FNA, K; = *A. pedatum* Linnaeus ssp. *calderi* Cody – C; = *A. pedatum* Linnaeus var. *aleuticum* Ruprecht – F]

Adiantum capillus-veneris Linnaeus, Venus'-hair Fern, Southern Maidenhair. Moist calcareous substrates, in the Coastal Plain on "marl" (coquina limestone) (NC and SC), on calcareous clay bluffs (GA), and adventive on lime mortar of old buildings and walls (as in Wilmington and Fayetteville, NC); in the Mountains and Interior Low Plateau on limestone or other calcareous sedimentary rocks. June-July. Widespread on several continents, in e. North America largely southern in distribution, from e. NC, w. VA, MO, CO, UT, and CO south; also disjunct in SD and BC, and in Mexico, the West Indies, tropical and warm temperate portions of Central and South America, Eurasia, and Africa. There is some question whether North American plants are conspecific with those in the Old World (Paris in FNA 1993b). [= RAB, C, F, FNA, G, K, S, W]

* ***Adiantum hispidulum*** Swartz, Rough Maidenhair, Garden Maidenhair. Stone walls, old wells; native of Asia. Reported for GA (Harper 1903). [= FNA, K, S]

Adiantum pedatum Linnaeus, Northern Maidenhair. Moist forests and cliffs, especially over calcareous or mafic rocks, sometimes in seasonal seepage. June-August. NS and NB west to ON and MN, south to GA, AL, MS, LA, and OK. [= RAB, FNA, G, K, S, W, WV; = *A. pedatum* ssp. *pedatum* – C; = *A. pedatum* var. *pedatum* – F]

10. Vittaria J.E. Smith 1793 (Shoestring Fern)

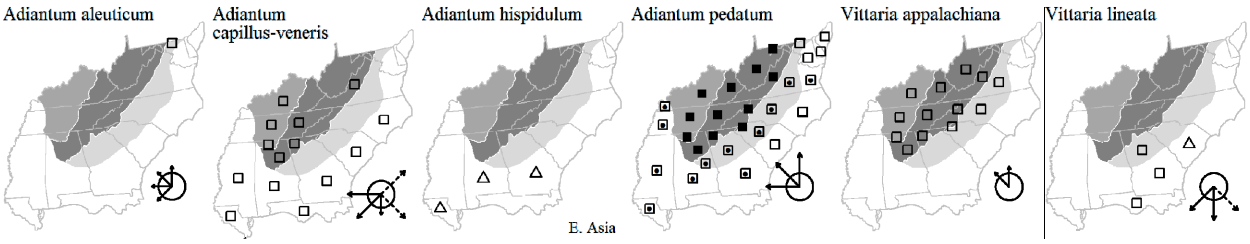
A genus of about 50 species, tropics and subtropics. References: Farrar in FNA (1993b); Farrar & Mickel (1991); Kramer in Kramer & Green (1990). Key adapted from Farrar in FNA.

1 Sporophytes present, the leaves linear, 10-60 cm long and 1-3 mm wide ..... ***V. lineata***
1 Gametophytes only present.
  2 Gemmae with 2-12 body cells (with at least some present with 2-3 body cells); end cells of gemmae often swollen and larger than the medial cells; rhizoid primordia often absent on 1 or both end cells, seldom present on medial cells; sporophytes apparently not produced.... ..... ***V. appalachiana***
  2 Gemmae with 4-16 body cells; end cells of gemmae equal to or smaller than the medial cells; rhizoid primordia regularly present on the end cells, as well as on some medial cells; sporophytes frequently produced (and small sporophytes often present in largely gametophytic colonies) ..... ***V. lineata***

Vittaria appalachiana Farrar & Mickel, Appalachian Shoestring Fern, "Appalachian Gametophyte." Shaded grottoes, undersides of overhanging rock outcrops, especially in moist gorges or on spray cliffs in the vicinity of waterfalls, usually on felsic metamorphic rocks, such as mica schist, mica gneiss, granite gneiss, or metaquartzite, or on sandstone. This reduced species consists of "a branched, ribbon-like thallus one cell in thickness, usually differentiated into basal and upright branches; basal branches attached to the substrate by numerous short, brown rhizoids emanating from marginal and interior cells; upright branches terminating in the production of gemmae" (Farrar & Mickel 1991). The species is often overlooked or mistaken for a

liverwort; it is most often collected by bryologists and hepaticologists, and was first noted in 1824 by von Schweinitz, who considered it a *Jungermannia*. Southern and Central Appalachians, south of the glacial boundary, from se. PA, sw. NY, and ne. OH south through c. TN and c. KY to n. GA, n. AL, and n. MS (Menapace, Davison, & Webb 1998). Although this species has been known for some time (often referred to as the "Appalachian Gametophyte"), it was only recently named formally (Farrar & Mickel 1991). A range of evidence (morphologic, electrophoretic, and developmental) indicates that it is not the gametophyte of any known *Vittaria* sporophyte; instead, it is a distinct taxon, reproducing vegetatively by gemmae, having lost the capability of producing sporophytes. For additional information, see Farrar (1974), Farrar (1978), Gastony (1977), Farrar, Parks, & McAlpin (1983), and Pittillo et al. (1975). [= FNA; = "a branching, ribbon-like gametophyte, with diffuse rhizoids and linear-shaped gemmae only one cell wide, of the genus *Vittaria*" – RAB; = "thalloid, irregularly shaped gametophytes of a species of *Vittaria*" – C; < *V. lineata* (Linnaeus) Smith – WV]

Vittaria lineata (Linnaeus) Smith, Shoestring Fern. Epiphyte on the bark of *Sabal palmetto*, but the northernmost native site (in Lincoln County, GA) was on rock. Se. GA and formerly ec. GA south to s. FL; c. Mexiso south through Central America to n. South America; West Indies; introduced in e. SC (Beaufort and Jasper counties) on landscaping plants. Sporophytic plants have pendant linear leaves, 1-3 mm wide and up to 60 cm long, hence the common name. [= FNA, K, S]



F32. CYSTOPTERIDACEAE Schmakov 2001 (Brittle Fern Family) [in POLYPODIALES]

A family of 4 genera. References: Christenhusz, Zhang, & Schneider (2011).

Cystopteris Bernhardi 1806 (Bladder Fern, Brittle Fern)

A genus of about 20 species, sub-cosmopolitan in distribution, primarily of temperate regions but also in montane to alpine settings in tropical regions. References: Haufler, Moran, & Windham in FNA (1993b); Haufler, Windham, & Ranker (1990); Kramer et al. in Kramer & Green (1990).

Identification notes: See *Woodsia* for suggestions on distinguishing between *Cystopteris* and *Woodsia*, similar ferns often confused. Hybrids frequently occur where two or more species of *Cystopteris* grow in proximity. The following hybrids may be anticipated in our area: *Cystopteris bulbifera* × *tennesseensis*, *Cystopteris bulbifera* × *tenuis* [= *C.* ×*illinoensis* R.C. Moran], *Cystopteris fragilis* × *tenuis*, *Cystopteris protrusa* × *tennesseensis*, *Cystopteris protrusa* × *tenuis*, *Cystopteris tennesseensis* × *tenuis* [= *C.* ×*wagneri* R.C. Moran].

1 Lowest pair of pinnae the longest, thus the leaf widest at the base; bulblets often present on the rachis; indusia, rachises, and veins with stalked glands (these sometimes sparse in *C. tennesseensis*).
  2 Leaf blade 10-55 cm long, usually 2-3× as long as the reddish to tan petiole; bulblets usually present, smooth, green, 2-3 mm in diameter, usually on the rachis and the midrib; spores 20-27 µ long ..... ***C. bulbifera***
  2 Leaf blade 6-25 cm long, usually about 1× as long as the dark brown petiole; bulblets present or absent, deformed and scaly, dark, < 1.5 mm in diameter, on the rachis only; spores 25-35 µ long ..... ***C. tennesseensis***
1 Lowest pair of pinnae shorter than the second or third pair, thus the leaf widest above the base; bulblets never present; indusia, rachises, and veins eglandular.
  3 Leaf blade (2.5-) 3-4× as long as wide; pinnae usually perpendicular to the rachis (or even reflexed); margins of pinnae serrulate, the teeth sharp; basal pinnules sessile, truncate to rounded at the base; indusium up to1 mm long, lanceolate; pinnae usually perpendicular to rachis; [on rock outcrops] ..... ***C. fragilis***
  3 Leaf blade 2-2.5 (-3)× as long as wide; pinnae usually at an acute angle to the rachis, curving toward the blade apex; margins of pinnae crenulate, the teeth rounded; basal pinnules short-stalked or sessile, rounded to cuneate at the base; indusium about 0.5 mm long, ovate to round; pinnae usually at an acute angle to the rachis; [on rock outcrops or forest floor].
    4 Rhizome long-creeping, the apex extending 10-60 mm beyond the last of the widely-spaced petioles (especially as seen from late spring to summer); rhizome covered with scales and tan to golden hairs; spores 20-32 µ long; leaves membranaceous in texture; basal pinnules conspicuously stalked; petiole green to tan, darkened at base; lowermost pinnules of each pinna deeply cut; [typically on forest floor, less commonly on rocks] ..... ***C. protrusa***
    4 Rhizome short-creeping, the apex extending only 1-5 mm beyond the last of the closely-spaced petioles; rhizome covered with scales, lacking hairs; spores 32-42 µ long; leaves thicker in texture; basal pinnules slightly stalked or merely cuneate to the base; petiole dark brown; lowermost pinnules of each pinna slightly lobed; [often on rocks, less commonly on forest floor] ..... ***C. tenuis***

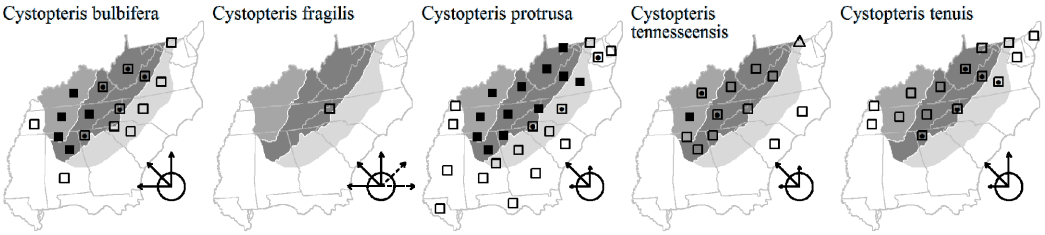
Cystopteris bulbifera (Linnaeus) Bernhardi, Bulblet Fern, Bulblet Bladder Fern. Moist outcrops and talus of calcareous rocks, rarely up to 1500 m elevation. May-August. NL (Newfoundland) west to MN, south to NC, nw. SC (Oconee County), nw. GA, AL, and AR; also disjunct in UT, AZ, NM, and TX. This species is a diploid involved in the reticulate evolution of *Cystopteris* in e. North America. It is one parent of *C. tennesseensis*. Its genome can be symbolized BB. [= RAB, C, F, FNA, G, K, S, W, WV]

Cystopteris fragilis (Linnaeus) Bernhardi, Fragile Fern, Brittle Fern. Cliffs, ascending in our area to 1650 m. June-September. Circumboreal, in North America ranging from NL (Newfoundland) west to AK, south to MA, CT, NJ, montane NC, VA, KY, MO, OK, TX, NM, and AZ. This species is a fertile allotetraploid, presumed to be derived from hybridization between *C. reevesiana* Lellinger and an extinct or currently undiscovered second parent (*C. "hemifragilis"*); its genome can be symbolized HHRR (Paler & Barrington 1995). *C. fragilis* appears to be a complex needing further study; additional entities may be found to warrant taxonomic recognition (see FNA for discussion). [= FNA, K, W; = *C. fragilis* var. *fragilis* – C, F, G, S; < *C. fragilis* (also see *C. tenuis*) – WV]

Cystopteris protrusa (Weatherby) Blasdell, Lowland Bladder Fern. Rich woods or on moss- and soil-covered talus in boulderfields, occasionally on ledges of rock outcrops. April-June. NY and ON west to MN, south to GA, Panhandle FL (Washington County) (Wunderlin & Hansen 2006), AL, MS, LA, AR, e. KS, and IA. This species is a diploid involved in the reticulate evolution of *Cystopteris* in e. North America. It is one parent of *C. tennesseensis* and *C. tenuis*. Its genome can be symbolized PP. [= RAB, C, FNA, K, W, WV; = *C. fragilis* var. *protrusa* Weatherby – F, G, S]

Cystopteris tennesseensis Shaver, Tennessee Bladder Fern. Moist to dry outcrops of calcareous rocks, including coquina limestone ("marl") in the outer Coastal Plain. April-June. PA, KY, IL, WI, and IA south to NC, nw. GA, n. AL, AR, and OK. This species is a fertile allotetraploid derived from hybridization between *C. bulbifera* and *C. protrusa.* Its genome can be symbolized BBPP. Haufler, Windham, & Ranker (1990) consider this a "successfully fledged and vigorous young species," adapted to a hybrid niche not successfully utilized by either parent. [= RAB, C, FNA, K, W; = *C. ×tennesseensis* – WV]

Cystopteris tenuis (Michaux) Desvaux, Mackay's Bladder Fern. Moist outcrops and cliffs of metamorphic and sedimentary rocks, occasionally in moist soils near rock outcrops or moist soil banks. May-August. NL (Newfoundland) west to MN and NE, south to VA, IL, and MO, and in the mountains to NC, TN, and n. GA. This species is a fertile allotetraploid derived from hybridization between *C. protrusa* and an extinct or currently undiscovered second parent (*C. "hemifragilis"*); its genome can be symbolized HHPP (Paler & Barrington 1995). [= FNA, K, W; = *C. fragilis* var. *mackayi* Lawson – C, F, G; < *C. fragilis* – WV]



Gymnocarpium Newman 1851 (Oak Fern)

A genus of about 8 species, north temperate in distribution. References: Pryer in FNA (1993b); Pryer & Haufler (1993)=Z; Pryer (1992); Kramer et al. in Kramer & Green (1990). Key based on FNA.

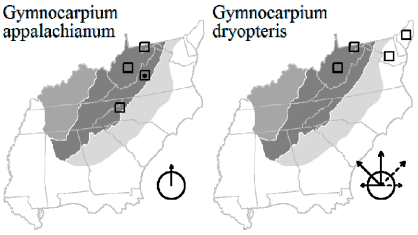
1 Sessile basal basiscopic pinnule of the proximal pinnae with basal basiscopic pinnulet shorter than the adjacent pinnulet; pinnae of second pair sessile, with basal pinnules shorter than the adjacent pinnule (or second basal pinnae rarely stalked); spores 27-31 µm in diameter..... ..... ***G. appalachianum***

1 Sessile basal basiscopic pinnule of the proximal pinnae with basal basiscopic pinnulet more or less equal in length to the adjacent pinnulet; pinnae of second pair usually sessile, with basal pinnules more or less equal in length to the adjacent pinnule; spores 34-39 µm in diameter.... .....***G. dryopteris***

Gymnocarpium appalachianum Pryer & Haufler, Appalachian Oak Fern. Moist, rocky forests, at medium to high elevations. June-September. Endemic to the c. and s. Appalachians (known from ne. WV, nw. VA, sc. PA, and disjunct in nw. NC and OH). Electrophoretic and morphologic analyses show that it is one of the diploid parents of the widespread allotetraploid *G. dryopteris*. In NC, it is limited to a single site, below the north-facing summit cliffs on Bluff Mountain, Ashe County, where seepage results in extensive ice formations which frequently persist until June. Karyotype = AA. [= FNA, K, Z; < *G. dryopteris* (Linnaeus) Newman – C, G, W, WV; < *Dryopteris disjuncta* (Ledebour) C.V. Morton – F]

Gymnocarpium dryopteris (Linnaeus) Newman, Northern Oak Fern. Moist, rocky forests, atmedium to high elevations. Circumboreal, occurring throughout northern and central Eurasia, Greenland, south in North America to MD (?), e. WV, s. PA, OH, MI, WI, IA, w. SD, CO, n. NM, and c. AZ. See Pryer & Haufler (1993) for a detailed analysis of the distinguishing features of *G. appalachianum* and *G. dryopteris*. Karyotype = AAJJ. [= FNA, K, Z; < *G. dryopteris* (Linnaeus) Newman – C, G, W, WV; < *Dryopteris disjuncta* (Ledebour) C.V. Morton – F]

Triploids are known from the mountains of VA. Their identity is uncertain; based on geography they are presumably *G. appalachianum* × *dryopteris* [AAJ], but could be *G. ×brittonii* (Sarvela) Pryer & Haufler [= *G. disjunctum* × *dryopteris* = AJJ]. Triploids can be distinguished by the presence of malformed spores, irregular in shape and size, often intermixed with large round spores (vs. all spores reniform and relatively uniform in size and shape). [*G. ×brittonii* (Sarvela) Pryer & Haufler – K]



F33. ASPLENIACEAE Frank 1877 (Spleenwort Family) [in POLYPODIALES]

A family of a 2 genera and more than 720 species, of nearly cosmopolitan distribution. Murakami et al. (1999) conducted a molecular phylogenetic analysis of the Aspleniaceae, which confirmed that *Camptosorus* should be included in *Asplenium*, but suggested that *Phyllitis* is better separated from *Asplenium*. A later and more comprehensive study shows *Phyllitis* and *Camptosorus* to be deeply embedded in *Asplenium* (Schneider et al. 2004), a conclusion followed here. References: Kramer & Viane in Kramer & Green (1990); Schneider et al. (2004).

Asplenium Linnaeus 1753 (Spleenwort)

Asplenium is a large, nearly cosmopolitan genus of more than 720 species, with centers of diversity in the Appalachians, Central America mountains, Andes, and Himalayas. References: Wagner, Moran, & Werth in FNA (1993b); Moran (1982); Taylor, Mohlenbrock, & Burton (1976); Murakami et al. (1999); Kramer & Viane in Kramer & Green (1990).

Identification notes: Several of the more frequently encountered sterile hybrids are included in the key and treated fully below. Others may be recognized by intermediate morphology and usual co-occurrence with both parents.

1 Leaves simple, unlobed (or sometimes with a few, irregular forkings); veins free or anastamosing-areolate.
  2 Leaf blades 0-3 mm wide, linear, forking or with a few toothlike projections ..... ***A. septentrionale***
  2 Leaf blades 10-40 mm wide, lanceolate, lance-attenuate, or oblong.
    3 Leaf apex long-attenuate and characteristically producing plantlets at the tip; veins anastomosing ..... ***A. rhizophyllum***
    3 Leaf apex acute or obtuse, not attenuate, not producing plantlets at the tip; veins free.
      4 Longer indusia of each frond avg. 1.2 cm long; leaves (1-) avg. 2.3 (-3.4) dm long; [native in TN, AL, and elsewhere, in natural limestone sinkholes] ..... ***A. scolopendrium*** *var.* ***americanum***
      4 Longer indusia of each frond avg. 1.7 cm long; leaves (1-) avg. 3 (-6) dm long; [rarely introduced in North America, typically in artificial settings, such as wells] ..... ***A. scolopendrium*** *var.* ***scolopendrium***
1 Leaves pinnatifid (at least in the lower half of the leaf), pinnate, pinnate-pinnatifid, bipinnate, or tripinnate, the apex obtuse, acute, acuminate, or attenuate; veins free.
  5 Rachis dull green throughout its length, or at least toward the tip; leaves pinnatifid to tripinnate, the outline of the leaf blade narrowly to broadly triangular, widest at the base (or slightly above the base in *A. abscissum*).
    6 Petiole dark throughout its length (from base to first leaflet).
      7 Leaves bipinnate at the base, pinnate-pinnatifid above; spores normal ..... ***A. bradleyi***
      7 Leaves pinnate at the base, pinnatifid above; spores abortive (or normal in *A. tutwilerae*, known only from Hale County, AL).
        8 Spores abortive ..... ***A. ×ebenoides***
        8 Spores normal; [endemic as far as known to Hale County, AL] ..... ***A. tutwilerae***
    6 Petiole partially or entirely green (darkened or not at its base).
      9 Leaves pinnatifid or pinnate through most or all of their lengths.
        10 Leaves pinnatifid, sometimes fully pinnate at the base; spores normal ..... ***A. pinnatifidum***
        10 Leaves pinnate (sometimes pinnate-pinnatifid at the base in *A. ×trudellii*); spores abortive (*A. ×trudellii*) or normal (*A. abscissum*)
          11 Spores normal ..... ***A. abscissum***
          11 Spores abortive ..... ***A. ×trudellii***
      9 Leaves bipinnate to tripinnate.
        12 Petiole darkened toward the base; pinnules toothed, lacerate, pinnatifid, or pinnate; leaves bipinnate to tripinnate, the leaf blades lanceolate-ovate to lanceolate-oblong; ultimate leaf segments sessile or nearly so; [of acidic rocks] ..... ***A. montanum***
        12 Petiole entirely green; pinnules toothed; leaves bipinnate, the leaf blades ovate-triangular; ultimate leaf segments mostly stalked; [of calcareous rocks] ..... ***A. ruta-muraria*** *var.* ***cryptolepis***
  5 Rachis shiny black or dark brown throughout its length; leaves pinnate, the outline of the leaf blade linear, lanceolate, or oblanceolate, with more-or-less parallel sides for much of its length.
    13 Pinnae orbicular to obovate-oblong, 1-2× as long as wide, the base more-or-less symmetrical (if auriculate, only slightly so and on the side of the pinna toward the base of the leaf); old leaf rachises often with persistent projections left from the disarticulation of the pinnae.
      14 Main pinnae deeply lobed into 3-many segments (the leaves therefore pinnate-pinnatifid); [of FL] ..... ***A. verecundum***
      14 Main pinnae merely toothed (the leaves therefore pinnate); [widespread in our area].
        15 Sori 4-6 (-9) per pinna, up to 2 mm long; rhizome scales up to 3 mm long; petiole relatively thin, shiny, coppery or bronze; pinnae mostly alternate, suborbicular, spaced more distantly, thinner in texture, set at a fairly oblique angle to the rachis, often slightly auriculate on the side of the pinna toward the leaf base; spores mostly 29-36 µ long; stomate guard cells mostly 38-43 µ long; [mostly of noncalcareous rocks] ..... ***A. trichomanes*** *ssp.* ***trichomanes***
        15 Sori 4-9 (-12) per pinna, up to 3 mm long; rhizome scales up to 5 mm long; petiole relatively thicker, blackish-brown; pinnae mostly opposite, oblong, spaced more closely, thicker in texture, set at a nearly right angle to the rachis, rarely at all auriculate; spores mostly 34-43 µ long; stomate guard cells mostly 41-49 µ long; [of calcareous rocks] .....

.....***A. trichomanes*** *ssp.* ***quadrivalens***

13 Pinnae oblong-rectangular, 2× or more as long as wide, the base asymmetrical or auricled (more prominently auricled on the side of the pinna toward the tip of the leaf); old leaf rachises lacking persistent projections left from the disarticulation of the pinnae.

16 Leaves slightly dimorphic, the fertile upright and larger, the sterile spreading and smaller; pinna auricles prominent, often overlapping the rachis; [terrestrial, often not associated with rock outcrops] .....***A. platyneuron***

16 Leaves not dimorphic; pinna auricles less prominent, usually not overlapping the rachis; [epipetric, always growing in crevices of rock outcrops or in thin soil immediately adjacent to exposed rock].

17 Main vein of the pinna running along the basal edge; sori 1 (-3) per pinna, 1.5-3 mm long, borne along the basal edge, the indusium translucent, whitish, opening toward the leaf tip.....***A. monanthes***

17 Main vein of the pinna running more-or-less medially; sori 4-10 per pinna (on well-developed pinnae), 1.0-1.5 mm long, borne on both sides of the main vein, the indusium opaque, greenish, opening toward the pinna tip.

18 Pinnae margins subentire; pinnae blue-green, coriaceous, borne at right angles to the rachis or slightly reflexed, usually strictly opposite throughout the entire length of the leaf blade .....***A. resiliens***

18 Pinnae margins shallowly crenate or crenate-serrate; pinnae bright-green, subcoriaceous, borne at right angles to the rachis or ascending, opposite below but usually becoming alternate in the apical 1/3-1/2 of the leaf blade

19 Pinna margins crenate to serrate; pinna base lacking an auricle, or the auricle rudimentary; veins evident; spores 64 per sporangium .....***A. heterochroum***

19 Pinna margins shallowly crenate; pinna base with auricle; veins obscure; spores 32 per sporangium .....***A. heteroresiliens***

Asplenium abscissum Willdenow, Cutleaf Spleenwort. Limestone sinkhole. Mexico, Central America, and n. South America; West Indies; nc. and c. FL peninsula; s. FL; n. AL. This species is a diploid, with chromosome complement AA. Found in Jackson County, AL in 2009 (Barger, pers. comm. 2009). [= FNA, K, WH] {add synonymy: S}

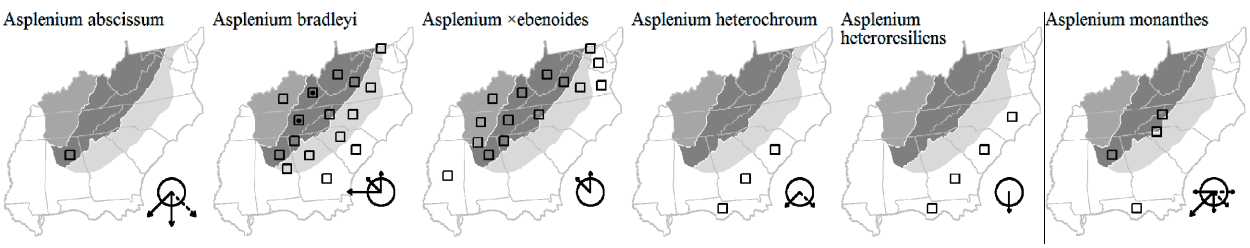
Asplenium bradleyi D.C. Eaton, Bradley's Spleenwort. Dry outcrops of felsic sedimentary or metasedimentary rocks, such as sandstone, quartzite, or metaquartzite, at low to moderate elevations. April-October. PA, MD, OH, KY, s. IL, and MO south to c. NC, c. GA, AL, TN, and AR, reaching its greatest abundance in the Ozarkian highlands. This species is a fertile allotetraploid derived from hybridization between *A. montanum* and *A. platyneuron*. Its chromosome complement can be symbolized MMPP. The sterile hybrid has also been found in NC; its chromosome complement is MP. [= RAB, C, F, FNA, G, K, S, W, WV; = *A.* ×*bradleyi*]

Asplenium* ×*ebenoides R.R. Scott (pro species) [*A. platyneuron* × *rhizophyllum*], Scott's Spleenwort. Moist outcrops of calcareous sedimentary rocks, such as limestone, dolostone, and on coquina limestone (shell marl), at low elevations. May-October. VT, NJ, c. PA, OH, s. IL, and MO south to e. VA, w. NC, nw. GA, c. AL, TN, and AR. *A.* ×*ebenoides* is a sterile hybrid (chromosome complement symbolized PR). In AL, however, one population in Hale County has undergone chromosome doubling and is a fertile allotetraploid (PPRR), now treated as *A. tutwilerae*. Populations of this taxon, especially if consisting of many individuals, should be checked for fertile spores. [= WV; = ×*Asplenosorus ebenoides* (R.R. Scott) Wherry – F; = *Asplenosorus ebenoides* (R.R. Scott) Wherry – G; < *Asplenium* ×*ebenoides* – K; < *Asplenium ebenoides* R.R. Scott – FNA, S]

Asplenium heterochroum Kunze, Bicolored Spleenwort. Fairly moist outcrops of calcareous sedimentary rocks, such as coquina limestone ("marl"). Se. and sc. GA (Jones & Coile 1988) south to n. FL; West Indies; s. Mexico (Chiapas, Veracruz), Belize. Its chromosome complement can be symbolized HHHH. [= FNA, K, WH; < *A. heterochroum* Kunze – S]

Asplenium heteroresiliens W.H. Wagner, Marl Spleenwort, Carolina Spleenwort, Wagner's Spleenwort, Morzenti's Spleenwort. Fairly moist outcrops of calcareous sedimentary rocks, such as coquina limestone ("marl"), along small blackwater streams or larger rivers, at low elevations, and rarely also on old ruins made of tabby (a cement made from lime, sand, and oyster shells). April-October. Rare and scattered from se. NC to se. GA, sw. GA, and n. FL, on the Coastal Plain. This species is an apogamous (producing viable spores asexually) allopentaploid derived from hybridization of the sexual tetraploid *H. heterochroum* Kunze (of Florida and the West Indies) and the apogamous triploid *A. resiliens*. Its chromosome complement can be symbolized EEEHH. [= RAB; = *A.* ×*heteroresiliens* – FNA, K, WH; < *A. heterochroum* Kunze – S]

Asplenium monanthes Linnaeus, Single-sorus Spleenwort. Moist calcareous situations, in the mountains in moist grottoes of calcareous to semi-calcareous metamorphic rocks (such as mylonite or marble) near waterfalls in humid escarpment gorges with high rainfall, on limestone talus in collapsed sinkhole mouth, or on moist Coastal Plain limestone outcrops. April-October. Scattered in highly humid (montane or maritime) parts of the tropics, subtropics, and warm temperate areas, known from se. and sw. North America, the West Indies (Hispaniola and Jamaica), n. South America, Central America, Mexico, South Africa, Hawaii, and the Azores, Madeira Islands, Madagascar, and the Philippines. In the continental United States, it is known from widely scattered sites with humid and calcareous microhabitats: humid escarpment gorges in Transylvania County, NC and Oconee County, SC; moist limestone outcrops in n. peninsular and Panhandle FL (Nelson 2000); limestone talus in the collapsed mouth of a sinkhole in Jackson County, AL; and the Huachuca Mountains, Cochise County, AZ. Given the variability of A. monanthes throughout is wide and scattered distribution, and its complex of related and closely similar species, our material deserves additional study to verify its true identity. [= RAB, FNA, K, W, WH]



Asplenium montanum Willdenow, Mountain Spleenwort. Moist to dry outcrops of metamorphic, sedimentary, or igneous rocks, such as gneiss, schist, amphibolite, quartzite, rhyolite, sandstone, mostly at moderate to high elevations (up to over 2000

m), but in the Piedmont to as low as 150 m. May-October. Primarily Appalachian: s. VT, MA, NY, OH, and KY south to c. NC, n. GA and AL; absent from the Ozarkian highlands. *A. montanum* is one of the diploid progenitors of the reticulately evolved Appalachian *Asplenium* complex; its chromosome complement is symbolized MM. It is one parent of *A. bradleyi, A. pinnatifidum*, and *A.* ×*trudellii* (and of other sterile hybrids). [= RAB, C, F, FNA, G, K, S, W, WV]

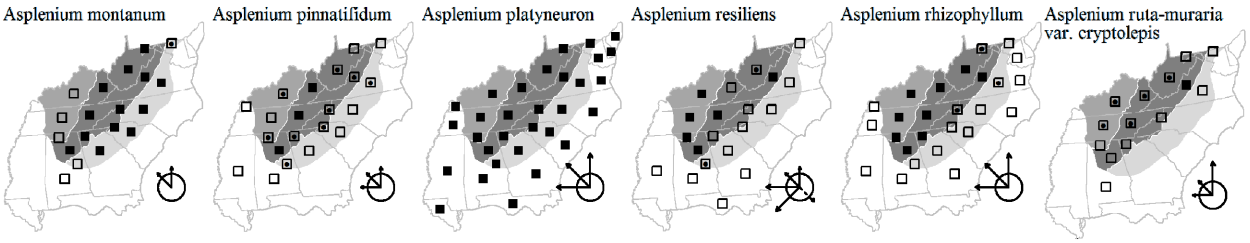
Asplenium pinnatifidum Nuttall, Lobed Spleenwort. Fairly moist to very dry outcrops of felsic sedimentary or (mostly low-grade) metamorphic rocks, such as sandstone, phyllite, and schist, at low to moderate elevations. May-October. NJ, se. PA, wc. PA, s. OH, IN, IL, and MO south to w. NC, c. GA (Jones & Coile 1988), AL, n. MS, AR, and e. OK. This species is a fertile allotetraploid derived from hybridization of *A. montanum* and *A. rhizophyllum*; its chromosome complement is symbolized MMRR. [= RAB, C, F, FNA, S, W, WV; = *A. pinnatifidum* var. *pinnatifidum* – G; = *A.* ×*pinnatifidum* – K]

Asplenium platyneuron (Linnaeus) Britton, Sterns, & Poggenburg, Ebony Spleenwort. Moist to dry soils of forests, woodlands, old fields; also on outcrops, especially of calcareous rocks and in masonry crevices, at low to moderate elevations; common. April-October. QC, ON, se. MN, IA, and se. CO south to FL, TX, NM, and AZ (and varieties or relatives reported from Central and South America). This species is one of the diploid progenitors involved in the reticulately evolved Appalachian *Asplenium* complex. It is one parent of *A. bradleyi* and *A.* ×*ebenoides* (as well as other sterile hybrids). *A. platyneuron* in general, and var. *platyneuron* specifically, is by far the most common of our *Asplenium* species, and the only one found characteristically away from rock. *A. platyneuron* var. *incisum* does not seem to warrant taxonomic recognition. Strikingly large plants of the outer Atlantic Coastal Plain and Gulf Coastal Plain have been named var. *bacculum-rubrum* (Featherman) Fernald; they are probably not worthy of taxonomic recognition. They can be distinguished as follows: var. *bacculum-rubrum* has the longest pinnae > 3.5-6 cm long, the pinnae often coarsely serrate-incised to pinnatifid and the larger leaves to (30-) 40-70 (-100) cm tall, with 45-70 pairs of pinnae (vs. longest pinnae < 3.5 cm long, pinnae subentire to pinnatifid, larger leaves to 20-45 (-50) cm tall, with 25-50 pairs of pinnae). [= RAB, C, FNA, S, W, WH, WV; > *A. platyneuron* var. *platyneuron* – F, G, K; > *A. platyneuron* var. *bacculum-rubrum* (Featherman) Fernald – F, G, K; > *A. platyneuron* var. *incisum* (Howe ex Peck) B.L. Robinson – F]

Asplenium resiliens Kunze, Blackstem Spleenwort. Moist to dry outcrops of calcareous sedimentary or metamorphic rocks, such as limestone, dolostone, coquina, or marble, sometimes on narrow seams of calcareous materials in otherwise acidic rocks, rarely on mortar or concrete, mostly at low to moderate elevations, but remarkably on Grandfather Mountain at over 1800 m. April-October. Sc. PA, KY, s. IL, MO, se. KS, OK, TX, CO, and s, NV south to FL, TX, AZ, and Mexico; West Indies; Central America and South America. This species is a triploid (EEE), unable to produce viable spores by sexual means, but producing spores apogamously. It is a parent species of the rare *A. heteroresiliens*. [= RAB, C, F, FNA, G, K, S, W, WH, WV]

Asplenium rhizophyllum Linnaeus, Walking Fern. Moist outcrops of calcareous sedimentary, calcareous metamorphic, or mafic metamorphic rocks, such as limestone, dolostone, calcareous siltstone, amphibolite, mostly at low to moderate elevations, rarely to 1500 m or higher. May-October. S. QC, ON and se. MN south to c. GA, AL, MS, AR, OK, and IA. This species, sometimes placed in the genus *Camptosorus* because of its strikingly different morphology from (most) other *Asplenium*, is one of the diploid progenitors of the reticulately evolved Appalachian *Asplenium* complex. It is a parent of *A. pinnatifidum* and *A.* ×*ebenoides* (as well as other sterile hybrids), both of which have inherited a limited ability to produce plantlets at the attenuate leaf-tip. It is closely related to *Asplenium sibiricum* of e. Asia. [= RAB, C, FNA, K, W; = *Camptosorus rhizophyllus* (Linnaeus) Link – F, G, S, WV]

Asplenium ruta-muraria Linnaeus *var.* ***cryptolepis*** (Fernald) Wherry, American Wall-rue. Moist to dry outcrops of calcareous sedimentary or metamorphic rocks, such as limestone, dolostone, or marble, at low to moderate elevations. May-October. *A. ruta-muraria* is a circumboreal species of Europe, Asia, and North America; in North America it ranges as var. *cryptolepis* from VT, s. ON and n. MI south to n. NJ, w. NC, nw. GA (Jones & Coile 1988), n. AL, TN, and AR. Var. *ohionis* is very likely only a form. The relationship of North American *A. ruta-muraria* (here distinguished as var. *cryptolepis*), a tetraploid, to the diploid and tetraploid subspecies of *A. ruta-muraria* present in Europe and e. Asia is uncertain. Given the prevalence of allopolyploidy in *Asplenium* and slight morphologic differences between American and European material, I prefer not to assume its identity to the European plants. In Europe *A. ruta-muraria* is an abundant plant of masonry, such as the defensive walls of towns and cities; it is very rarely seen on walls in North America, presumably because they are not old enough. [= WV; < *A. ruta-muraria* – RAB, C, FNA, W; > *A. cryptolepis* Fernald var. *cryptolepis* – F, S; > *A. cryptolepis* Fernald var. *ohionis* Fernald – F, S; > *A. ruta-muraria* var. *ohionis* (Fernald) Wherry – G; > *A. ruta-muraria* var. *cryptolepis* – G, K; > *A. ruta-muraria* var. *lanceolum* Christ – K]



Asplenium scolopendrium Linnaeus *var.* ***americanum*** (Fernald) Kartesz & Gandhi, American Hart's-tongue Fern. Humid sinkholes. E. TN and n. AL, and in other habitats farther north in c. NY, n. MI, and ON; also in the West Indies (Haiti) and s. Mexico (Chiapas, Nuevo León, Oaxaca). It is also reported as naturalized in MD by Reed (1953). [= FNA, K; = *Phyllitis scolopendrium* (Linnaeus) Newman var. *americana* Fernald – C, F, G; < *Phyllitis scolopendrium* – S]

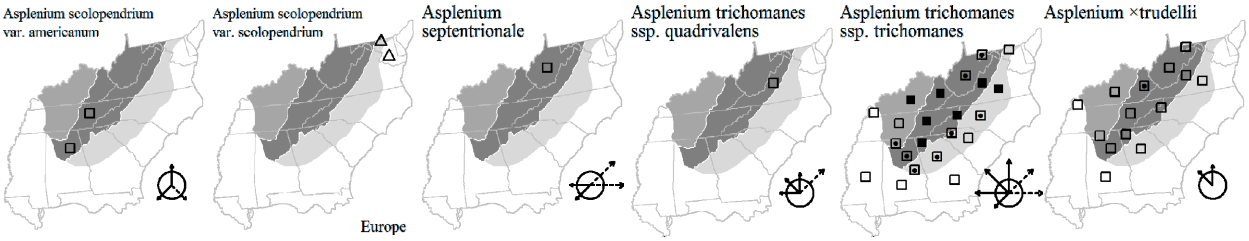
* ***Asplenium scolopendrium*** Linnaeus *var.* ***scolopendrium***, European Hart's-tongue Fern. Sparsely naturalized from cultivation; reported as naturalized in a well in MD by Reed (1953). [= FNA, K; = *Phyllitis scolopendrium* (Linnaeus) Newman var. *scolopendrium* – C, F, G]

Asplenium septentrionale (Linnaeus) Hoffmann, Forked Spleenwort. Acidic rocks. Western North America south into nw. Mexico (Baja California), Asia, Europe; disjunct in WV (Hardy and Monroe counties). This very inconspicuous species is likely to be found at additional locations. Its chromosome formula is SSSS. [= C, FNA, K]

Asplenium trichomanes Linnaeus *ssp.* ***quadrivalens*** D.E. Meyer emend. Lovis, Maidenhair Spleenwort. Moist outcrops of calcareous sedimentary rocks, such as limestone or dolostone. May-October. Ssp. *quadrivalens* is known from North America and Europe (at least); in North America it is substantially rarer than ssp. *trichomanes* and more limited in range, occurring from New England and s. ON south to w. VA, OH, and s. IL, and in BC, WA, and OR. Ssp. *quadrivalens* is a tetraploid of uncertain origin, presumably autotetraploid, but perhaps the result of the hybridization of two ecologically differentiated diploid races of *A. trichomanes*. [= FNA, K, W; < *A. trichomanes* – C, F, G, S]

Asplenium trichomanes Linnaeus *ssp.* ***trichomanes***, Maidenhair Spleenwort. Moist outcrops of slightly to strongly calcareous sedimentary or metamorphic rocks and moderately to strongly mafic metamorphic and igneous rocks, such as limestone, dolostone, mafic and intermediate gneisses and schists, amphibolite, most typically in strong shade, as under overhangs. May-October. *A. trichomanes* as a whole is a complex species, with diploid, tetraploid, and hexaploid elements, occurring in North America, Europe, Australia, New Zealand, and Asia. Ssp. *trichomanes* is known to occur in Europe and North America (at least); in North America, it ranges from NL (Newfoundland) to AK, south to NC, c. GA (Jones & Coile 1988), c. AL, AR, OK, w. TX, Chihuahua, se. AZ, and w. OR. Ssp. *trichomanes* is a diploid, probably involved in the origin of ssp. *quadrivalens*. [= FNA, K, W; < *A. trichomanes* – RAB, C, F, G, S, WH, WV]

Asplenium ×trudellii Wherry (pro species) [*montanum* × *pinnatifidum*], Trudell's Spleenwort. Moist outcrops of felsic sedimentary or metamorphic rocks, such as sandstone, phyllite, schist, at low elevations. May-October. This taxon is a sterile triploid hybrid (MMR) of *A. montanum* and *A. pinnatifidum*. It is considerably more common than most other sterile *Asplenium* hybrids, sometimes occurring without one or either parents. There are some reports that it can sometimes produce fertile spores. [= F, FNA, K, WV; = *Asplenium pinnatifidum* Nuttall var. *trudellii* (Wherry) Clute – G; = *Asplenium trudellii* Wherry – S; = ×*Asplenosorus trudellii* (Wherry) Mickel]



Asplenium tutwilerae B.R. Keener & L.J. Davenport, Tutwiler's Spleenwort. Crevices of calcareous conglomerate. So far as is known, *A. tutwilerae*, the fertile allotetraploid of *A.* ×*ebenoides*, is limited to a single population in Hale County, AL. Its chromosome formula is PPRR. See Keener & Davenport (2007). [< *A.* ×*ebenoides* – K; < *Asplenium ebenoides* R.R. Scott – FNA, S]

Asplenium verecundum Chapman ex Underwood, Modest Spleenwort, Delicate Spleenwort. Moist limestone outcrops, grottoes, and sinkholes. Endemic to FL, from n. FL (Columbia, Jackson, Liberty, Taylor counties) southwards (Wunderlin & Hansen 2004); or perhaps better treated as the northern component of the West Indian *A. myriophyllum*. Its chromosome formula is VVVV. [= FNA, WH; < *A. myriophyllum* (Swartz) K. Presl – K; > *A. verecundum* – S; > *A. scalifolium* E.P. St. John – S; > *A suave* E.P. St. John – S; > *A. subtile* E.P. St. John – S]

F34. DIPLAZIOPSIDACEAE X.C. Zhang & Christenhusz 2011 (Glade Fern Family) [in POLYPODIALES]

A family of 3 genera. References:

Homalosorus Small ex Pichi-Sermolli 1977 (Glade Fern)

A monotypic genus, perennial, of e. North America. References: Christenhusz, Zhang, & Schneider (2011)=Z; Kato in FNA (1993b); Kramer et al. in Kramer & Green (1990).

Homalosorus pycnocarpos (Sprengel) Pichi-Sermolli, Glade Fern. Very nutrient-rich, loamy or seepy forests, over calcareous sedimentary (such as limestone or dolostone) or mafic metamorphic or igneous rocks (such as greenstone or amphibolite). July-September. QC, ON, and MN south to GA and LA (much more common in sedimentary rock areas of the Appalachians than in the primarily acid-soil Blue Ridge and Piedmont). [= S, W, Z; = *Diplazium pycnocarpon* (Sprengel) M. Broun – FNA, K; = *Athyrium pycnocarpon* Sprengel – RAB, C, F, G, WV; = *Diplaziopsis pycnocarpa* (Sprengel) M.G. Price]

F35. THELYPTERIDACEAE Pichi Sermolli 1970 (Marsh Fern Family) [in POLYPODIALES]

A family of 6-30 genera (generic circumscription especially controversial and problematic) and about 900 species. References: Smith in FNA (1993b); Smith & Cranfill (2002); Lellinger (1985); Mickel (1979); Smith in Kramer & Green (1990).

1 Leaf blades 7-25 (-30) cm long, triangular, < 2× as long as wide; rachis with adnate wings between the pinnae; sori without indusia; midribs of pinnae lacking an adaxial groove..... ***Phegopteris***

1 Leaf blades (15-) 20-100 cm long, lanceolate, oblong-lanceolate, or triangular, > 2× as long as wide; rachis without adnate wings between the pinnae; sori with reniform indusia; midribs of pinnae with an adaxial groove (adaxial groove lacking in *Macrothelypteris*).

2 Midribs of the pinnae lacking an adaxial groove; leaf bipinnate to tripinnate ..... ***Macrothelypteris***
2 Midribs of the pinnae with an adaxial groove; leaf pinnate to pinnate-pinnatifid..... ***Thelypteris***

Macrothelypteris (H. Itô) Ching 1963 (Maiden Fern)

A genus of about 10 species, tropical and subtropical. References: Smith in Kramer & Green (1990).

* ***Macrothelypteris torresiana*** (Gaudichaud-Beaupré) Ching, Mariana Maiden Fern. Disturbed areas, and increasingly invasive in natural habitats (especially in the southern parts of our area); native of the Asian and African tropics. Leonard (1972) discusses the history of this species in the southeastern United States. [= FNA, K, WH; = *Dryopteris setigera* Blume – S, misapplied; = *Thelypteris torresiana* (Gaudichaud-Beaupré) Alston]

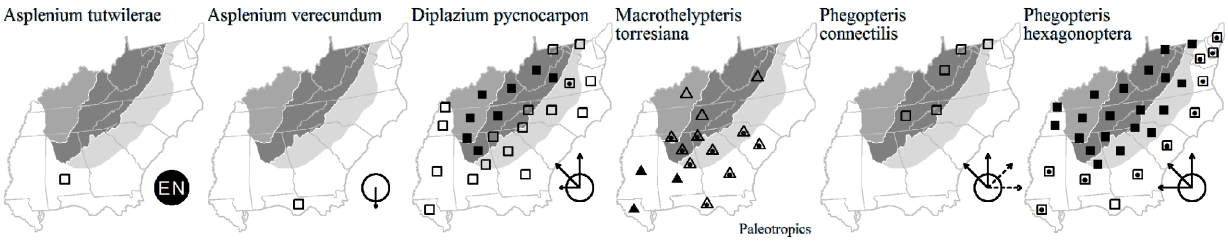
Phegopteris (C. Presl) Fée 1852 (Beech Fern)

A genus of 3 species, north temperate and boreal. References: Smith in Kramer & Green (1990).

1 Rachis wings absent between the two basal pinna pairs; rachis bearing on its lower surface numerous tan to brown, lanceolate scales (these mostly 6-12 cells wide at the base) and acicular hairs 0.3-1.0 mm long..... ***P. connectilis***
1 Rachis wings present between the two basal pinna pairs; rachis bearing on its lower surface relatively few, white to pale tan, narrowly lanceolate scales (these mostly 3-5 cells wide at the base) and hairs 0.1-0.25 mm long..... ***P. hexagonoptera***

Phegopteris connectilis (Michaux) Watt, Northern Beech Fern. Moist cliffs where wet by spray from waterfalls (at medium elevations), also on high elevation cliffs wet by seepage and in spruce-fir forests, northwards in cool ravines and on swamp borders. April-August. A circumboreal species, at its southern limit in North America in MD, WV, OH, IL, IA, MT, and OR; disjunct southwards in w. NC and e. TN, and in CO. Most of the occurrences in NC are at waterfalls in the escarpment gorges of Transylvania, Macon, and Jackson counties, near Highlands. The species is a triploid, reproducing apogamously. [= FNA, K, WV; = *Thelypteris phegopteris* (Linnaeus) Slosson – RAB, C, G, W; = *Dryopteris phegopteris* (Linnaeus) C. Christensen – F; = *Phegopteris phegopteris* (Linnaeus) Keyserling – S]

Phegopteris hexagonoptera (Michaux) Fée, Broad Beech Fern. Mesic to submesic forests. April-August. Widespread in eastern North America, from QC west to ON, WI, and MN, south to Panhandle FL and e. TX. [= FNA, K, S, WH, WV; = *Thelypteris hexagonoptera* (Michaux) Weatherby – RAB, C, G, W; = *Dryopteris hexagonoptera* (Michaux) C. Christensen – F]



Thelypteris Schmidel 1763 (Maiden Fern, Shield Fern, Marsh Fern)

A genus of about 875 species, cosmopolitan, perhaps warranting separation into various segregates. *Thelypteris* is a large and rather heterogeneous group, even with the removal of *Phegopteris* and *Macrothelypteris*. Our species fall into several subgenera, sometimes treated as genera: subgenus or genus *Thelypteris* (*Th. palustris* var. *pubescens*), subgenus or genus *Parathelypteris* (*Th. noveboracensis*, *Th. simulata*), subgenus *Cyclosorus* or genus *Christella* (*Th. dentata*, *Th. hispidula* var. *versicolor, Th. interrupta, Th. kunthii*, *Th. ovata* var. *ovata*), and subgenus or genus *Stegnogramma* (*Th. burksiorum*). The appropriate names, should the additional segregate genera be adopted, are listed in synonymy. References: Smith (1981); Smith in Kramer & Green (1990). [also see *Macrothelypteris* and *Phegopteris*]

1 Sori elongate; sporangia with hairs 0.1-0.2 mm long; [endemic to nc. AL]; [subgenus or genus *Stegnogramma*] ..... ***T. burksiorum***
1 Sori round or slightly longer than wide; sporangia glabrous; [collectively widespread]
  2 Leaves 5-15 (-20) cm wide; rhizome scales 1-4 mm long, lanceolate to ovate, glabrous, pale brown to golden brown, flexible and very thin.
    3 Leaf blade broadest near the middle, gradually reduced to the base, the petiole < 1/3 the length of the blade; [of upland and wetland habitats]; [subgenus or genus *Parathelypteris*]..... ***T. noveboracensis***
    3 Leaf blade broadest near the base, the pinnae stopping abruptly, the petiole 2/3 to fully as long as the blade; [of wetland habitats].
      4 Undersurface of blades without glands; lateral veins of sterile lobes forked once between the pinnule midvein and the margin; lower surface of costae with tan, ovate scales; lobes of fertile leaves revolute; indusia ciliate (rarely glabrous); [subgenus or genus *Thelypteris*] ..... ***T. palustris*** *var.* ***pubescens***
      4 Undersurface of blades with minute, sessile, globular, golden to reddish glands; lateral veins of sterile lobes simple, not forked between the pinnule midvein and the margin; lower surface of costae lacking scales; lobes of fertile leaves plane to slightly revolute; indusia with minute glands along the margins; [subgenus or genus *Parathelypteris*] ..... ***T. simulata***
  2 Leaves (6-) 10-35 cm wide; rhizome scales 2-6 mm long, linear-lanceolate, usually minutely pilose, yellowish-brown to brown, stiff and rather thick; [subgenus *Cyclosorus* or genus *Christella*].
    5 Basal veins from adjacent lobes of the pinna uniting below the sinus (between the sinus and the costa), with a united vein continuing to the sinus.

6 Lower surface of costae with tan scales; upper surface of costae glabrous or sparsely pubescent with hairs < 0.2 mm long; rhizomes long-creeping ..... ***T. interrupta***

6 Lower surface of costae lacking scales; upper surface of costae moderately to densely hairy with hairs > 0.3 mm long; rhizomes short-creeping.

7 Rachises and petioles usually purplish; costae densely short-hairy on the lower surface, the hairs 0-0.1 (-0.2) mm long (about half as long as the costa width); widest point of the leaf usually 3-5 pairs of pinnae up from the base ..... ***T. dentata***

7 Rachises and petioles usually tan; costae sparsely hairy on the lower surface, the hairs variable in length, most of them > 0.3 mm long and at least some > 0.5 mm long (the longer as long as or longer than the costa width); widest point of the leaf usually 1-3 pairs of pinnae up from the base ..... ***T. hispidula*** *var.* ***versicolor***

5 Basal veins from adjacent lobes of the pinna not meeting at all, or reaching the sinus at the same point, thus without a united vein to the sinus.

8 Upper surface of the costae and costules glabrous above (rarely minutely hairy, the hairs never > 0.2 mm long), eglandular..... ***T. ovata*** *var.* ***ovata***

8 Upper surface of the costae and costules with at least a few stout hairs > 0.3 mm long; upper leaf surface pubescent to nearly glabrous, also glandular with stipitate glands.

9 Lowermost 1-2 pairs of pinnae distinctly shorter than the pair above (ca. ¾ as long); basal veins from adjacent lobes of the pinna always meeting ..... ***T. hispidula*** *var.* ***versicolor***

9 Lowermost pair of pinnae equal to or very slightly shorter than the next pair above; basal veins from adjacent lobes of the pinna not meeting at all, or reaching the sinus at the same point ..... ***T. kunthii***

Thelypteris burksiorum J.E. Watkins & D.R. Farrar. Moist sandstone grottoes. A narrow endemic of nc. AL. Watkins & Farrar (2002, 2005) present evidence for its recognition as a species distinct from *Thelypteris pilosa* and discuss its likely evolution as an ancient relictual taxon. The appropriate combination for its recognition at the species level in *Stegnogramma* has not been made. [= *Thelypteris pilosa* (M. Martens & Galeotti) Crawford var. *alabamensis* Crawford – FNA, K; = *Stegnogramma pilosa* (M. Martens & Galeotti) K. Iwatsuki var. *alabamensis* (Crawford) K. Iwatsuki; = ***Stegnogramma* species 1**]

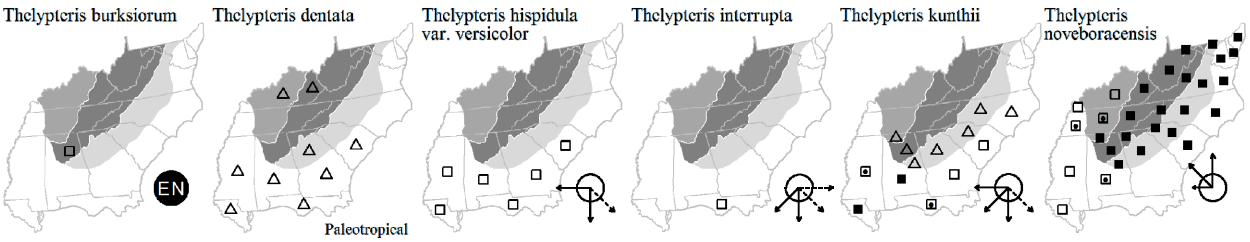
* ***Thelypteris dentata*** (Forsskål) E. P. St. John, Downy Maiden Fern, Soft Fern. Disturbed areas; native of tropical and subtropical Asia and Africa. [= FNA, K, S, WH; = ***Christella dentata* (Forsskål) Brownsey & Jermy**]

Thelypteris hispidula (Decaisne) C.F. Reed *var.* ***versicolor*** (R. St. John) Lellinger, Hairy Maiden Fern. Moist forests, limesinks, and on soil in disturbed areas. E. SC south to s. FL< west to e. TX. Other varieties occur in the West Indies, in tropical New and Old World. [= FNA, K, WH; = *T. versicolor* R. St. John – S; < ***Christella hispidula* (Decaisne) Holttum**; = *T. quadrangularis* (Fee) Schelpe var. *versicolor* (R. St. John) A.R. Smith]

Thelypteris interrupta (Willdenow) K. Iwatsuki, Hottentot Fern. Marshes, swamps, ditches. Pantropical. [= FNA, K, WH; ? *T. gongylodes* (Schkuhr) Small – S; > *T. totta* (Thunberg) Schelpe; = *Cyclosorus interruptus* (Willdenow) H. Itô; ***Christella***]

Thelypteris kunthii (Desvaux) C.V. Morton, Kunth's Maiden Fern, Southern Shield Fern. Coquina limestone ('marl') outcrops, calcareous bluffs and sinkhole slopes, also adventive on and around coquina limestone (marl) riprap around small bridges and ditches and in suburban forests. May-August. Se. NC south to s. FL and west to c. TX; Mexico south through Central America into n. South America; West Indies. [= RAB, FNA, K, WH; < *T. normalis* (C. Christensen) Moxley – S; < ***Christella normalis* (C. Christensen) Holttum**]

Thelypteris noveboracensis (Linnaeus) Nieuwland, New York Fern. Mesic forests, bottomland forests, bogs, submesic forests. May-August. NL (Newfoundland) and WI south to GA, AL, and AR. Distinctive in the leaves tapering about equally to both tip and base. [= RAB, C, FNA, G, K, S, W, WV; = *Dryopteris noveboracensis* (Linnaeus) A. Gray – F; = ***Parathelypteris noveboracensis* (Linnaeus) Ching**]



Thelypteris ovata R. P. St. John *var.* ***ovata***, Ovate Maiden Fern. On coquina limestone ("marl") or in disturbed, calcareous areas. S. SC south to s. FL, west to s. AL; and in the Bahamas. Var. *lindheimeri* (C. Christensen) A.R. Smith occurs in TX, Mexico, Belize, Guatemala, and Jamaica. [= FNA, K; > *T. ovata* var. *ovata* – S, in a narrower sense; > *T. ovata* var. *harperi* (C. Christensen) R. P. St. John – S; < *T. ovata* – WH; = ***Christella ovata* (R.P. St. John) Löve & Löve**]

Thelypteris palustris Schott *var.* ***pubescens*** (Lawson) Fernald, Marsh Fern. Bogs, marshes (including freshwater tidal marshes), and bottomland forests. June-September. The species is circumboreal, occurring in n. Europe, n. Asia, and n. North America. Var. *pubescens* is the American variety, ranging from NL (Newfoundland) and MB south to s. FL and c. TX; c. Mexico (Michoacán, Distrito Federal); Bermuda, Cuba. [= C, FNA, G, K, W, WH, WV; < *T. palustris* – RAB; = *Dryopteris thelypteris* (Linnaeus) Swartz var. *pubescens* (Lawson) A.R. Prince ex Weatherby – F; < *T. thelypteris* (Linnaeus) Nieuwland – S]

Thelypteris simulata (Davenport) Nieuwland, Bog Fern, Massachusetts Fern. In NC and WV in acid peat bogs at about 1000 meters in elevation, in DE, NJ, and VA in acid seepage swamps in the Coastal Plain. July-September. Northeastern, ranging from NS south to ne. VA (Accomack, New Kent, Northampton and Westmoreland counties) and n. WV (Tucker and Preston counties), and disjunct in NC (Alleghany and Avery counties) and WI. Discovered in NC in the 1980's. Presently known in NC only from two sites. [= C, FNA, G, S, W, WV; = *Dryopteris simulata* Davenport – F; = ***Parathelypteris simulata* (Davenport) Holttum**]

F36. WOODSIACEAE Herter 1949 (Woodsia Family) [in POLYPODIALES]

A family of about 15 genera and 700 species, cosmopolitan in distribution, but concentrated in temperate and montane areas. References: Smith in FNA (1993b); Smith et al. (2006); Lellinger (1985); Kramer et al. in Kramer & Green (1990).

1 Sori elongate, indusia present and flaplike, attached along a long side.
  2 Leaves 2-pinnate to 3-pinnate (the pinnae at least 1-pinnate); sori elongate, 2-3× as long as wide, the larger sori generally curved and extending across the veins (except *Diplazium esculentum*).
    3 Veins free, simple or forked ..... [see ***Athyrium*** in ATHYRIACEAE]
    3 Veins anastamosing ..... [see ***Diplazium*** in ATHYRIACEAE]
  2 Leaves 1-pinnate to 1-pinnate-pinnatifid (the pinnae entire or pinnatifid); sori elongate, 2.5-6× as long as wide, even the larger sori generally straight and not extending across the veins.
    3 Leaves 1-pinnate-pinnatifid, the pinnae pinnatifid ..... [see ***Deparia*** in ATHYRIACEAE]
    3 Leaves 1-pinnate, the pinnae entire ..... [see ***Homalosorus*** in DIPLAZIOPSIDACEAE]
1 Sori round, indusia present or absent, if present cuplike or lateral (but not attached along a long side).
  4 Leaf blades broadly triangular in outline, ca. 1× as long as wide; rhizome ca. 1 mm in diameter; indusia absent; [native species of mountain peaks of n. NC and VA] ..... [see ***Gymnocarpium*** in CYSTOPTERIDACEAE]
  4 Leaf blades lanceolate, oblong, or ovate in outline, 2× or more as long as wide; rhizome more than 2 mm in diameter.
    5 Indusium attached under one side of the sorus, hoodlike or pocketlike, arching over the sorus; petioles glabrous or sparsely beset with scales, the petiole bases not persistent ..... [see ***Cystopteris*** in CYSTOPTERIDACEAE]
    5 Indusium attached under the sorus, cuplike (divided into 3-6 lanceolate to ovate lobes which surround the sorus from below) or of minute numerous septate hairs, which extend out from under the sorus on all sides; petioles often densely beset with scales, the petiole bases persistent ..... ***Woodsia***

Woodsia R. Brown 1810 (Woodsia, Cliff Fern)

A genus of about 30 species, of temperate and cool-temperate regions, widespread in the Northern Hemisphere, in montane tropical South America, and south temperate in Africa and South America. References: Windham in FNA (1993b); Kramer et al. in Kramer & Green (1990).

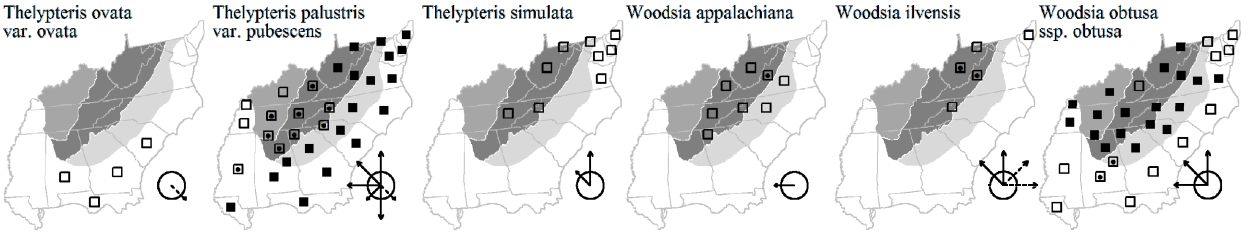
Identification notes: *Woodsia* species and *Cystopteris* species are all small ferns with thin-textured leaves, occurring primarily on or near rock outcrops; they frequently occur together or in proximity to one another and are often confused. *Woodsia* has the indusium divided into a series of scale-like or hair-like structures, attached below the sorus; *Cystopteris* has an undivided indusium, pocket-like or hood-like, attached around one side of the sorus. *Woodsia* has persistent dark petiole bases; in *Cystopteris* the petiole bases are deciduous. *Woodsia* has the final veinlets not reaching the margin; *Cystopteris* veins do reach the margin.

1 Petioles with a distinct joint about 1-3 cm above the base, the petiole bases of former leaves forming a fairly even stubble; leaf blade lacking glands (though bearing both long septate hairs and pale linear scales); indusium of numerous filamentous segments ..... ***W. ilvensis***
1 Petioles lacking a joint, the petiole bases of former leaves disintegrating irregularly and forming an uneven stubble; leaf blade with stalked glands, at least below on the costae, costules, and veins (and also bearing nonglandular hairs and/or linear scales); indusium of 3-6 lanceolate segments.
  2 Rachis with flattened, septate, white hairs and elongate stipitate glands; leaf blade with flattened, septate, white hairs and elongate stipitate glands ..... ***W. appalachiana***
  2 Rachis with scattered scales; leaf blade with sparse to dense stipitate glands ..... ***W. obtusa*** *ssp.* ***obtusa***

Woodsia appalachiana T.M.C. Taylor, Appalachian Woodsia, Appalachian Cliff Fern, Mountain Woodsia. On cliffs of sandstone, shale, granite, granitic gneiss, and hornblende gneiss. June-September. Endemic to the Southern and Central Appalachians of VA, WV, NC, nw. GA, TN, and the Ozarks of AR. This species is similar to *W. scopulina* of the western mountains of AK south to CO and CA. The eastern plants have been variously treated as a full species, a subspecies or variety of *W. scopulina*, or as indistinguishable from *W. scopulina* (see synonymy). It now appears that *W. appalachiana* may be a rather cryptic but distinct element of a reticulate complex also involving *W. scopulina* ssp. *scopulina* (of the Rocky Mountains) and *W. scopulina* ssp. *laurentiana* Windham (primarily of the Rocky Mountains but also disjunct eastward in ON and QC). Windham in FNA (1993b) treats these three entities as subspecies, and suggests that ssp. *laurentiana* is the allotetraploid derivative of hybridization of the eastern and western diploids. If this is indeed so, each of the 3 entities should be recognized at the species level. [= F, K; < *W. scopulina* D.C. Eaton – RAB, C, S, W, WV; = *W. scopulina* ssp. *appalachiana* (T.M.C. Taylor) Windham – FNA; = *W. scopulina* var. *appalachiana* (T.M.C. Taylor) Morton – G]

Woodsia ilvensis (Linnaeus) R. Brown, Rusty Woodsia, Rusty Cliff Fern. Cliffs of amphibolite, greenstone, other rocks. June-September. Circumboreal, ranging in North America from NL (Newfoundland) and AK south to VA, nw. NC, OH, n. IL, nw. IA, SK, and BC. [= RAB, C, F, FNA, G, K, S, W, WV]

Woodsia obtusa (Sprengel) Torrey *ssp.* ***obtusa***, Common Woodsia, Blunt-lobed Cliff Fern. Rock outcrops of various sorts, moist talus, terrestrial near rock outcrops. June-September. ME, QC, MN, and e. NE, south to Panhandle FL and TX. [= FNA, K; < *W. obtusa* – RAB, C, F, G, S, W, WH, WV]



F38. ONOCLEACEAE Pichi Sermolli 1970 (Sensitive Fern Family) [in POLYPODIALES]

A family of 4 genera and 5 species, of north temperate regions. The family as here circumscribed is monophyletic and sister to Blechnaceae (Smith et al. 2006). Christenhusz, Zhang, & Schneider (2011) prefer to combine the 5 species in the family into a single genus (*Onoclea*). References: Christenhusz, Zhang, & Schneider (2011); Smith et al. (2006)

1 Sterile leaves pinnate-pinnatifid, 6-25 dm tall, broadest toward the tip; fertile leaves 1-pinnate; veins free; rhizomes of 2 types, the slender, creeping rhizomes leafless, giving rise at intervals to extremely stout, vertical rhizomes which bear a cluster of many leaves ..... ***Matteuccia***
1 Sterile leaves pinnatifid, 2-10 dm tall, broadest near the base; fertile leaves 2-pinnate; veins netted; rhizomes all slender and creeping, the leaves borne scattered along the rhizome ..... ***Onoclea***

Matteuccia Todaro 1866 (Ostrich Fern)

A monotypic genus, north temperate in distribution. Two other species formerly included in *Matteuccia* (or sometimes in *Onoclea*) are either better treated in the genus *Pentarhizidium* Hayata (Gastony & Ungerer 1997), or else the genera *Pentarhizidium*, *Matteucia*, and *Onocleopsis* should be united into *Onoclea* (Christenhusz, Zhang, & Schneider 2011). References: Johnson in FNA (1993b); Kramer et al. in Kramer & Green (1990).

Matteuccia struthiopteris (Linnaeus) Todaro *var.* ***pensylvanica*** (Willdenow) C.V. Morton, Ostrich Fern. Alluvial forests and calcareous wetlands. The species is circumboreal; the North American var. *pensylvanica* ranges from NL (Newfoundland) west to AK, south to VA (Smyth and Craig cos.), MO, SD, and BC. The North American var. *pensylvanica* is separated from the Eurasian var. *struthiopteris* on the basis of its concolorous rhizome scales (vs. bicolorous scales) and less truncate pinna lobes. *Matteuccia* stores starch in its persistent petiole bases. [= FNA, G; < *M. struthiopteris* – C, K; = *Pteretis pensylvanica* (Willdenow) Fernald – F; = *M. pensylvanica* (Willdenow) Raymond – WV; = *Onoclea struthiopteris* (Linnaeus) Roth var. pensylvanica (Willdenow) B. Boivin]

Onoclea Linnaeus 1753 (Sensitive Fern)

A genus of 1 species, of temperate e. North America and e. Asia. References: Gastony & Ungerer (1997)=Z; Johnson in FNA (1993b); Kramer et al. in Kramer & Green (1990).

Onoclea sensibilis Linnaeus *var.* ***sensibilis***, Sensitive Fern, Bead Fern. Marshes, swamps, wet disturbed places. May-June. The species ranges from NL (Newfoundland) west to MN and CO, south to FL, TX, and CO; also in e. Asia. Var. *sensibilis* is North American; var. *interrupta* is Asian. The recognition of two varieties is supported by molecular evidence. Alternatively, species status is sometimes given (Gastony & Ungerer 1997). The specific epithet and common name refer to the fact that the fronds wither at the first touch of frost, not that they respond to touch. The peculiar fertile leaves (with their brown, beadlike, fertile pinnules) are collected for use in dried arrangements. The expanded, persistent petiole bases store starch. [< *O. sensibilis* – RAB, C, F, FNA, G, K, S, W, WV; = *O. sensibilis* – Z]

F39. BLECHNACEAE (C. Presl) Copeland 1947 (Deer Fern Family) [in POLYPODIALES]

A family of about 9 genera and 250 species, cosmopolitan in distribution. References: Lellinger (1985); Cranfill in FNA (1993b); Kramer, Chambers, & Hennipman in Kramer & Green (1990).

1 Veins of sterile leaves free; sori continuous ..... ***Blechnum***
1 Veins of sterile leaves anastomosing; sori distinct from one another, in rows ..... ***Woodwardia***

Blechnum Linnaeus 1753 (Deer Fern)

A genus of about 220 species, of nearly cosmopolitan distribution (mostly tropical and especially Southern Hemisphere). References: Mickel & Smith (2004)=Z; Kramer, Chambers, & Hennipman in Kramer & Green (1990).

1 Leaf blades usually < 5 dm long; leaves pinnate-pinnatifid in all or part; margins entire (to sparingly and irregularly serrulate) ..... ***B. appendiculatum***
1 Leaf blades usually > 5 dm long; leaves pinnate throughout; margins serrulate ..... ***B. serrulatum***

Blechnum appendiculatum Willdenow, Hammock Fern. Moist forests. S. GA south to s. FL; West Indies; Central America, South America. Collected once in LA, on the west bank of the Mississippi River in bottomland hardwoods in Iberville Parish, LA. [= Z; = *B. occidentale* Linnaeus var. *minor* Hooker – FNA; < *B. occidentale* – K1, K2, S]

Blechnum serrulatum L.C. Richard, Swamp Fern, Marsh Fern. Vacant lots, bottomlands. Ne. FL south to FL peninsula; Mexico, Central America, South America; West Indies; Malesia and Australia. Introduced and established in e. SC (Beaufort and Jasper counties) via landscaping plants brought in from FL (P. McMillan, pers. comm. 2005). [= FNA, K1, K2, S, Z]

Woodwardia J.E. Smith 1793 (Chain Fern)

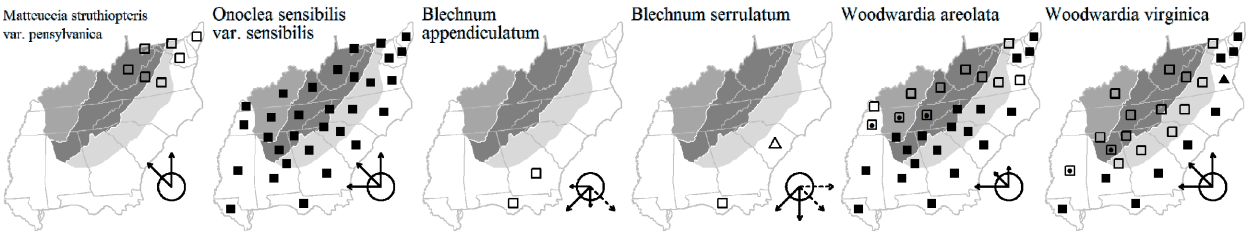
A genus of about 13 species of temperate and tropical portions of the Northern Hemisphere, especially e. and se. Asia. References: Kramer, Chambers, & Hennipman in Kramer & Green (1990).

Identification notes: In sterile leaf, *Woodwardia areolata* is sometimes confused with *Onoclea*, but *W. areolata* has the pinnae generally alternate (vs. tending to be opposite), the pinnae generally acute or acuminate (vs. obtuse), and the pinna margin finely serrulate (vs. entire).

1 Sterile leaves pinnatifid, the pinnae 7-10 pairs per leaf, basally not distinct from one another, the rachis therefore winged by leaf tissue throughout its length, the pinnae merely finely serrulate ..... ***W. areolata***
1 Sterile leaves pinnate-pinnatifid, the pinnae 15-20 pairs per leaf, fully distinct, the rachis therefore not winged by leaf tissue, the pinnae themselves pinnatifid..... ***W. virginica***

Woodwardia areolata (Linnaeus) T. Moore, Netted Chain Fern. Moist to wet, acid, organic soils, such as bogs, blackwater bottomlands, pocosins. May-September. NS west to MI and MO, south to s. FL and e. TX, primarily on the Coastal Plain. See Cranfill (1983) for a discussion of the geography and ecology of *W. areolata*. [= RAB, C, F, FNA, G, K, W, WH; = *Lorinseria areolata* (Linnaeus) K. Presl – S, WV]

Woodwardia virginica (Linnaeus) J.E. Smith, Virginia Chain Fern. Moist to wet, acid, organic soils, such as bogs, blackwater bottomlands, pocosins, sometimes in standing water, as in periodically flooded coastal plain depression ponds. June-September. NS west to MI and IL, south to s. FL and TX, and in Bermuda, primarily on the Coastal Plain. Sometimes confused when sterile with *Osmundastrum cinnamomeum* (which see for discussion). [= RAB, C, F, FNA, G, K, W, WH; = *Anchistea virginica* (Linnaeus) K. Presl – S]



F40. ATHYRIACEAE Alston 1956 (Lady Fern Family) [in POLYPODIALES]

References: Christenhusz, Zhang, & Schneider (2011).

1 Leaves 2-pinnate to 3-pinnate (the pinnae at least 1-pinnate); sori elongate, 2-3× as long as wide, the larger sori generally curved and extending across the veins (except *Diplazium esculentum*).
  2 Veins free, simple or forked ..... ***Athyrium***
  2 Veins anastamosing ..... ***Diplazium***
1 Leaves 1-pinnate to 1-pinnate-pinnatifid (the pinnae entire or pinnatifid); sori elongate, 2.5-6× as long as wide, even the larger sori generally straight and not extending across the veins.
  3 Leaves 1-pinnate-pinnatifid, the pinnae pinnatifid..... ***Deparia***
  3 Leaves 1-pinnate, the pinnae entire ..... [see ***Homalosorus*** in DIPLAZIOPSIDACEAE]

Athyrium Roth 1799 (Lady Fern)

A genus of about 180 species, cosmopolitan in distribution, but concentrated in e. and se. Asia. Kelloff et al. (2002) and Kelloff & Werth (1998) support recognition of two taxa at either specific or infraspecific levels, based on morphology, allozymes, and spores. References: Kato in FNA (1993b); Kramer et al. in Kramer & Green (1990); Kelloff et al. (2002). [also see *Deparia* and *Homalosorus*]

Identification notes: *Athyrium* and *Deparia* superficially resemble *Dryopteris*, and they often grow together. *Athyrium* and *Deparia* have linear, flap-like sori (vs. rounded, reniform sori). Sterile individuals can be distinguished by the number of vascular bundles in the petiole (easily determined by breaking off a leaf and counting the vascular bundles, which will appear as thread-like, but flattened, strands); *Athyrium* and *Deparia* have 2, *Dryopteris* has 4-7.

1 Leaves variegated, silvery gray and gray-green; [alien]..... ***A. niponicum***
1 Leaves not variegated, bright green; [native, sometimes cultivated]

1 Leaf blade widest near middle (the fourth or fifth pair of pinnae from the base the largest); margins of indusium toothed or ciliate (not glandular); rachis glandular; spores yellow or brown, finely papillose; petiole scales persistent, up to 1 cm long and 1.5 mm wide ..... ***A. angustum***

1 Leaf blade widest near base (the second or third pair of pinnae from the base the largest); margins of indusium ciliate and glandular-ciliate; rachis eglandular; spores brown or dark brown, reticulate-wrinkled; petiole scales early deciduous, up to 5 mm long and 1 mm wide..... ***A. asplenioides***

Athyrium angustum (Willdenow) K. Presl, Northern Lady Fern. Moist forests, rock outcrops on grassy balds at high elevations. June-September. The occurrence of this northern species is not fully documented in NC or VA; it was found in the 1980's by Murray Evans on Hump Mountain, on or near the TN-NC border. NL (Newfoundland) and n. QC west to SK, south to w. NC, e. TN, OH, MO, and NE. Reported for VA by Kartesz (1999). [= S, WV; = *A. filix-femina* (Linnaeus) Roth ex Mertens var. *michauxii* (Sprengel) Farwell – C, F, G; = *A. filix-femina* var. *angustum* (Willdenow) G. Lawson – FNA; = *A. filix-femina* ssp. *angustum* (Willdenow) Clausen – K, W]

Athyrium asplenioides (Michaux) A.A. Eaton, Southern Lady Fern. Moist forests. May-September. MA, WV, IL, and KS south to n. FL and e. TX. [= RAB, S, WV; = *A. filix-femina* (Linnaeus) Roth ex Mertens var. *asplenioides* (Michaux) Farwell – C, F, FNA, G; = *A. filix-femina* ssp. *asplenioides* (Michaux) Hultén – K, W, WH]

* ***Athyrium niponicum*** (Mettenius) Hance, Japanese Painted Fern. Suburban woodlands, lawns; commonly planted as an ornamental, rarely naturalizing, native of Japan. This common suburban ornamental (forma *picta*) spreads locally from plantings; it seems only a matter of time before it begins to naturalize more widely

Deparia Hooker & Greville 1829

A genus of about 40-50 species, primarily in tropical to warm temperate Asia and Africa. References: Kato in FNA (1993b); Kramer et al. in Kramer & Green (1990).

Identification notes: Unlike *Athyrium*, *Deparia* has the costal groove not continuous with the rachis groove. In addition, *Deparia* has multicellular hairs on the leaf blades.

1 Leaf blade narrowed to base; petiole bases swollen, with 2 rows of teeth; [plant a common native species of moist forests]; [section *Lunathyrium*] ..... ***D. acrostichoides***

1 Leaves widest at the base; petiole bases not markedly swollen, lacking teeth; [plant an exotic species, rarely introduced and naturalized]; [section *Athyriopsis*] ..... ***D. petersenii***

Deparia acrostichoides (Swartz) M. Kato, Silvery Spleenwort. Moist forests, cove forests. June-September. NS west to MN, south to NC, SC, n. GA, n. AL, and AR. *D. acrostichoides* is the only species native to the New World; it has several very closely related species in e. Asia (in section *Lunathyrium*). It stores starch in the swollen, persistent petiole bases. [= FNA, K, W; = *Athyrium thelypteroides* (Michaux) Desvaux – RAB, C, F, G, WV; = *Diplazium acrostichoides* (Swartz) Butters – S]

* ***Deparia petersenii*** (Kunze) M. Kato. Swamp forests, disturbed areas; native to se. Asia. Introduced and naturalized in the Southeast, including in c. and s. GA, AL, s. MS, and FL. [= FNA; = *Deparia petersonii* – K, orthographic variant; = *Deparia japonica* (Thunberg) M. Kato, misapplied; = *Diplazium japonicum* (Thunberg) Beddome, misapplied]

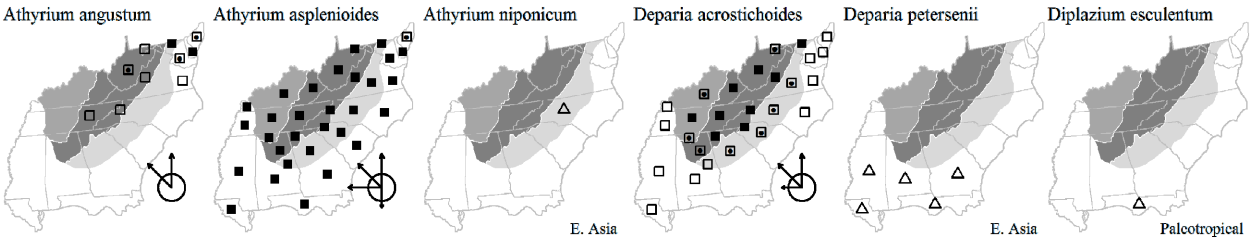
Diplazium Swartz 1800 (Twin-sorus Fern)

A genus of about 400 species, primarily tropical and north temperate in distribution. References: Kato in FNA (1993b); Kramer et al. in Kramer & Green (1990).

1 Leaves 2-pinnate; veins anastamosing ..... ***D. esculentum***

1 Leaves 1-pinnate; veins free ..... [see ***Homalosorus pycnocarpos*** in DIPLAZIOPSIDACEAE]

* ***Diplazium esculentum*** (Retzius) Swartz, Vegetable Fern. Moist disturbed areas; native of the Old World tropics. [= FNA, K]



F42. DRYOPTERIDACEAE Ching 1965 (Wood-fern Family) [in POLYPODIALES]

A family of about 40-45 genera and 1700 species, cosmopolitan in distribution, but concentrated in temperate and montane areas. Here circumscribed (following Smith et al. 2006) to exclude Onocleaceae and Woodsiaceae. References: Smith in FNA (1993b); Smith et al. (2006); Lellinger (1985); Kramer et al. in Kramer & Green (1990).

1 Leaf blades pentagonal in outline, ca. 1× as long as wide, the terminal pinna by far the largest; [introduced species, naturalized in moist ravines in SC] ..... ***Arachniodes***
1 Leaf blades lanceolate, oblong, or ovate in outline, 1.5× or more as long as wide.
2 Leaves 1-pinnate-pinnatifid to more divided, the pinnae pinnatifid or themselves fully divided, generally lacking a prominent basal lobe, light green to dark green, herbaceous to subcoriaceous; indusia reniform (*Dryopteris*) or peltate (*Rumohra*).
3 Indusia reniform; leaf blade (at least of larger leaves on mature plants) usually > 40 cm long ..... ***Dryopteris***
3 Indusia peltate; leaf blade < 40 cm long ..... ***Rumohra***
2 Leaves 1-pinnate, the pinnae toothed and each with a slight to prominent lobe near the base on the side toward the leaf tip, dark green, subcoriaceous to coriaceous; indusia peltate.
4 Veins anastamosing, rejoining to form a netlike pattern; pinnae 4-25 pairs per leaf; [non-native, rarely naturalized] ..... ***Cyrtomium***
4 Veins branching dichotomously, free, not rejoining to form a netlike pattern; pinnae 25-50 pairs on larger leaves; [plant a common native species] ..... ***Polystichum***

Arachniodes Blume 1828 (East Indian Holly Fern)

A genus of about 50-60 species, of tropical and warm temperate regions, and especially of Asia and America. References: Smith in FNA (1993b); Kramer et al. in Kramer & Green (1990).

* ***Arachniodes simplicior*** (Makino) Ohwi, Simpler East Indian Holly Fern. Moist banks in forested creek ravine; native of Japan and China. Gordon (1981) discusses this interesting introduced population, apparently established for several decades at the time of its discovery, and likely originating from spores. [= FNA, K]

Cyrtomium K. Presl 1836 (Net-veined Holly Fern)

A genus of about 15 species, of temperate regions of Africa, Asia, and the Pacific Islands. Perhaps better treated as a portion of *Polystichum*; at the least, *Cyrtomium* is closely related to *Polystichum*. Both species in our area are apogamous triploids. References: Yatskievych in FNA (1993b); MacDougal (1976); Kramer et al. in Kramer & Green (1990).

1 Leaf coriaceous, the upper surface dark green and shiny; pinnae 4-10 (-12) pairs per leaf, 1.5-3 cm wide, the margins coarsely toothed or undulate ..... ***C. falcatum***
1 Leaf less coriaceous, the upper surface pale green and dull; pinnae (8-) 10-25 pairs per leaf, 1-2 cm wide, the margins finely denticulate ..... ***C. fortunei*** *var.* ***fortunei***

* ***Cyrtomium falcatum*** (Linnaeus f.) K. Presl, Asian Net-veined Holly Fern. Ditches, disturbed swamps, moist ravines, old mortar of brick walls; native of e. Asia. [= FNA, K, S; = *Polystichum falcatum* Linnaeus f.]

* ***Cyrtomium fortunei*** J. Smith *var.* ***fortunei***, Fortune's Net-veined Holly Fern. Roadside banks, old mortar of brick walls; native of se. China. Two other varieties are recognized; neither appears to be naturalized in North America. Reported for Polk County, TN (D. Estes, pers. comm., 2010). [= FNA; < *C. fortunei* – K]

Dryopteris Adanson 1763 (Wood-fern, Shield-fern)

A genus of about 250 species, nearly cosmopolitan, but concentrated in temperate Asia. References: Montgomery & Wagner in FNA (1993b); Montgomery & Paulton (1981); Montgomery (1982); Kramer et al. in Kramer & Green (1990); Hoshizaki & Wilson (1999).

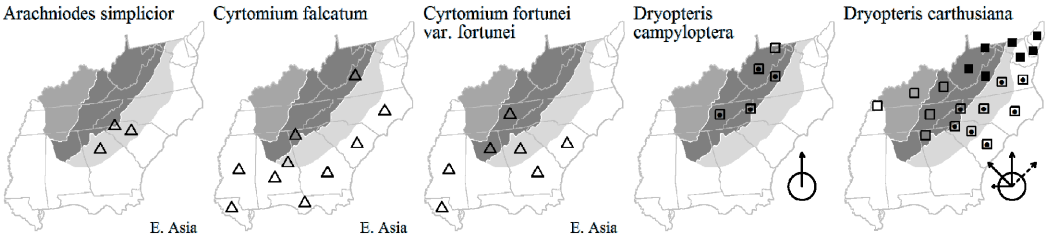
Identification notes: *Dryopteris* and *Athyrium* are often confused when not fertile; they can be easily distinguished by breaking off a leaf and counting vascular bundles (which will appear as thread-like strands). *Dryopteris* has 5 and *Athyrium* has 2. Many *Dryopteris* species will hybridize with one another to form sterile hybrids. Whenever two or more *Dryopteris* species are found growing together, there is a good chance that hybrids are present. Hybrids generally show intermediacy between the two parents, and have abortive sporangia or spores.

1 Leaves bipinnate-pinnatifid to tripinnate-pinnatifid (or to quadripinnate in the lower pinnae).
2 Leaves evergreen, the blades appearing more-or-less parallel-sided and minutely glandular-pubescent, especially on the indusium, rachis, and pinnae midribs; first basal-pointed pinnule of the basal pinna shorter than or equal to the next outermost basal-pointed pinnule; first basal-pointed pinnule of the basal pinna usually < 2× as long as the first tip-pointed pinnule of the basal pinna ..... ***D. intermedia***
2 Leaves deciduous, the blades appearing more or less triangular and lacking gland-tipped hairs (except occasionally on the indusium); first basal-pointed pinnule of the basal pinna longer than the next outermost basal-pointed pinnule; first basal-pointed pinnule of the basal pinna > 2× as long as the first tip-pointed pinnule of the basal pinna.
3 Leaf blade ca. 1× as long as the petiole; indusium occasionally glandular; first basal-pointed pinnule of the basal pinna 2.5-5× as long as the first tip-pointed pinnule of the basal pinna ..... ***D. campyloptera***
3 Leaf blade 2× as long as the petiole; indusium glabrous; first basal-pointed pinnule of the basal pinna ca. 2× as long as the first tip-pointed pinnule of the basal pinna ..... ***D. carthusiana***
1 Leaves pinnate-pinnatifid to bipinnate (or to bipinnate-pinnatifid in the lower pinnae).
4 Sori marginal; leaves evergreen, gray-green, leathery in texture ..... ***D. marginalis***
4 Sori medial or submedial; leaves evergreen or deciduous, dark- to bright-green, thin to stiff in texture.
5 Leaves dimorphic, the deciduous, fertile leaves erect, 2-3× as long as the spreading, evergreen, sterile leaves, which form a winter "rosette"; fertile leaves linear-lanceolate in outline, generally 4-8× as long as wide; pinnae mostly 1.5-3× as long as wide, triangular; scales at base of petiole tan.

6 Fertile pinnae nearly in plane of the blade (like a closed Venetian blind); fertile leaves 12-20 cm wide ..... ***D. clintoniana***
6 Fertile pinnae usually twisted out of the plane of the leaf axes, often nearly to 90° (like an open Venetian blind); fertile leaves 8-12 cm wide ..... ***D. cristata***
5 Leaves not dimorphic, or only slightly so, deciduous (*D. goldiana*), evergreen (*D. ludoviciana*) , or else with usually deciduous fertile and semi-evergreen sterile fronds (*D. celsa*); fertile leaves lanceolate to ovate in outline, generally 1.5-4× as long as wide; pinnae mostly 3-5× as long as wide; scales at base of petiole dark brown with tan margins.
7 Leaves evergreen, fertile only toward the tip, the fertile pinnae and segments narrower than the sterile and more widely spaced; scales at the petiole base light brown, not shiny ..... ***D. ludoviciana***
7 Leaves deciduous or semi-evergreen, fertile throughout or nearly so, the fertile pinnae and segments not differentiated from sterile ones; scales at petiole base medium to dark brown, shiny or not.
8 Costa with bullate (blistered-appearing) scales abundant, usually dark; [rarely naturalized alien] ..... ***D. erythrosora***
8 Costa lacking bullate scales; [native, sometimes also cultivated].
9 Sterile leaves semi-evergreen; fertile leaves deciduous with sori submedial, not touching the costule at maturity; leaf blade lanceolate, usually 2-4× as long as wide, gradually tapering at the apex; scales at the petiole base medium to dark brown, with a narrow black central band..... ***D. celsa***
9 Leaves deciduous with sori medial, touching the costule at maturity; leaf blade ovate to narrowly ovate, usually 1.5-3× as long as wide; abruptly tapering at the apex; scales at the petiole base dark brown, nearly black, with a narrow pale margin .... ***D. goldiana***

Dryopteris campyloptera Clarkson, Mountain Wood-fern. Spruce-fir forests, northern hardwood forests. July-September. NL (Newfoundland) and n. QC south to extreme n. PA, and from extreme s. PA south through e. WV and w. VA to e. TN and w. NC. This species is a fertile allotetraploid derived from hybridization of *D. intermedia* and the northern and western *D. expansa* (K. Presl) Fraser-Jenkins & Jermy, which does not (now) reach our area. The chromosome complement is symbolized EEII. [= RAB, C, K, S, W, WV; = *D. spinulosa* (O.F. Mueller) Watt var. *americana* (Fischer ex Kunze) Fernald – F; = *D. austriaca* (Jacquin) Woynar ex Schinz & Thellung var. *austriaca* – G]

Dryopteris carthusiana (Villars) H.P. Fuchs, Spinulose Wood-fern, Toothed Wood-fern. Acidic, organic-rich bogs, swamps, less frequently in moist rocky ravines, rich forests, and sloping rock outcrops. June-September. Irregularly circumboreal, in North America ranging from n. QC west to YT, south to NC, SC, ne. GA, TN, AR, NE, w. MT, and WA. This species is a fertile allotetraploid derived from hybridization of *D. intermedia* and "*D. semicristata*," a hypothetical species which may now be extinct. Its chromosome complement is symbolized IISS. [= C, FNA, K, W; = *D. spinulosa* (O.F. Mueller) Watt – RAB, S, WV; = *D. spinulosa* var. *spinulosa* – F; = *D. austriaca* (Jacquin) Woynar ex Schinz & Thellung var. *spinulosa* (O.F. Mueller) Fiori – G]



Dryopteris celsa (W. Palmer) Knowlton, W. Palmer, & Pollard ex Small, Log Fern. Swamps, seepage bogs, and calcareous floodplains, typically associated with calcareous substrates. June-September. Ne. NJ and ne. NY west to s. IL, e. MO, and AR, south to SC, GA, n. AL, TN, e. and n. LA, and e. TX (Mink, Singhurst, & Holmes 2011a); disjunct in w. NY and w. MI; overall very scattered in its distribution. This species is a fertile allotetraploid derived from hybridization of *D. goldiana* and *D. ludoviciana*; its chromosome complement is symbolized GGLL (Werth 1991). [= RAB, C, F, FNA, K, S, W, WV; = *D. goldiana* (Hooker ex Goldie) ssp. *celsa* W. Palmer – G]

Dryopteris clintoniana (D.C. Eaton) Dowell, Clinton's Wood-fern, Broad Swamp Fern. Acid seepages, swampy forests, red maple swamps. NB, QC, and ON, south to DE, DC, MD (Somerset Co.), n. VA (Arlington and Fairfax counties), PA, OH, IN, and IL. This species is a fertile allohexaploid derived from hybridization of *D. cristata* and *D. goldiana*; its chromosome complement is symbolized GGLLSS. [= FNA, C, G, K; = *D. cristata* (Linnaeus) A. Gray var. *clintoniana* (D.C. Eaton) Underwood – F]

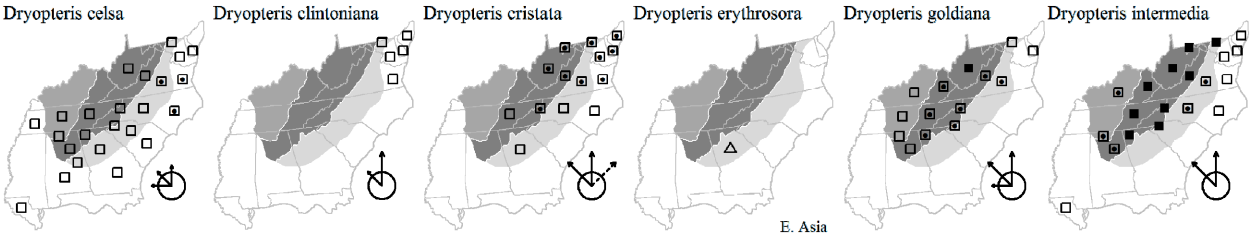
Dryopteris cristata (Linnaeus) A. Gray, Crested Wood-fern. Bogs, swamp forests. July-September. Circumboreal, in North America from NL (Newfoundland) to s. SK and se. BC, south to NC, TN, OH, IN, n. IL, IA, NE, and ID; disjunct in c. GA, AL, and LA. This species is a fertile allotetraploid derived from hybridization of *D. ludoviciana* and "*D. semicristata*," a hypothetical species which may be extinct. Its chromosome complement is symbolized LLSS. It has also served as a "parent species" of *D. clintoniana*, a fertile allohexaploid derived from *D. cristata* × *goldiana*. Thus, its genome constitutes two thirds of the genome of *D. clintoniana*. [= RAB, C, FNA, G, K, S, W, WV; = *D. cristata* var. *cristata* – F]

* ***Dryopteris erythrosora*** (D.C. Eaton) Kuntze, Autumn Fern, Japanese Red Shield-fern. Suburban woodlands; native of Japan, Korea, and China. Also recently reported as naturalizing in AR (Simpson, Crank, & Peck 2008).

Dryopteris goldiana (Hooker ex Goldie) A. Gray, Goldie's Wood-fern. Boulderfield forests, rich cove forests, seepage swamps, especially over calcareous sedimentary or mafic metamorphic or igneous rocks. June-September. NB west to s. ON and MN, south to nw. SC, n. GA, n. AL, TN, KY, IL, and IA. This species is one of the diploid "parent species" of the e. North American reticulately-evolved *Dryopteris* complex. Its genome (symbolized GG) forms half of the genome of the tetraploid *D. celsa*, and one third of the hexaploid *D. clintoniana*, which does not occur as far south as our area. [= RAB, C, F, FNA, K, S, W, WV; = *D. goldiana* ssp. *goldiana* – G]

Dryopteris intermedia (Muhlenberg ex Willdenow) A. Gray, Fancy Fern, Evergreen Wood-fern. Cove forests, other moist, rocky forests, over a variety of substrates. June-September. NL (Newfoundland) west to MN, south to n. GA and AR. This species is one of the diploid "parent species" of the e. North American reticulately-evolved *Dryopteris* complex. Its genome (symbolized II) forms half of the genome of the tetraploids *D. campyloptera* and *D. carthusiana*. [= RAB, C, FNA, K, S, W, WV; =

D. spinulosa (O.F. Mueller) Watt var. *intermedia* (Muhlenberg ex Willdenow) Underwood – F; = *D. austriaca* (Jacquin) Woynar ex Schinz & Thellung var. *intermedia* (Muhlenberg ex Willdenow) Morton – G]



Dryopteris ludoviciana (Kunze) Small, Southern Wood-fern. Blackwater swamp forests. June-September. A Southeastern Coastal Plain species: e. NC south to s. FL, west to s. AL, s. MS (Sorrie & Leonard 1999), and e. LA; disjunct in the West Gulf Coastal Plain of LA and AR, and possibly disjunct in sc. KY, the report old and somewhat uncertain. This species is one of the diploid "parent species" of the e. North American reticulately-evolved *Dryopteris* complex. Its genome (symbolized LL) forms half of the genome of the tetraploids *D. cristata* and *D. celsa,* as well as contributing one third of the genome of *D. clintoniana* indirectly (via its daughter species *D. cristata*). [= RAB, FNA, K, S]

Dryopteris marginalis (Linnaeus) A. Gray, Marginal Wood-fern. Rock outcrops, boulderfield forests, other rocky forests. June-September. NL (Newfoundland) west to s. ON and MI, south to SC, c. GA, AL, TN, AR, and e. OK. *D. marginalis* has not participated in the reticulate evolution of *Dryopteris* in e. North America; it does, however, form sterile hybrids with some other species. [= RAB, C, F, FNA, G, K, S, W, WV]

Polystichum Roth 1799 (Holly Fern)

A genus of about 180 species, nearly cosmopolitan in distribution. References: D.H. Wagner in FNA (1993b); Kramer et al. in Kramer & Green (1990).

1 Leaves 1-pinnate; [common, native] .....***P. acrostichoides***
1 Leaves 2-pinnate; [rare, alien] .....***P. polyblepharum***

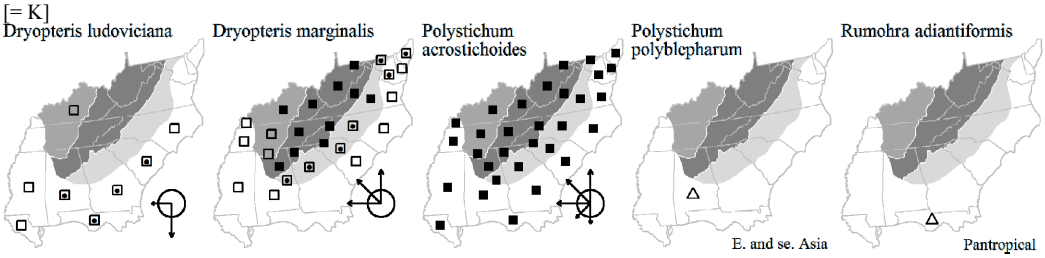
Polystichum acrostichoides (Michaux) Schott, Christmas Fern. Moist to dry forests and woodlands, especially slopes, ravines, and small stream bottomlands. June-September. NS west to MN, south to s. FL and e. TX; also in ne. Mexico (Nuevo León and Tamaulipas). One of the most familiar ferns in e. North America. Var. *lonchitoides* Brooks, allegedly endemic to WV, is of dubious taxonomic value. [= RAB, C, F, FNA, G, S, W, WV; > *P. acrostichoides* var. *acrostichoides* – K; > *P. acrostichoides* var. *lonchitoides* Brook – K]

* ***Polystichum polyblepharum*** (Roemer ex Kunze) K. Presl, JapaneseTassel-fern. Moist ravines; native of e. Asia. Reported for AL as *P. braunii* (Spenner) Fée. {not yet keyed}

Rumohra Raddi 1819 (Leatherleaf Fern)

A genus of about 7 species, perennials, mainly tropical and Southern Hemisphere. References: Kramer et al. in Kramer & Green (1990).

* ***Rumohra adiantiformis*** (G. Forster) Ching, Leatherleaf Fern. Suburban woodlands, roadsides, disturbed areas; native of Old World and New World tropics. June-September. Reported for Franklin County in the FL Panhandle by Kunzer et al. (2009). [= K]



F44. NEPHROLEPIDACEAE Pichi Sermolli 1975 (Sword Fern Family) [in POLYPODIALES]

A family of 1 genus and about 15-30 species. Sometimes united, as by Smith et al. (2006), into the Lomariopsidaceae. References: Christenhusz, Zhang, & Schneider (2011).

Nephrolepis Schott 1834 (Sword Fern)

A genus of about 15-30 species, widespread in tropical and subtropical areas.

1 Pinnae 2.5-23 cm long; midleaf pinnae with veins densely pubescent on the upper surface; pinnae not distinctly auricled at base ..... ***N. biserrata***
1 Pinnae 1-7.3 cm long; midleaf pinnae with veins glabrous on the upper surface; pinnae auricled at base on the side towards the leaf tip.
2 Scales on the upper surface of the rachis bicolored (pale but distinctly darker at the base); pinnae attachments spaced 5-12 mm apart; rhizomes bearing spherical tubers (not always present)..... ***N. cordifolia***
2 Scales on the upper surface of the rachis concolored (pale to reddish brown throughout); pinnae attachments spaced 7-21 mm apart; rhizomes not bearing tubers..... ***N. exaltata***

* ***Nephrolepis biserrata*** (Swartz) Schott, Giant Sword Fern. Disturbed suburban areas; native of the tropics and subtropics of both hemispheres. [= FNA, K; ? *N. falcata* (Cavanilles) C. Christensen]
* ***Nephrolepis cordifolia*** (Linnaeus) K. Presl, Narrow Sword Fern. Moist places; probably not native in FL. Pantropical, the original distribution obscure. [= FNA, K, S]
Nephrolepis exaltata (Linnaeus) Schott, Boston Fern. Epiphytic or terrestrial in a range of open to shaded moist habitats; in our area perhaps only introduced. Panhandle and ne. FL south to s. FL; West Indies; Central and South Americ; widely introduced elsewhere. [= FNA, S; > *N. exaltata* ssp. *exaltata* – K]

F48. POLYPODIACEAE Berchtold & J.C. Presl 1820 (Polypody Family) [in POLYPODIALES]

A family of about 35-40 genera and 500-700 species, cosmopolitan, especially tropical. Here circumscribed to include Grammitidaceae (including *Micropolypodium*). References: Smith in FNA (1993b); Smith et al. (2006); Hennipman, Veldhoen, & Kramer in Kramer & Green (1990); Parris in Kramer & Green (1990).

1 Plants dwarf, the leave blades <5 cm long; [occurring only in habitats where the air is constantly humid and the substrate saturated, as in grottoes behind waterfalls] ..... ***Micropolypodium***
1 Plants larger, the leave blades 7-90 cm long; [occurring in moist to dry habitats].
2 Leaf blade densely scaly on the lower surface; rhizome 1-2 mm in diameter; leaf segment margins entire..... ***Pleopeltis***
2 Leaf blade scaleless on the lower surface; rhizome 3-15 (-30) mm in diameter; leaf segment margins denticulate (*Polypodium*) or entire (*Phlebodium, Pecluma*).
3 Leaves pectinate, at least the larger with >25 pairs of segments, each 1.5-5 (-8) mm wide; [of ne. FL southward] ..... ***Pecluma***
3 Leaves pinnatifid, even the larger with < 25 pairs of segments, (3-) 5-40 mm wide; [collectively widespread in our area.
4 Venation highly reticulate, with 3-4 rows of areoles between the midvein and the margin; rhizome 8-15 (-30) mm in diameter; leaf blade 10-50 cm wide..... ***Phlebodium***
4 Venation free or with a row of areoles between the midvein and the margin; rhizome 3-6 mm in diameter; leaf blade <9 cm wide..... ***Polypodium***

Micropolypodium Hayata (Dwarf Polypody)

A genus of about 30 species, mainly of tropical America and e. and se. Asia. *Micropolypodium* has traditionally been considered a part of a broadly circumscribed *Grammitis*, but has been re-circumscribed at the generic level by Smith (1992). Smith in FNA (1993b) states that our species "probably warrants generic status under the ame *Micropolypodium* Hayata, a primarily neotropical genus with representatives in eastern Asia (Malaysia, China, Sikkim, Taiwan, and Japan)." References: Smith in FNA (1993b); Massey *et al.* (1983); Smith (1992)=Z.

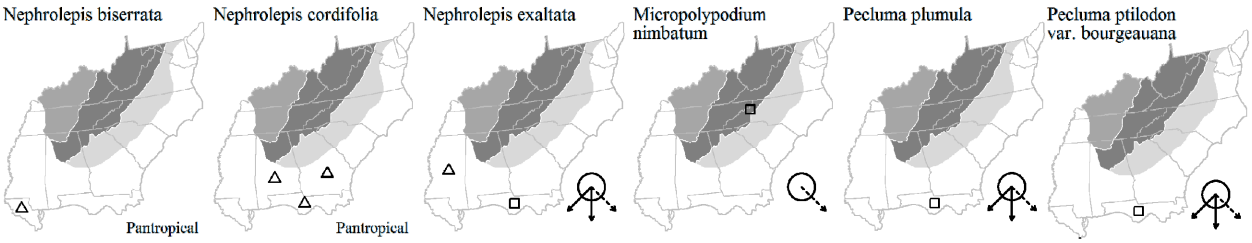
Micropolypodium nimbatum (Jenman) A.R. Smith, Dwarf Polypody. On ceiling of grotto in spray cliff of waterfall in humid gorge. Sporophytes (juvenile only) have been found at only a single site in North America, in Macon County, NC. Gametophytes (and/or sporophytes) may be present at other spray cliffs in the escarpment gorges of sw. NC or adjacent SC and GA. Other than this disjunct temperate-zone occurrence, the species is known from Cuba, Jamaica, and Hispaniola. See Moran (1998) for an interesting discussion and overview of independent fern gametophytes in e. North America. [= Z; = *Grammitis nimbata* (Jenman) Proctor – RAB, FNA, K]

Pecluma M.G. Price (Rockcap Fern)

A genus of about 30 species, of tropical and subtropical America. References: Mickel & Smith (2004)=Z; Evans in FNA (1993b).

1 Veins 1-forked; segments at base of blade abruptly reduced in size; [usually epiphytic] ..... ***P. plumula***
1 Veins 2-4 forked; segements at base of blade gradually reduced to auricles; [usually terrestrial] ..... ***P. ptilodon*** *var.* ***caespitosa***

Pecluma plumula (Humboldt & Bonpland ex Willdenow) M.G. Price. Epiphytic on tree branches, less commonly on limestone, in hammocks and swamps. Ne. FL (Duval County) south to s. FL; West Indies, Mexico, Central America, and n. South America. [= FNA, K, Z; = *Polypodium plumula* Humboldt & Bonpland ex Willdenow – S]
Pecluma ptilodon (Kunze) M.G. Price *var.* ***bourgeauana*** (E. Fournier) A.R. Smith. Terrestrial or on logs or tree bases in hammocks and swamps. Ne. FL (Duval County) south to s. FL; West Indies; Mexico and Central America. [= Z; = *Pecluma ptilodon* (Kunze) M.G. Price var. *caespitosa* (Jenman) Lellinger – FNA; = *Pecluma ptilodon* (Kunze) M.G. Price ssp. *caespitosum* (Jenman) Windham – K; = *Polypodium pectinatum* Linnaeus – S]



Phlebodium (R. Brown) J. Smith 1841 (Golden Polypody)

A genus of 2-4 species, of tropical and subtropical regions of the Western Hemisphere. References: Nauman in FNA (1993b); Hennipman, Veldhoen, & Kramer in Kramer & Green (1990).

Phlebodium aureum (Linnaeus) J. Smith, Goldfoot Fern, Golden Polypody. Epiphytic on the old leaf bases of *Sabal palmetto* and in crotches and crevices of other trees, particularly *Quercus virginiana*, and rarely terrestrial on calcareous soils or masonry. E. SC (Beaufort, Jasper, and Charleston counties), e. GA (Camden, Chatham, and Glynn counties), south to s. FL, west to Panhandle FL (Wakulla County) (Kunzer et al. 2009). Found in Cape Romain National Wildlife Refuge (Charleston County, SC) in the late 1970s by Steve Bowling, where apparently native (S. Bowling, pers. comm. 2007); also introduced and apparently established in SC (Beaufort, Jasper, Charleston counties) via planting of palmettos from further south (P. McMillan, pers. comm. 2005). [= FNA, K, S; = *Polypodium aureum* Linnaeus]

Pleopeltis Humboldt & Bonpland ex Willdenow 1810 (Shielded-Sorus Polypody)

A genus of about 50 species, primarily tropical. Windham (1993) makes a compelling case, based on morphological, chemical, and molecular data, that the "scaly polypodies" should be placed in *Pleopeltis*, rather than in *Polypodium*. References: Windham (1993); Andrews & Windham in FNA (1993b); Hennipman, Veldhoen, & Kramer in Kramer & Green (1990).

Pleopeltis polypodioides (Linnaeus) E.G. Andrews & Windham *ssp.* ***michauxiana*** (Weatherby) E.G. Andrews & Windham, Resurrection Fern, Scaly Polypody. On tree limbs and trunks (especially when leaning) and on rocks. June-October. Ssp. *michauxiana* ranges from se. MD, IL, MO, and se. KS, south to s. FL and TX; also in Mexico and Guatemala; recent studies suggest that it warrants specific status. Ssp. *polypodioides* ranges in the West Indies, Central America and South America. Four additional subspecies are tropical in Central America, South America, and Africa. [= FNA, K; < *Polypodium polypodioides* (Linnaeus) Watt – RAB; = *Polypodium polypodioides* (Linnaeus) Watt var. *michauxianum* Weatherby – C, F, G, W, WV; < *Marginaria polypodioides* (Linnaeus) Tidestrøm – S]

Polypodium Linnaeus 1753 (Polypody)

A genus of about 100 species, cosmopolitan. References: Haufler et al. in FNA (1993b); Haufler, Windham, & Rabe (1995)=Z; Haufler & Windham (1991); Bryan & Soltis (1987); Kott & Britton (1982); Hennipman, Veldhoen, & Kramer in Kramer & Green (1990); Cusick (2002). [also see *Pecluma, Phlebodium* and *Pleopeltis*]

Identification notes: The two species are somewhat cryptic, and the relatively frequent triploid backcross makes field identification still more problematic. Individuals not identified to species may be referred to as "*Polypodium virginianum* complex."

[Note: three leads]

1 Leaf blade averaging 5.8 cm wide (range of 3.2-8.2 cm), widest at the base, thus the blade elongate-deltoid in outline; rhizome scales averaging 1.1 mm wide, mostly golden brown throughout; paraphyses (sporangiasters) usually > 40 per sorus (range of 25-120); leaves mostly lobed to apex, without an attenuate, unlobed tip ..... ***P. appalachianum***

1 Leaf blade averaging 4.5 cm wide (range of 3.0-5.8 cm); blade widest near the middle, thus the blade oblong to narrowly lanceolate in outline; rhizome scales averaging 1.5 mm wide, mostly brown, with a dark central stripe; paraphyses (sporangiasters) usually < 40 per sorus (range of 7-69); leaves mostly with an attenuate, unlobed tip ..... ***P. virginianum***

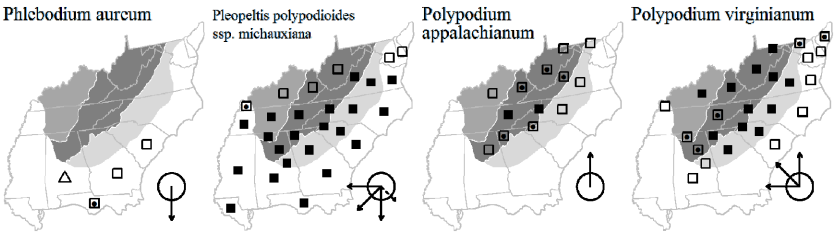
1 Characters intermediate; spores abortive ..... ***P. ×incognitum***

Polypodium appalachianum Haufler & Windham [*P. virginianum* complex], Appalachian Rockcap Fern. Moist rocks at low to high elevations, especially in ravines, on north-facing outcrops, and in other moist sites. June-October. NL (Newfoundland) west to e. ON, south to n. GA and n. AL; nearly restricted to the Appalachian Mountains. Its chromosome complement can be symbolized as AA. It is one parent of *P. virginianum*. [= FNA, K, Z; < *P. virginianum* – RAB, C, F, S, W, WV; < *P. vulgare* Linnaeus var. *virginianum* (Linnaeus) Eaton – G]

Polypodium ×incognitum Cusick is the triploid hybrid [*P. appalachianum* × *virginianum*]. It is rather frequent; there is some evidence that it may reproduce successfully via apogamous spores. It is best recognized by the spores, which are irregular in size and shape. Morphologically, it tends to intermediacy between the two parents, but can closely resemble either. Its chromosome complement can be symbolized AAS. {not mapped}

Polypodium virginianum Linnaeus [*P. virginianum* complex], Common Rockcap Fern. Moist rocks. June-October. Haufler and Windham (1991) indicate that the tetraploid cytotype (*P. virginianum*) of the *P. virginianum* complex is an allotetraploid derivative of the sterile hybrid of the diploid occurring in our area (*P. appalachianum*) and another diploid with a

boreal distribution (*P. sibiricum* Siplivinsky). Electrophoretic evidence supports this finding (Bryan & Soltis 1987, Haufler, Windham, & Rabe 1995). Thus, *Polypodium* in our area is another classic example of the reticulate evolution of pteridophytes, and the cytotypes must be treated as species and given names. Unfortunately, the two species are somewhat cryptic, and the relatively frequent triploid backcross makes field identification still more problematic. Individuals not identified to species may be referred to as "*Polypodium virginianum* complex." The chromosome complement of *P. virginianum* can be symbolized as AASS. [= FNA, K, Z; < *P. virginianum* – RAB, C, F, S, W, WV (also see *P. appalachianum*); < *P. vulgare* Linnaeus var. *virginianum* (Linnaeus) Eaton – G (also see *P. appalachianum*)]



SECTION 3: ACROGYMNOSPERMAE (EXTANT GYMNOSPERMS)

The gymnosperms are a possibly artificial grouping of about 16 families, about 86 genera, and about 850 species. References: Kramer & Green (1990). The folk taxonomy of conifers in our area is an interesting, tangled story. The town of Spruce Pine, NC is apparently named for *Tsuga canadensis*. Spruce Pinnacle in Buncombe County, NC is crowned with old *Tsuga caroliniana*. *Picea rubens* and *Abies fraseri* are called "He Balsam" and "She Balsam" (considered the male and female of a single species), Tamarack Post Office in Watauga County, NC and Tamarack Ridge in Highland County, VA are named for the abundance of *Picea rubens*! The generally used common name for *Juniperus* is "cedar," and *Chamaecyparis* is called "juniper."

G2. ZAMIACEAE Reichenbach 1837 (Sago-palm Family) [in CYCADALES]

A family of about 9-11 genera and 100-185 species, of tropical and warm temperate North America, Central America, South America, Africa, and Australia. References: Landry in FNA (1993b); Johnson & Wilson in Kramer & Green (1990); Jones (1993).

Zamia Linnaeus

A genus of about 30-60 species, of extreme se. North America, West Indies, Central America, and South America. References: Landry in FNA (1993b); Johnson & Wilson in Kramer & Green (1990); Ward (2001)=Y; Stevenson (1991)=Z.

Zamia floridana Alphonse de Candolle *var.* ***umbrosa*** (Small) D.B. Ward, Coontie. Maritime forests, pinelands. Se. GA (Camden and Glynn counties) south to FL. *Zamia floridana* var. *floridana* is more widespread in the FL Peninsula. Ward (2001), Landry in FNA (1993b), and Stevenson (1991) conclude that North American *Zamia* belongs to one of several *Zamia* species in the West Indies. Ward (2001, 2009) concludes that *Z. floridana* is the correct name for this taxon, and that varietal status is warranted for the "*umbrosa*" entity. [= Y; < *Zamia integrifolia* Linnaeus f. in Aiton – FNA, Z; < *Z. pumila* Linnaeus – K, misapplied; = *Z. umbrosa* Small – S; < *Z. floridana* Alphonse de Candolle]

G3. GINKGOACEAE Engler in Engler & Prantl 1897 (Ginkgo Family) [in GINKGOALES]

A family of a single genus and single species, a tree, native of China. *Ginkgo* has no close living relatives. References: Whetstone in FNA (1993b); Page in Kramer & Green (1990).

Ginkgo Linnaeus 1771 (Ginkgo, Maidenhair Tree)

A monotypic genus, a tree, native of China. *Ginkgo* is famous as a "living fossil," known from fossils nearly 200 million years old which are nearly identical to modern plants; it may be extinct as a native plant. References: Whetstone in FNA (1993b); Page in Kramer & Green (1990).

* ***Ginkgo biloba*** Linnaeus, Ginkgo, Maidenhair Tree. Frequently planted, rarely escaped to suburban woodlands and yards; native to se. China. As pointed out by Whetstone in FNA (1993b), *Ginkgo* is only weakly naturalized. [= C, FNA, K]

G7. PINACEAE Sprengel ex F. Rudolphi 1830 (Pine Family) [in PINALES]

A family of about 12 genera and about 220 species, trees and shrubs, almost exclusively in the Northern Hemisphere. References: Thieret in FNA (1993b); Price (1989)=Z; Page in Kramer & Green (1990).

1 Leaves borne in fascicles of 2-5 (basally bound by a scarious sheath) or on short shoots in clusters of many leaves in apparent whorls.
  2 Leaves borne in fascicles of 2-5 (basally bound by a scarious sheath) ; [subfamily *Pinoideae*] ..... ***Pinus***
  2 Leaves borne on short shoots in clusters of many (>10) leaves in apparent whorls; [subfamily *Laricoideae*].
    3 Leaves evergreen; cones 6-12 cm long ..... ***Cedrus***
    3 Leaves deciduous; cones 1-2 cm long ..... ***Larix***
1 Leaves alternate; [subfamily *Abietoideae*].
  4 Leaves 4-angled in cross-section ..... ***Picea***
  4 Leaves distinctly flattened (2-sided) in cross-section.
    5 Leaves attached directly to twig; cones 4-15 cm long, erect ..... ***Abies***
    5 Leaves jointed, on short, persistent base; cones 1-3.8 cm long, pendant ..... ***Tsuga***

Abies P. Miller 1754 (Fir)
(by Alan S. Weakley and Derick B. Poindexter)

A genus of about 40-50 species, trees, of temperate regions of the Northern Hemisphere, south to Central America. Our 2 native species and other non-natives are grown as ornamentals, especially in the mountains. References: Hunt in FNA (1993b); Liu (1971)=Y; Page in Kramer & Green (1990).

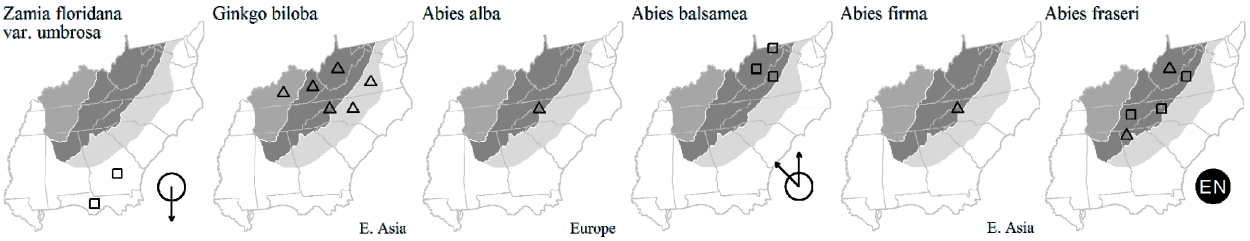
1 Cones 3.5-8 cm long; [native, also planted]; [section *Balsameae*].
2 Bracts of the mature cones shorter than the scales or slightly exserted beyond the scales; stomatal rows (4-) 7 (-8) on each side of the midvein on the lower leaf surface (visible at 10× magnification); [plant of the Central Appalachians and north, native from Page and Madison counties, VA, northward] ..... ***A. balsamea***
2 Bracts of the mature cones longer than the scales and reflexed; stomatal rows (8-) 10 (-12) on each side of the midvein on the lower leaf surface (visible at 10× magnification); [plant of the Southern Appalachians, native from Grayson and Smyth counties, VA, southward] ..... ***A. fraseri***
1 Cones 10-15 cm long; [alien, persistent from horticultural use and sparingly naturalized].
3 Juvenile-form leaves of young plants with rounded-retuse apices; leaf resin canals 2, marginal; cone bracts exserted and reflexed with elongate apical cusps; [section *Abies*] ..... ***A. alba***
3 Juvenile-form leaves of young plants with spinose-bifid apices; leaf resin canals 2, median (and usually with up to 2 additional marginal canals); cone bracts exserted and erect with abrupt, short apical cusps; [section *Momi*] ..... ***A. firma***

* ***Abies alba*** P. Miller, European Fir, Silver Fir. Naturalized in Highlands, NC (Macon Co.), from plantings made by Thomas G. Harbison in the late 1800's (J.D. Pittillo, pers. comm.). May; October. [= Y]

Abies balsamea (Linnaeus) P. Miller, Balsam Fir, Northern Balsam. High elevation forests and cliffs. April-May. NL (Newfoundland) and NL (Labrador) west to n. AB, south to NY, PA, MI, WI, and IA, and (disjunct) in the mountains to n. VA (known in our area as a native only from Page and Madison counties, VA). There has been considerable debate over the taxonomic status of some, especially southern, populations of *A. balsamea*, which show some transition in characters toward *A. fraseri*, and have been variously treated as *A. intermedia* Fulling, *A. balsamea* var. *phanerolepis* Fernald, or *A.* ×*phanerolepis* (Fernald) Liu. Variation in e. North American *Abies* is somewhat clinal, with the greatest geographical and morphological discontinuity between n. VA and s. VA. It seems best, therefore, to recognize *A. fraseri* as a species and *A. balsamea* as a species (which includes the clinal var. *phanerolepis*). The balsam woolly adelgid, an alien pest, is afflicting this species in Shenandoah National Park. [= C, FNA, K, W, Y, Z; > *A. balsamea* var. *balsamea* – F, G; > *A. balsamea* var. *phanerolepis* Fernald – F, G, WV; > *A.* ×*phanerolepis* (Fernald) Liu – Y; > *A. intermedia* Fulling]

* ***Abies firma*** Siebold & Zuccarini, Momi Fir. Naturalized from horticultural plantings near homesites. See Poindexter (2010b) for detailed information on the naturalization of this fir in our area and its recognition.

Abies fraseri (Pursh) Poiret, Fraser Fir, She Balsam, Southern Balsam. High elevation forests, from about 1500-2037 m. May-June; September-November. Southern Appalachian endemic, from Grayson and Smyth counties, VA (notably, Mount Rogers) south to e. TN and sw. NC; naturalizing on Brasstown Bald in GA, where planted. This species is threatened as a native species by a virulent alien pest, the balsam woolly adelgid, and environmental damage caused by pollution. Populations on Mt. Rogers and, to a lesser extent, Roan and Grandfather mountains, appear to be relatively healthy. *A. fraseri* is closely related to the northern Balsam Fir, *A. balsamea*, and may be a relatively recent derivative of it. During the 1970's and 1980's, the cultivation of Fraser Fir Christmas trees became an important part of the economy of the North Carolina mountains (especially Alleghany, Ashe, Avery, Mitchell, and Watauga counties). Most Christmas tree plantations are at 1000-1500 m in elevation; below 1000 m, Fraser Fir is very susceptible to a fungal root rot (*Phytophthora*), above 1500 m it grows too slowly to be profitable and is often "flagged" by winds, ruining its shape for commercial purposes. [= RAB, C, F, FNA, G, K, S, W, WV, Y, Z]



Cedrus Trew 1757 (Cedar)

A genus of 2-4 species, trees, native to n. Africa to Asia. References: Page in Kramer & Green (1990).

* ***Cedrus deodara*** (Roxburgh ex D. Don) G. Don, Deodar Cedar. Frequently planted, rarely escaped to suburban woodlands. [= K]

Larix P. Miller 1754 (Larch)

A genus of about 10 species, trees, of cold temperate and boreal regions of the Northern Hemisphere. References: Parker in FNA (1993b); Page in Kramer & Green (1990).

1 Leaves 2.5-3 cm long; cones 2-3.5 cm long, with > 30 pubescent scales; twigs pubescent; [alien species rarely planted] ..... ***L. decidua***
1 Leaves 1-2.5 cm long; cones 1.2-2 cm long, with 10-20 glabrous scales; twigs glabrous; [native species rarely south to MD and WV] ..... ***L. laricina***

* ***Larix decidua*** P. Miller, European Larch. Forests; native of Europe. Planted as an ornamental and experimentally as a forest tree, persisting and sometimes escaping in the high mountains of NC. [= F, K]

Larix laricina (Du Roi) K. Koch, Eastern Larch, Eastern Tamarack. Bogs and swamps. NL (Newfoundland), NL (Labrador), Keewatin, and AK, south to MD (Garrett County, WV (Preston County and Randolph counties), OH, IN, IL, MN, and Britsish Columbia. [= FNA, C, F, G, K, WV]

Picea A. Dietrich 1824 (Spruce)

A genus of about 35-40 species, trees, of cool temperate and boreal parts of the Northern Hemisphere. References: Taylor in FNA (1993b); Page in Kramer & Green (1990).

1 Cones 10-16 cm long; upper branches spreading to ascending, the lower drooping; outer bud scales without hairlike projections; [plant an alien, but widely planted as an ornamental and sometimes as an experimental timber plantation tree] ..... ***P. abies***
1 Cones 2.5-4.5 cm long; upper branches ascending, the lower spreading; outer bud scales prolonged into minute hairlike projections; [plant native] ..... ***P. rubens***

* ***Picea abies*** (Linnaeus) H. Karsten, Norway Spruce. Persisting and escaping from forestry plantations at moderate or high elevations, notably in e. WV, Great Smoky Mountains National Park (Kephart Prong), Mount Mitchell State Park, and the Biltmore Estate; native of n. Europe. [= FNA, K, WV]

Picea rubens Sargent, Red Spruce, He Balsam. Common to dominant in spruce and spruce-fir forests at high elevations, scattered in northern hardwood forests, heath balds, boulderfield forests, ridges, and rarely coves, also in bogs or swampy forests at lower elevations (down to about 1000 m), ranging in moisture tolerance from dry ridges (though these are often fog-bathed) to saturated peats, and sometimes planted and naturalized. May-June; October. NS and NB south (interruptedly) to w. NC and e. TN. *Picea mariana* (P. Miller) Britton, Sterns, & Poggenburg, Black Spruce, ranges south to s. PA and n. NJ, and has also been reported from bogs in our area: for NC (Small 1933) and for VA (Fernald 1950). These reports are apparently based on misidentifications of short-leaved, bog-inhabiting populations of *P. rubens*. Hardin (1971b) discusses the existence of these southern populations of *P. rubens* growing in bogs (notably Long Hope Valley, Ashe and Watauga counties, NC and Pineola Bog, Avery County, NC) with shorter than normal leaves (8-10 mm long vs. 12-15 mm long). He suggests that "this may be ecotypic, but one wonders whether the short leaves and bog habitat might reflect a few Black Spruce genes that have persisted since the Pleistocene." Further study with modern electrophoretic and molecular techniques is warranted. [= RAB, C, F, FNA, G, K, W, WV, Z; > *P. rubens* – S; > *P. australis* Small – S]

Pinus Linnaeus 1753 (Pine)

A genus of about 110 species, trees, of the Northern Hemisphere, south to Central America. The State Tree of North Carolina is the "Pine," the species left artfully and politically ambiguous. References: Kral in FNA (1993b); Duncan & Duncan (1988); Gernandt et al. (2005); Price, Liston, & Strauss (1998); Richardson (1998); Page in Kramer & Green (1990).

Identification notes: Young saplings generally have shorter needles than larger saplings and mature trees; measurements in the key are those of mature trees. Seedlings have needles single, rather than fascicled.

1 Needles 5 in each bundle; each needle with 1 vascular bundle; [subgenus *Strobus*, section *Strobus*] ..... ***P. strobus***
1 Needles 2-3 (-4) in each bundle; each needle with 2 vascular bundles; [subgenus *Pinus*].
  2 Bracts and bud scales fimbriate; sheath > 1.3 cm long; needles 20-50 cm long, in bundles of 3 (-4); twigs about 1 cm in diameter; [subgenus *Pinus*, section *Trifoliae*, subsection *Australes*] ..... ***P. palustris***
  2 Bracts and bud scales entire or edged with hairs, but not fimbriate; sheath < 1.5 cm long; needles (2-) 3-30 cm long, in bundles of 2-4; twigs < 1 cm in diameter.
    3 Needles in bundles of 3, or 2 and 3, or 3 and 4 (predominantly or at least substantially in 3's); [subgenus *Pinus*, section *Trifoliae*, subsection *Australes*].
      4 Needles in bundles of 2 and 3.
        5 Needles 3-7 cm long; prickles on cones 3-8 mm long, stout (> 1 mm wide at base of prickle) ..... ***P. pungens***
        5 Needles 5-30 cm long; prickles on cones 1-3 mm long, slender (< 1 mm wide at base of prickle).
          6 Needles 17-30 cm long; cones (6) 12-15 cm long ..... ***P. elliottii*** *var.* ***elliottii***
          6 Needles 5-12 cm long; cones 4-7 cm long ..... ***P. echinata***
      4 Needles in bundles of 3 (rarely with a few 2's), or 3 and 4.
        7 Cones distinctly longer than broad when open or closed, 5-13 cm long; needles mostly (10-) 12-23 (-28) cm long, 0.7-1.5 mm wide; buds not resinous (or only slightly so); trunks not producing adventitious sprouts (epicormic sprouting) ..... ***P. taeda***
        7 Cones about as broad as long, 3-6 cm long; needles (4-) 7-16 (-20) cm long, 1.5-2.0 mm wide; buds resinous; trunks commonly producing adventitious sprouts (epicormic sprouting), especially in response to fire.
          8 Needles (10-) 16-20 (-21) cm long, persisting 3-4 years; cones serotinous; [trees of pocosins, savannas, and other wetlands of the Coastal Pain] ..... ***P. serotina***
          8 Needles (4-) 7-10 (-15) cm long, persisting only 2 years; cones opening at maturity, not serotinous; [trees of ridges, slopes, bottomlands, and bogs of the Mountains and Piedmont] ..... ***P. rigida***
    3 Needles in bundles of 2 only.
      9 Needles slender to somewhat stout, 0.5-1.2 mm wide.
        10 Needles 10-17 cm long; branches brittle; spring shoots with a single node, with 1 whorl of branches; [subgenus *Pinus*, section *Pinus*, subsection *Pinus*] ..... ***P. resinosa***
        10 Needles 2-13 cm long; branches flexible; spring shoots usually with several nodes (several whorls of branches).
          11 Needles 2-8 cm long, generally twisted; cones **either** opening at maturity, not serotinous, the scales bearing prominent, slender prickles 2-5 mm long, **or** serotinous and unarmed; [subgenus *Pinus*, section *Trifoliae*, subsection *Contortae*].
            12 Needles 2-3.5 cm long, not twisted, curved; cones serotinous, unarmed; leaf sheaths < 2.5 mm long ..... ***P. banksiana***

12 Needles 2-8 cm long, generally twisted, straight; cones opening at maturity, not serotinous, the scales bearing prominent, slender prickles 2-5 mm long; leaf sheaths > 2.5 mm long ..... ***P. virginiana***

11 Needles 5-13 cm long, twisted or not; cones opening at maturity or serotinous, the scales bearing prominent, short, stout prickles or minute, deciduous prickles, and also with a faint to conspicuous horizontal ridge.

13 Anthers dark orange; bark flaky, the laminated layers sloughing off in a manner typical of a pine; [native trees of xeric sands, also sometimes planted in pine tree farms]; [subgenus *Pinus*, section *Trifoliae*, subsection *Contortae*] ..... ***P. clausa***

13 Anthers yellow; bark tight, closely ridged, not sloughing off, reminiscent of a hardwood; [native trees of mesic to fairly wet, fertile soils]; [subgenus *Pinus*, section *Trifoliae*, subsection *Australes*] ..... ***P. glabra***

9 Needles stout, 1.3-2.5 mm wide.

14 Needles 15-25 cm long; cones 8-22 cm long; needles 1.5-2.5 mm wide; [trees naturalized on barrier islands]; [subgenus *Pinus*, section *Pinus*, subsection *Pinaster*] ..... ***P. pinaster***

14 Needles 3-16 cm long; cones 3-9 cm long; needles 1.3-2 mm wide; [collectively widespread.

15 Needles 7-16 cm long; cones 4-6 cm long, each scale bearing a small depressed mucro; [introduced tree].

16 Buds light brown, resinous; [introduced tree, often planted inland] ..... ***P. nigra***

16 Buds white, not resinous; [introduced tree, usually planted only on Coastal Plain barrier islands]; [subgenus *Pinus*, section *Pinus*, subsection *Pinus*] ..... ***P. thunbergiana***

15 Needles 3-6 (-8) cm long; cones **either** 6-9 cm long with each scale bearing a stout, woody spine, **or** 3-6 cm long and unarmed; [native tree of the Mountains and upper Piedmont **or** introduced trees south to MD and WV].

17 Cones 6-9 cm long with each scale bearing a stout, woody spine; [native tree of the Mountains and upper Piedmont]; [subgenus *Pinus*, section *Trifoliae*, subsection *Australes*] ..... ***P. pungens***

17 Cones 3-6 cm long, unarmed; [introduced trees south to MD and WV].

18 Needles 2-3.5 cm long; cone appressed upwards against the stem, strongly asymmetrical; leaf sheaths < 2.5 mm long; [subgenus *Pinus*, section *Trifoliae*, subsection *Contortae*] ..... ***P. banksiana***

18 Needles 3-7 cm long; cone reflexed downwards against the stem; leaf sheaths > 2.5 mm long; [subgenus *Pinus*, section *Pinus*, subsection *Pinus*] ..... ***P. sylvestris*** *var.* ***sylvestris***

Auxiliary Key to common pines of the Piedmont

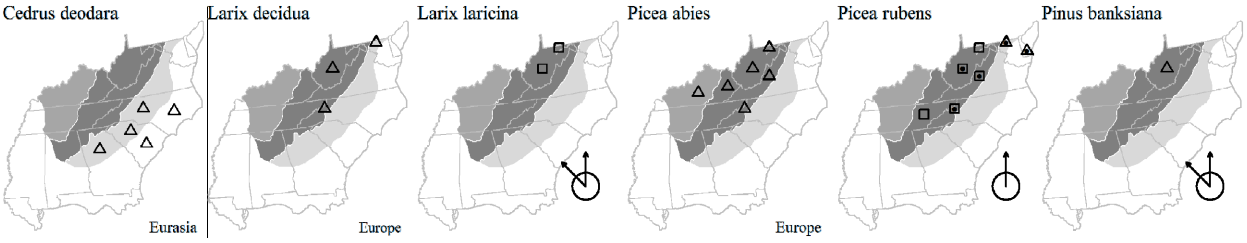
1 Needles 12-25 cm long, predominantly in bundles of 3; winter buds > 1 cm long; cones 6-15 cm long, falling soon after releasing seed; bark plates thick, without crater-like blisters ..... ***P. taeda***

1 Needles 2-13 cm long, predominantly in bundles of 2; winter buds < 1 cm long; cones 3-7 cm long, persisting on trees for several years after releasing seed; bark plates thin, with or without crater-like blisters.

2 Needles 7-13 cm long, not twisted, or slightly so, in bundles of 2 (usually with some in bundles of 3), rather slender, < 1.0 mm wide; bark plates mostly > 4 cm wide, with crater-like blisters ca. 1 mm in diameter; winter buds not very resinous; 3-4 year-old twigs rough and flaking ..... ***P. echinata***

2 Needles 2-8 cm long, typically twisted, in bundles of 2, rather stout, often 1.0-1.2 mm wide; bark plates mostly about 2 cm wide, without crater-like blisters; winter buds very resinous; 3-4 year-old twigs smoothish to rough, but not flaking ..... ***P. virginiana***

* ***Pinus banksiana*** Lambert, Jack Pine. Dry forests. Reported as possibly naturalized in WV (Harmon, Ford-Werntz, & Grafton 2006). [= C, F, FNA, G, K]



Pinus clausa (Chapman ex Engelmann) Vasey ex Sargent, Sand Pine. Dry sands, widely planted in pulp plantations in FL and s. GA, experimentally planted as far north as NC. *P. clausa* is closely related to *P. virginiana*, the n. North American *P. banksiana*, and the nw. North American *P. contorta* complex. [= FNA, K, S, WH, Z]

Pinus echinata P. Miller, Shortleaf Pine, Rosemary Pine, Yellow Pine. Dry rocky ridges and slopes, sandhills, old fields, forests, generally in rather xeric sites, but also occurring in mesic to even wet sites. March-April; September-October. Widespread in se. North America, north to s. NY, NJ, s. PA, s. OH, s. IL, s. MO, and e. OK, perhaps reaching its greatest importance in dry, sandstone landscapes, such as the Cumberland Plateau of WV, KY, TN, and AL, and the Ozarks and Ouachitas of AR, MO, and OK. [= RAB, C, F, FNA, G, K, S, W, WH, WV, Z]

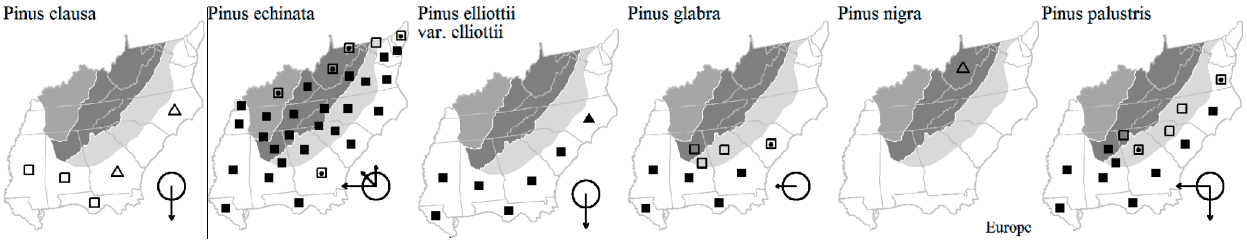
Pinus elliottii Engelmann *var.* ***elliottii***, Slash Pine. Native in wet pine flatwoods and maritime forests in GA and SC, extensively planted in GA, SC, and NC in silvicultural plantations on a wide variety of soils, many of them unsuitable for its successful growth. January-February; October-November. *P. elliottii* var. *elliottii* ranges from e. SC south to c. peninsular FL, west to e. LA; var. *densa* Little & Dorman is restricted to c. and s. peninsular FL. *P. elliottii* var. *densa* is perhaps better treated as a full species, *Pinus densa* (Little & Dorman) de Laubenfels & Silba. *P. elliottii* var. *elliottii* has been extensively planted throughout the Coastal Plain of Ga, NC, and SC, where it now occupies tens of thousands of hectares. Superficially, *P. elliottii* resembles both *P. palustris* and *P. taeda*, with cone size and needle length intermediate. *P. elliottii* var. *elliottii* is sometimes difficult to tell from *P. taeda*; additional helpful characteristics are the seed cones on 1.5-3 cm long stalks (vs. essentially sessile), seed cones reddish-brown and glossy, appearing varnished (vs. brown and dull), needles thicker and a dark glossy green (vs. thinner and a yellowish green); bark prominently flaking off and revealing reddish patches (vs. not notably flaking off and not

revealing reddish patches). [= FNA, K, Z; < *P. elliottii* – RAB, WH; >< *P. caribaea* Morelet – S, misapplied; >< *P. palustris* P. Miller – S, misapplied; ? *P. heterophylla* – S]

Pinus glabra Walter, Spruce Pine, Walter's Pine. Bottomland forests, rich, moist soils. March-April; September-October. SC south to n. FL and west to se. LA. This pine is unusual in growing in moist (even infrequently flooded), fertile habitats, usually mixed with bottomland hardwoods, and apparently rather shade tolerant, sometimes growing as an understory tree. [= RAB, FNA, K, S, WH, Z]

* ***Pinus nigra*** Arnold, Austrian Pine. Disturbed areas; native of Europe. [= C, F, FNA, G, K]

Pinus palustris P. Miller, Longleaf Pine, Southern Pine. Formerly throughout the Coastal Plain, Sandhills, and lower Piedmont, on a wide variety of soils (sandy, loamy, clayey, or peaty), from very dry to very wet conditions, in savannas, woodlands, and forests affected by relatively frequent natural (lightning caused) fires (likely augmented by native Americans), now reduced to less than a tenth of its former abundance by a variety of forces, including turpentining, timbering, free-range hogs, fire suppression, and "site conversion" by foresters to other trees, now extremely rare in VA and north of the Neuse River in NC, still occurring in some abundance in the outer Coastal Plain from Carteret County, NC south into GA, in the Bladen Lakes area of Bladen and Cumberland counties, and in the Sandhills of Harnett, Hoke, Scotland, Richmond, Moore, Anson, and Montgomery counties, NC and south into GA. March-April; September-October. A Southeastern Coastal Plain endemic: se. VA south to FL and west to se. TX; it extends slightly into the Piedmont in most states where it occurs, and further into the Piedmont and low mountains in GA and AL. "The species has been heavily exploited for timber and turpentine production, and it has been estimated that by 1930 only ten percent of its original volume of timber remained" (Price 1989); certainly much less now remains. Longleaf Pine is featured in the official NC State Toast ("Here's to the land of the longleaf Pine…") and the highest honor that the Governor of North Carolina can bestow on an individual for service to the state is to appoint him or her to the honorary Order of the Longleaf Pine. A hybrid with *P. taeda*, *P.* ×*sondereggeri* H.H. Chapman, occurs. [= RAB, C, FNA, K, WH; = *P. australis* Michaux f. – F, G, S]



* ***Pinus pinaster*** Aiton, Maritime Pine, Cluster Pine. Planted and naturalized on barrier islands; native of Mediterranean Europe. *P. pinaster* is reported by Brown (1959) to be "introduced from Mediterranean region and planted on sand-flats in vicinity of Corolla, Currituck Banks, Bodie and Hatteras Island 1936-1940.... Now producing seeds and becoming naturalized near Cape Hatteras Lighthouse. More resistant to salt spray than native pines" (Brown 1959). Graetz (1973) discusses its use on the Outer Banks and concludes that it is "not as well adapted to inclement beach conditions as Japanese black pine." *P. pinaster* is conspicuous just south of Nags Head on NC Highway 12 (Dare County, NC), further south at Bodie Island Lighthouse (Dare County, NC), on Ocracoke Island (Hyde County, NC), and elsewhere. [= K]

Pinus pungens Lambert, Table Mountain Pine, Burr Pine, Hickory Pine. Dry ridges, cliffs, shale barrens, usually requiring fire for its reproduction, occurring at least up to 1550 m. May; September-October. A Central and Southern Appalachian endemic: n. NJ, through se. PA, w. MD, WV, w. VA, w. NC, and e. TN to nw. SC and ne. GA. [= RAB, C, F, FNA, G, K, S, W, WV, Z]

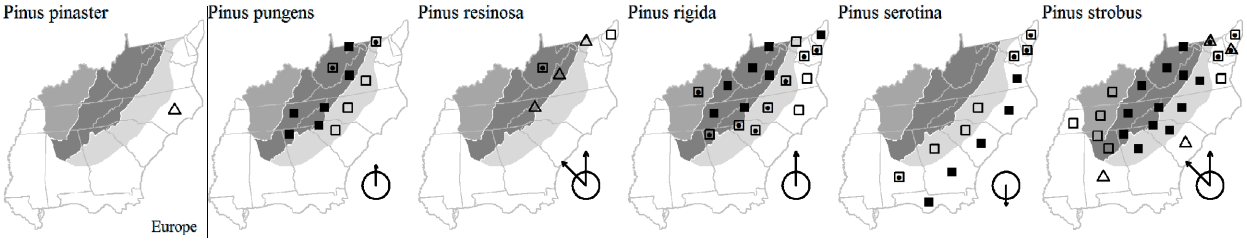
Pinus resinosa Aiton, Red Pine. High elevation forests, in pine plantations, and persisting after silvicultural planting. This species is native as far south as WV (Pendleton and Hardy counties) and PA (Luzerne, Wyoming, Tioga, and Centre counties). In WV, it is much more common as a plantation tree than as a native. [= C, F, FNA, G, K, WV]

Pinus rigida P. Miller, Pitch Pine. Primarily on dry ridges, more or less requiring fire for its reproduction, less commonly in peat soils of mountain bogs (and then often at elevations of 800-1000 m) and also scattered through a variety of forest types. May; September-October. S. Canada and s. ME south to n. GA. It is abundant near sea level in the Pine Barrens of NJ, but in NC is limited to the mountains and upper Piedmont; it is replaced in Coastal Plain fire-maintained wetland communities by the related *Pinus serotina*. [= RAB, C, F, FNA, G, K, S, W, WV, Z; = *P. rigida* ssp. *rigida*]

Pinus serotina Michaux, Pocosin Pine, Pond Pine, Marsh Pine. Peaty soils of pocosins, swamps of small blackwater streams. April; August (or at any time of year in response to fire). A Southeastern Coastal Plain endemic: s. NJ south to n. FL and se. AL, restricted to the Coastal Plain. A remarkable tree, well-adapted to fire by its serotinous cones and its ability to resprout needles from the branches, trunk ("epicormic sprouting"), or roots following fire. Extensive areas of peatland in the outer Coastal Plain are dominated by *P. serotina*, sometimes codominant with *Gordonia lasianthus*. Following fires which destroy all branches but do not kill the trees, epicormic sprouting results in entire forests of odd-looking cylindrical pines, the trunk thickly beset with needles, the outline of the tree a narrow cylinder 10-20 meters tall and less than 1 meter in diameter from base to summit. *P. serotina* is clearly a southern relative of *P. rigida*. It normally occurs in fire-maintained wetlands associated with ("downhill" from) *P. palustris*. On deep peats, *P. serotina* is stunted and of very irregular form; on mineral or shallower organic soils it can reach large size. Even when well-developed, the trunk is typically twisted and gnarled, helping to distinguish it from *P. taeda*. [= RAB, C, F, FNA, G, K, S, WH, Z; = *P. rigida* P. Miller ssp. *serotina* (Michaux) Clausen]

Pinus strobus Linnaeus, Eastern White Pine. Moist to dry forests, bottomlands, dry, rocky ridges in humid gorges. April; August-September. Widespread in ne. North America, south to VA, w. and (rarely) c. NC, nw. SC, n. GA, e. TN, KY, IN, n. IL, e. IA, and MN. *P. strobus* was probably the tallest tree in e. North America, reaching heights of 60-70 meters. It was a very important timber tree historically. In NC a notable relict and disjunct stand of *P. strobus* occurs on bluffs of the Deep River in

the eastern Piedmont of Chatham County; in VA *P. strobus* is widely but irregularly distributed in the lower Piedmont. [= RAB, C, F, FNA, G, K, W, WV, Z; = *Strobus strobus* (Linnaeus) Small – S]



* ***Pinus sylvestris*** Linnaeus *var.* ***sylvestris***, Scots Pine. Cultivated and sometimes escaped; native of Europe. Introduced and at least weakly naturalized south to MD (Kartesz 1999) and e. WV (Morton et al. 2004). [= FNA; < *P. sylvestris* – C, F, G, K]

Pinus taeda Linnaeus, Loblolly Pine, Old Field Pine. Forests, fields, pine plantations, much more abundant and widespread than formerly, occurring further west than as a native. March-April; October-November. Native from s. NJ, DE, and e. MD south to n. peninsular FL, west to e. TX and se. OK, primarily on the Coastal Plain, but inland to s. TN; this distribution now expanded by forestry plantation. Northward. See *P. elliottii* for additional characters to distinguish these two species. [= RAB, C, F, FNA, G, K, S, W, WH, Z]

* ***Pinus thunbergiana*** Franco, Japanese Black Pine. Planted and persisting, sometimes appearing native, on barrier islands, native of Japan. Growing in maritime situations in its native land, this tree's strong resistance to salt spray is the reason for its horticultural use in our area. Following moderate storm events on the coast, *P. thunbergiana*'s needles remain green and undamaged, even when needles of *P. taeda*, native to such situations, are salt-killed. [= K; =*? P. thunbergii* Parlin]

Pinus virginiana P. Miller, Virginia Pine, Scrub Pine, Jersey Pine. Dry forests and woodlands, especially on slopes and ridges, also common in certain areas as a weedy successional tree on nearly any kind of site. March-May; September-November. Primarily a Central and Southern Appalachian endemic: s. NY, NJ, and PA, south through VA, WV, s. OH, s. IL, KY, TN, and NC to nw. SC, n. GA, n. AL, and ne. MS. A small, scrubby pine, occurring in very dense, monospecific stands in the upper Piedmont as a result of secondary succession of old fields. [= RAB, C, F, FNA, G, K, S, W, WV, Z]

Tsuga Carrière 1847 (Hemlock)

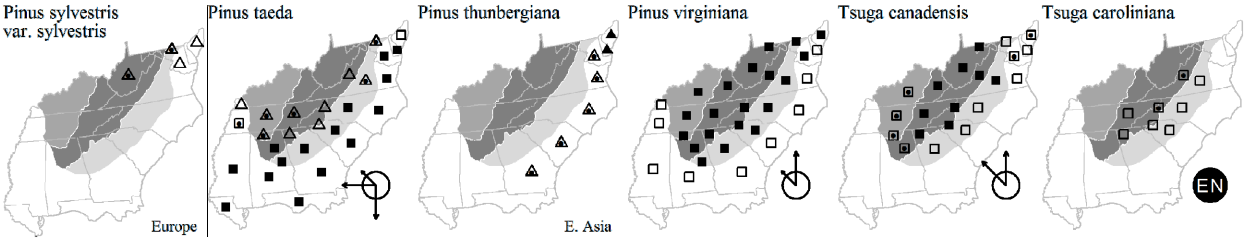
A genus of about 14 species, trees, of e. Asia (China, Japan, and Taiwan), e. North America, and w. North America. References: Taylor in FNA (1993b); Page in Kramer & Green (1990).

1 Most of the leaves 8-13 mm long, those originating from the sides and lower surface of the twig spreading more or less distichously in a horizontal plane, normally sized, those borne on the upper surface of the twig more or less appressed, dwarf, mostly 1/6 to 1/2 as long as the adjacent lateral leaves, 1-3 (-6) mm long, the whitened undersurface (consisting of rows of stomata) exposed upward; leaf margins minutely serrulate; leaf apices obtuse to rounded; seed cones 12-25 mm long, the ovuliferous scales ascending, even at maturity ..... ***T. canadensis***

1 Most of the leaves 10-18 mm long, those originating from the sides and lower surface of the twig spreading more or less distichously in a horizontal plane, normally sized, those borne on the upper surface of the twig not appressed, spreading at a 60-90 degree angle from the twig, mostly 3/4 to fully as long as the adjacent lateral leaves, 8-15 mm long, the whitened undersurface (consisting of rows of stomata) not exposed upward; leaf margins entire; leaf apices minutely retuse (notched), truncate, or rounded; seed cones 20-38 mm long, the ovuliferous scales spreading at a right angle to the axis at maturity..... ***T. caroliniana***

Tsuga canadensis (Linnaeus) Carrière, Eastern Hemlock, Canada Hemlock. In a wide variety of habitats in the mountains, most typically and abundantly in moist sites in ravines or coves along streams, but likely to be found in all but the driest habitats between 300 and 1500 m (even occurring in peaty bogs, where it has a sickly yellow color and short life expectancy); in the western Piedmont of NC limited to progressively rarer microhabitats (primarily north-facing river bluffs), reaching its eastward limit in NC at a disjunct stand at Hemlock Bluff State Natural Area, Wake County (but uncommon in the Piedmont of VA and even present, though rare, in the Coastal Plain of VA). March-April; September-November. Widespread in ne. North America, south to w. and c. VA, w. and (rarely) c. NC, nw. SC, n. GA, n. AL, TN, KY, IN, WI, and MN. One of the largest trees commonly encountered nowadays in our area, but probably not naturally larger than many other trees – because of its low timber value, it was often left by loggers. The hemlock woolly adelgic is severely affecting this species. [= RAB, C, F, FNA, G, K, S, W, WV, Z]

Tsuga caroliniana Engelmann, Carolina Hemlock. Primarily in open forests on ridge tops, rocky bluffs, or gorge walls, generally in drier and rockier sites than *T. canadensis*, but the two sometimes growing in close proximity or even intermixed in humid gorges; very limited in the western Piedmont, apparently reaching its eastern limit in NC at Hanging Rock State Park, Stokes County, and ranging east to Halifax County in the Piedmont of VA. March-April; August-September. *T. caroliniana* is a rather narrow Southern Appalachian endemic, occurring only in w. NC, e. TN, sw. and sc. VA, nw. SC, and ne. GA. Carolina Hemlock has achieved a substantial reputation in NC as a Christmas tree, and is finally coming into favor as an ornamental; Coker and Totten (1945) wrote "the Carolina Hemlock is a very beautiful tree in cultivation, perhaps the handsomest of any eastern American conifer, combining in a remarkable way delicacy, symmetry, and strength." The hemlock woolly adelgid threatens this species. [= RAB, C, F, FNA, G, K, S, W, Z]



G11. CUPRESSACEAE Bartlett 1830 (Cypress Family) [in CUPRESSALES]

A family of about 29 genera and about 130 species. Recent studies indicate that the separation of the Taxodiaceae from the Cupressaceae is not warranted, and they are here combined (Gadek et al. 2000; Brunsfeld et al. 1994). The subfamilial classification used here follows Gadek et al. (2000). References: Farjon (2005); Hart & Price (1990); Hardin (1971b); Watson & Eckenwalder in FNA (1993b); Page in Kramer & Green (1990).

1 Leaves alternate.
  2 Leaves evergreen, rigid, > 2 cm long, tapering from near the base to a long-acuminate apex; [subfamily *Cunninghamioideae*]..... ***1. Cunninghamia***
  2 Leaves deciduous, flexible, < 2 cm long, parallel-sided, the apex short-acute; [subfamily *Taxodioideae*]..... ***2. Taxodium***
1 Leaves opposite or whorled; [subfamily *Cupressoideae*].
  3 Branchlets not disposed in one plane, thus bushy and not fan-like; plants dioecious, male and female cones on separate plants; mature female cones fleshy and berry-like, with smooth surfaces, indehiscent; leaves opposite (decussate) or in whorls of 3 ..... ***5. Juniperus***
  3 Branchlets disposed in one plane, thus flattened and fan-like; plants monoecious, male and female cones on the same plant; mature female cones woody or leathery, with irregular surfaces, dehiscent; leaves opposite (decussate).
    4 Leaves acute; female cones globose and woody, the hard scales peltate, not imbricate; ultimate branchlets (including the scale leaves) about 1 mm broad..... ***4. Chamaecyparis***
    4 Leaves obtuse; female cones ellipsoid and leathery, the pliable scales basally attached, imbricate; ultimate branchlets (including the scale leaves) about 1.5 mm broad
      5 Branchlets flattened in vertical planes; seeds wingless; [planted tree, sometimes persistent] ..... ***6. Platycladus***
      5 Branchlets flattened in horizontal planes; seeds winged; [native tree, but also sometimes planted] ..... ***3. Thuja***

1. Cunninghamia R. Brown 1826 (China-fir)

A genus of 2 species, trees, of e. Asia (China and Taiwan). References: Farjon (1998)=Z; Page in Kramer & Green (1990).

* ***Cunninghamia lanceolata*** (Lambert) Hooker, China-fir. Suburban woodlands; commonly planted horticulturally, rarely naturalizing, native of China. A variety of forms are seen, some with dark-green, others with glaucous-blue foliage. [= K, Z; *C. sinensis* R. Brown]

2. Taxodium L.C. Richard 1810 (Bald-cypress)

A genus of 3 species, trees, of e. North America and Mexico. There has been much debate over whether the two taxa of *Taxodium* in our area should be treated as species or varieties, and if as varieties, the proper nomenclature. I agree with Godfrey (1988), in his preference "to recognize two species ... because it is my perception that the vast majority of trees (populations) are thus distinguishable." True intermediates appear to be non-existent, though the "mimicry" of the two species creates "pseudo-intermediates" that can cause difficulties in identification. Occasionally, the two species can be seen growing together, in "hybrid habitats," as at the junction of Lake Waccamaw and the Waccamaw River (Columbus County, NC); a few recognizable intermediates can be seen. See Lickey & Walker (2002) for a contrary argument supporting varietal status. Neufeld (1986) discusses the different architecture and ecophysiology of the two species. The only other species in the genus is *T. mucronatum* Tenore, ranging from s. TX south to Mexico and Guatemala. West of the Mississippi River, the architecture of *T. distichum* comes to resemble that of *T. mucronatum*, suggesting the possibility of introgression. For this and other reasons, Watson in FNA (1993b) and other authors prefer to treat *T. mucronatum* as a third variety of *T. distichum*, *T. distichum* var. *mexicanum* Gordon. *Taxodium* is most closely related to *Glyptostrobus* and *Cryptomeris*. References: Godfrey (1988)=Z; Duncan and Duncan (1988); Lickey & Walker (2002)=Y; Watson in FNA (1993b); Page in Kramer & Green (1990); Tsumura et al. (1999). Key adapted from Z.

1 Larger knees short, rarely > 4 dm tall, usually columnar or broad and mound-like, with thick, compact bark on top; leafy branchlets ascending from the twigs, secundly erect (the base often curving, the apical portion of the branchlet borne in a vertical plane), except on juvenile trees (which mimic *T. distichum*); leaves subulate, spirally arranged, not spreading laterally and featherlike (except on juvenile trees), ascending or appressed; leaves mostly 3-10 mm long (to 15 mm long on juvenile trees); bark thick (1-2.5 cm thick), furrowed, dark-brown, not exfoliating; [trees of isolated depressions (clay-based Carolina bays, depression ponds), wet savannas, pocosins and other wet peaty habitats, and, less commonly, blackwater swamps and natural lakes] ..... ***T. ascendens***
1 Larger knees often tall, often > 4 dm tall, usually narrowly conical, with thin, shreddy bark on top; leafy branchlets spreading laterally from the twigs, except in the crowns of mature trees (which sometimes mimic *T. ascendens*); leaves linear, flat, spirally arranged but by twisting of their basal portions spreading laterally and featherlike (pseudo-distichous), appressed only on drooping branches of the crown, if at all; leaves

mostly 8-20 mm long (sometimes less on crown branches); bark thin (< 1 cm thick), exfoliating in shreddy, orange-brown strips; [trees of brownwater swamp forests, blackwater swamp forests, natural lakes, and millponds] ..... ***T. distichum***

Taxodium ascendens Brongniart, Pond-cypress. Limesink ponds (dolines), clay-based Carolina bays, wet savannas, pocosins and other wet, peaty habitats, shores of natural blackwater lakes, swamps of blackwater streams. March-April; October. Se. VA (recently confirmed, J. Townsend, pers. comm. 2009) south to s. FL, west to e. LA; it is surely one of the most scenic trees of eastern North America. [= RAB, G, K, S, WH, Z; < *T. distichum* – F; = *T. distichum* var. *imbricarium* (Nuttall) Croom – FNA, Y; = *T. distichum* var. *nutans* (Aiton) Sweet]

Taxodium distichum (Linnaeus) L.C. Richard, Bald-cypress. Brownwater and blackwater swamps, usually in riverine situations. March-April; October. DE and e. MD south to s. FL and west to e. TX and se. OK, north along the Mississippi River and its tributaries to s. IN and s. IL. This species is sometimes planted as an ornamental in upland sites. [= RAB, G, K, S, WH, WV, Z; = *T. distichum* var. *distichum* – C, FNA, Y; < *T. distichum* – F (also see *T. ascendens*)]

3. Thuja Linnaeus 1753 (Arborvitae)

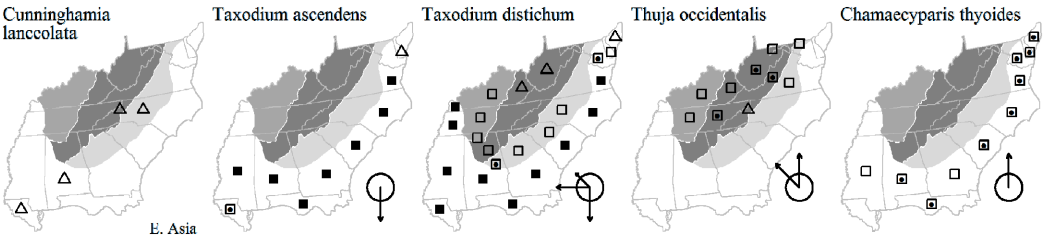
A genus of 5 species, trees, of e. North America, w. North America, and e. Asia. References: Chambers in FNA (1993b); Page in Kramer & Green (1990).

Thuja occidentalis Linnaeus, American Arborvitae, Northern White Cedar, Flat Cedar. Dry limestone, dolostone, and calcareous sandstone cliffs, talus, and boulderfields, rarely in our area in calcareous swamps, also planted and persisting around old homesites and cemeteries (mainly in the Mountains). March-April. NS, Hudson Bay, and MB south to PA (where considered strictly introduced by Rhoads & Klein 1993), OH, n. IN, n. IL, and in the mountains to WV, w. VA, and e. TN. This species is alleged by various authors to have occurred as a native species in nw. NC on limestone bluffs in Alleghany, Ashe, and/or Burke counties, but it has not been relocated in this century, and little apparently suitable habitat occurs in NC. [= RAB, C, F, FNA, G, K, S, W, WV]

4. Chamaecyparis Spach 1841 (White Cedar)

A genus of about 6 species, trees, of warm temperate to cool temperate North America and Asia. The genus consists of 6 species – ours, 1 in w. North America, and 3 in Japan & Taiwan. References: Michener in FNA (1993b); Farjon (2005)=Y; Farjon (1998)=Z; Page in Kramer & Green (1990).

Chamaecyparis thyoides (Linnaeus) Britton, Sterns, & Poggenburg, Atlantic White Cedar, Juniper. Peat dome and streamhead pocosins, blackwater stream swamps, hillside seepages, in highly acidic, peaty or sandy soils. March-April; October-November. S. ME south to n. FL and west to s. MS. From NJ south it is strictly a tree of the Coastal Plain; northward it is often found in kettle-hole bogs. In SC and GA, *C. thyoides* is absent in the outer Coastal Plain, occurring primarily in the fall-line Sandhills. A prized timber tree, now much reduced in abundance, formerly used for cabinetry, boat-building, shingles, and other uses. The wood is valuable enough (and resistant enough to rot) to have been mined from bogs in NJ. NC has some of the largest remaining stands of Atlantic White Cedar, in areas of very difficult access, such as the interiors of major peat-domes and large peat-filled Carolina bays. The species is generally known as "juniper" in our area. [= RAB, C, F, FNA, G, K, S; > *C. thyoides* var. *henryae* (H.L. Li) Little – Y, Z; > *C. thyoides* var. *thyoides* – Y, Z; = *Cupressus thyoides* Linnaeus]



5. Juniperus Linnaeus 1753 (Red Cedar, Juniper, Savin)

A genus of about 60 species, trees and shrubs, of temperate, boreal, and subtropical regions of the Northern Hemisphere. Various species of *Juniperus*, especially creeping species, are frequently used in landscaping. Molecular studies suggest that section *Juniperus* (*J. communis* var. *depressa* in our area) and section *Sabina* (*J. virginiana* in our area) are quite divergent (Adams & Demeke 1993). Small's (1933) recognition of the genus *Sabina* may prove to be warranted; some modern authors accept it (especially Europeans) and recent molecular evidence provides some support. References: Adams (2008b, 2008c)=Z; Adams in FNA (1993b); Adams (1986); Adams & Demeke (1993); Adams (1995, 2008a); Page in Kramer & Green (1990).

1 Leaves flat-acicular, 5-20 mm long, never scale-like, with a white line on the upper surface; leaves borne in whorls of 3, spreading at 45-90 degrees from the twig; female cone ("berry") axillary, maturing in 2-3 years; [section *Juniperus*] ..... ***J. communis var. depressa***

1 Leaves primarily scale-like, ca. 1-2 mm long, though acicular and 2-10 mm long on young trees and some lower branches of larger trees, without a white line on the upper surface (though generally somewhat glaucous); leaves of mature twigs borne in opposite pairs of 2, decussate (thus 4-ranked), appressed to the twig (leaves of immature twigs sometimes in whorls of 3, spreading at 10-45 degrees from the twig); female cones ("berries") terminal on short branches, maturing the first year; [section *Sabina*].

2 Female cones ("berries") 3-4 mm long; terminal twigs 0.75-0.90 mm wide (including the scale-like leaves); scale leaves 1.20-1.45 mm long, obtuse to acute; trees generally with rounded or flattened crowns, the lower branches often drooping .....***J. virginiana*** *var.* ***silicicola***

2 Female cones ("berries") 4-7 mm long; terminal twigs 0.85-1.00 mm wide (including the scale-like leaves); scale leaves 1.40-1.65 mm long, acute; trees generally with sharply tapered crowns, the lower branches generally ascending.....***J. virginiana*** *var.* ***virginiana***

Juniperus communis Linnaeus *var.* ***depressa*** Pursh, Ground Juniper, Mountain Juniper, Common Juniper. In thin soil around rock outcrops on mountain summits and Piedmont monadnocks and rocky bluffs (in GA and NC), high elevation old fields (in VA), xeric Coastal Plain sandhills (in SC and VA). March-April; fleshy cone maturing in second or third year. This species is circumpolar, widespread in n. North America, n. Europe, and n. Asia. Adams (2008a, 2008b, 2008c) recognizes 5 varieties in North America, all eastern North American plants belonging to var. *depressa*. In North America *J. communis* is primarily northern and montane, occurring nearly throughout Canada and AK, south in the Appalachians to n. GA, south in the Rocky Mountains to NM, AZ, and CA. Its berry is the juniper berry used as a spice, as well as the main flavoring of gin. It is sometimes planted as a landscaping plant. In e. North America, it is rare and scattered south of PA, MI, and WI, ranging south to a few disjunct sites in VA, NC, SC, GA, and s. IN, in our area notably known from Mount Satulah (Macon County, SC), King's Pinnacle (Gaston County, NC), and in sandy soils at Hitchcock Woods (Aiken County, SC). Definitely in our area is var. *depressa,* a decumbent shrub, up to about 1 meter high, forming large clonal patches. Harvill et al. (1992) report scattered sites for var. *communis* in montane VA; these are based on columnar trees. Adams in FNA (1993b) considers var. *depressa* to be the only variety occurring in e. United States, and states that var. *depressa* sometimes forms columnar trees to 10 m tall; such individuals may be the basis of reports of var. *communis* from our area. Additional problems about the status of *Juniperus communis* in our area remain unresolved; variation in growth form, morphologic characters, and habitat suggest the possibility of the presence of several native taxa. See Coker & Totten (1945) for additional discussion. [= RAB, C, F, FNA, G, K, W, Z; < *J. sibirica* Burgsdorff – S; < *J. communis* – WV]

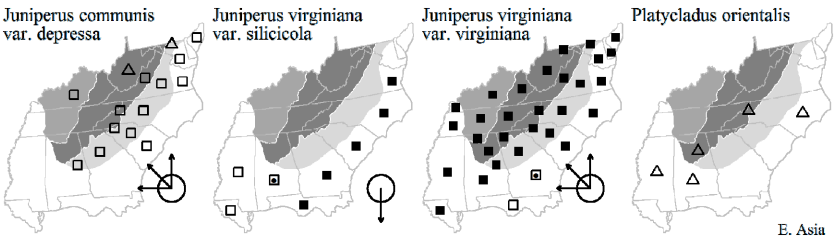
Juniperus virginiana Linnaeus *var.* ***silicicola*** (Small) E. Murray, Southern Red Cedar, Coastal Red Cedar. Maritime forests and scrub, hammocks, coastal shell middens and natural shell deposits, brackish marshes, and other sandy or peaty, circumneutral situations. January-February; October-November. Se. VA south to c. peninsular FL, west to e. LA (Florida Parishes). Many recent authors have treated this taxon as a species, but Adams (1986) and Adams in FNA (1993b) consider varietal status more appropriate; Adams (1995) suggests that the two may have diverged as recently as the Pleistocene. The two varieties are said to intergrade in GA, and in other areas the characters used to separate them seem variable or imperfectly correlated. Large individuals can be as much as a meter in diameter. [= FNA, K, Z; = *J. silicicola* (Small) L.H. Bailey – RAB; = *Sabina silicicola* Small – S; = *J. virginiana* ssp. *silicicola* (Small) J. Silba; < *J. virginiana* – WH]

Juniperus virginiana Linnaeus *var.* ***virginiana***, Eastern Red Cedar. In a wide variety of forests, pastures, old fields, roadsides, and fencerows, primarily upland, occurring most abundantly on circumneutral soils (including shrink-swell clays), derived from mafic or calcareous rocks. January-March; October-November. Var. *virginiana* ranges throughout e. United States. The wood is much used for fence posts and the traditional southern cedar chest (which takes advantage of the aromatic and moth-deterrent properties of cedar wood). [= C, F, FNA, G, K, Z; = *J. virginiana* – RAB, W, WV; = *Sabina virginiana* (Linnaeus) Antoine – S; < *J. virginiana* – WH; = *J. virginiana* ssp. *virginiana*]

6. ***Platycladus*** Spach 1842 (Chinese Arborvitae)

A monotypic genus, a tree, of e. Asia (n. China and Manchuria). *Platycladus* is distinct from *Thuja*. References: Watson & Eckenwalder in FNA (1993); Page in Kramer & Green (1990).

* ***Platycladus orientalis*** (Linnaeus) Franco, Oriental Arborvitae, Tree-of-life. Commonly planted, especially in graveyards, and rarely persisting and spreading to pastures, fields, and roadsides; native of Asia. [= FNA, K; = *Biota orientalis* (Linnaeus) Endlicher – S; = *Thuja orientalis* Linnaeus]



G12a. CEPHALOTAXACEAE Neger 1907 (Plum-yew Family) [in CUPRESSALES]

A family of 1 genus and ca. 10 species, trees and shrubs, of e. Asia. References: Farjon (1998); Tripp (1995)=Z; Page in Kramer & Green (1990).

Cephalotaxus Siebold and Zuccarini ex Endlicher 1842 (Plum-yew)

* ***Cephalotaxus harringtonia*** (Knight ex J. Forbes) K. Koch, Plum-yew. Suburban woodlands; uncommonly grown horticulturally, rarely naturalizing in the vicinity of plantings (as in Chapel Hill, Orange County, NC, and Grottoes, Augusta County, VA), native of Asia. [= Z]

G12b. TAXACEAE S.F. Gray 1822 (Yew Family) [in CUPRESSALES]

A family of about 4 genera and ca. 16-20 species, shrubs and trees, of isolated regions of the Northern Hemisphere and New Caledonia. References: Hils in FNA (1993b); Price (1990); Page in Kramer & Green (1990).

1 Leaves flexible, the tips pointed but not piercing to the touch; fleshy "cone" ca. 5 mm long, ca. 5 mm in diameter, red when ripe, the seed exposed at the top by a gap in the aril ..... ***Taxus***
1 Leaves stiff, the tips piercing to the touch; fleshy "cone" 2.5-3 cm long, ca. 2 cm in diameter, dark green to purple when ripe, seed entirely surrounded by fleshy tissue ..... ***Torreya***

Taxus Linnaeus 1753 (Yew)

The genus consists of about 8 (or more) very closely related species, trees and shrubs, of temperate regions of the Northern Hemisphere. The species have been termed "discouragingly similar" by Hils in FNA (1993b). In e. North America, *T. canadensis* occurs in ne. North America, and *T. floridana* Chapman is endemic to Panhandle FL. *T. brevifolia* Nuttall, Pacific Yew, of BC and AB south to MT, ID, OR, and CA, has recently been widely publicized as the source of an anti-cancer drug, present in all species of the genus. *T. baccata* Linnaeus is native to Europe, and 3-4 additional species occur in Japan and e. mainland Asia (Price 1990). References: Hils in FNA (1993b); Spjut (2007a, 2007b)=Y; Farjon (1998)=Z; Page in Kramer & Green (1990).

1 Bud scales blunt, only slightly keeled ..... ***T. baccata***
1 Bud scales often acute, keeled.
  2 Leaf undersurfaces with cuticular papillae along the stomatal bands; shrubs or small trees to 10 m tall; [of Panhandle FL] ..... ***T. floridana***
  2 Leaf undersurfaces usually lacking cuticular papillae along the stomatal bands; shrubs to 2 m tall (or trees in *T. cuspidata*); [of w. NC and VA northward, or naturalized from plantings].
    3 Stomata in (4-) 5-9 (-11) rows on each side of midvein; [native of ne. N. America, south to w. NC and VA] ..... ***T. canadensis***
    3 Stomata in (7-) 9-14 (-17) rows on each side of midvein; [alien] ..... ***T. cuspidata***

* ***Taxus baccata*** Linnaeus, English Yew. Suburban woodlands, planted as hedges and ornamentals, escaping locally, as in Rock Creek Park, Washington, DC (Shetler & Orli 2000); native of Europe. [= C, G, K, Z; = *T. baccata* ssp. *baccata*]

Taxus canadensis Marshall, Canada Yew, American Yew. Cliffs, bluffs, and rocky slopes over calcareous or mafic rocks, red spruce and hemlock swamps and bogs. April-May. NL (Newfoundland), NL (Labrador), MN, and s. MB south to nw. NC, ne. TN, KY, and IA. *Taxus* was first found in NC in 1968 (McDowell 1969). In our area, *Taxus* occurs primarily on limestone and mafic bluffs, but at its southernmost site in the hanging valley of Long Hope Creek (Ashe and Watauga counties, NC), *Taxus* is found in red spruce swamps and bog edges, where it is locally common. Deer have a devastating effect on populations of this species in our area. [= C, F, FNA, G, K, W, WV, Z; > *T. canadensis* var. *canadensis* – Y; > *T. canadensis* var. *minor* (Michaux) Spjut – Y; > *T. canadensis* var. *adpressa* (Hort. ex Carrière) Spjut – Y; = *T. baccata* Linnaeus ssp. *canadensis* (Marshall) Pilger]

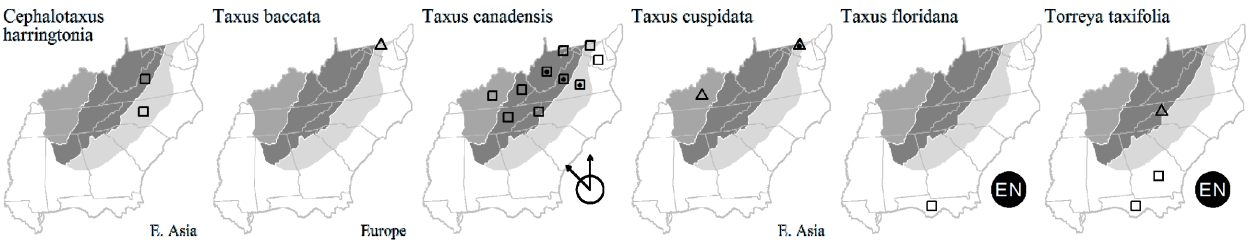
* ***Taxus cuspidata*** Siebold & Zuccarini, Japanese Yew. Suburban woodlands, planted as hedges and ornamentals, escaping locally (Shetler & Orli 2000); native of Japan. [= C, G, K, Y; > *T. cuspidata* var. *cuspidata* – Z; = *T. baccata* Linnaeus ssp. *cuspidata* (Siebold & Zuccarini) Pilger]

Taxus floridana Nuttall ex Chapman, Florida Yew. Mesic bluffs and ravines. Endemic to Panhandle FL. [= FNA, K, S, WH, Z; = *T. globosa* Schlechtendahl var. *floridana* (Nuttall ex Chapman) Spjut – Y = *T. baccata* Linnaeus ssp. *floridana* (Nuttall ex Chapman) Pilger; = *T. baccata* var. *floridana* (Nuttall ex Chapman) Silba]

Torreya Arnott 1838 (Torreya, Stinking Cedar)

The genus consists of 6-7 species, trees, of temperate regions of the Northern Hemisphere – 1 in FL and adjacent GA, 1 in CA, 1 in Japan, and 4 in c. and s. China and adjacent Burma (Price 1990). References: Hils in FNA (1993b); Page in Kramer & Green (1990).

Torreya taxifolia Arnott, Florida Torreya. Moist ravines and bluffs, and also rarely established near plantings. An endangered endemic of ravines along the Apalachicola River in Panhandle FL and sw. GA. Pittillo and Brown (1988) report that "young saplings [are] established downslope and beneath transplanted trees south of Highlands [Macon County, NC]." Godfrey (1988) reports that the national champion Florida Torreya is in Warren County, NC, with "a near-basal circumference of 9 feet, a spread of 52 feet, and a height of 60 feet. It is estimated that it may have been planted there about 1830." [= FNA, K, WH; = *Tumion taxifolium* (Arnott) Greene – S]



SECTION 4: MAGNOLIIDS AND PRIMITIVE ANGIOSPERMS

3. CABOMBACEAE A. Richard 1828 (Water-shield Family) [in NYMPHAEALES]

A family of 2 genera and about 6 species, aquatic herbs, nearly cosmopolitan. This family is closely related to the Nymphaeaceae and may be best combined with it (Angiosperm Phylogeny Group 2003). References: Wiersema in FNA (1997); Williamson & Schneider in Kubitzki, Rohwer, & Bittrich (1993); Les et al. (1999).

1 Plants with all leaves floating and peltate; plants coated with a layer of transparent, mucilaginous jelly; floating peltate leaves 3.5-11 cm long, 2-6.5 cm wide; [subfamily *Hydropeltoideae*] ..... ***Brasenia***
1 Plants with submersed leaves dichotomously divided into linear segments; plants not coated with mucilaginous material; floating peltate leaves (when present) 0.6-3.0 cm long, 0.1-0.4 wide; [subfamily *Cabomboideae*] ..... ***Cabomba***

Brasenia Schreber 1789 (Water-shield)

A monotypic genus, an aquatic herb, widely distributed in tropical and temperate regions of the Old and New World. References: Williamson & Schneider in Kubitzki, Rohwer, & Bittrich (1993).

Identification notes: The elliptic, peltate, floating leaves and mucilaginous petioles make *Brasenia* unmistakable.

Brasenia schreberi J.F. Gmelin, Water-shield, Purple Wen-dock. Lakes, ponds, sluggish streams, floodplain oxbow ponds. June-October. NS west to MN, south to s. FL and TX; also from BC south to CA; also in tropical America and the Old World. [= RAB, C, F, FNA, G, GW, K, S, W]

Cabomba Aublet 1775 (Fanwort)

A genus of about 5 species, aquatic herbs, tropical and temperate regions of America. References: Williamson & Schneider in Kubitzki, Rohwer, & Bittrich (1993).

Identification notes: *Cabomba* is sometimes mistaken for other, superficially somewhat similar aquatics, such as *Ceratophyllum* (Ceratophyllaceae), *Utricularia* (Lentibulariaceae), and *Myriophyllum* (Haloragaceae). *Cabomba* has the leaves opposite (rather than whorled), dichotomously divided (like *Ceratophyllum*), but the divisions lacking the marginal denticles of *Ceratophyllum*, and on a 1-3 cm long petiole (vs. sessile or on a petiole 0-2 mm long). *Utricularia* has the leaves sometimes dichotomously divided, but the divisions are usually irregular, the leaves are alternate (in most species), and bladder traps are present. *Myriophyllum* has the leaves pectinately rather than dichotomously divided.

Cabomba caroliniana A. Gray, Fanwort. Millponds, lakes, slow-moving streams. May-September. NJ west to OH, s. MI, and MO, south to FL and TX; sporadically introduced elsewhere from aquarium "throw-outs." *C. caroliniana* var. *pulcherrima* R.M. Harper, with purplish flowers and vegetative parts, occurs in the southeastern Coastal Plain; it needs further evaluation. GW imply that the purple pigmentation may be merely an environmental response to warm waters, and is not correlated with morphologic characters. [= RAB, C, F, FNA, G, GW, S; > *C. caroliniana* var. *caroliniana* – K; > *C. caroliniana* var. *pulcherrima* R.M. Harper – K; > *C. pulcherrima* (R.M. Harper) Fassett]

4. NYMPHAEACEAE R.A. Salisbury 1805 (Water-lily Family) [in NYMPHAEALES]

A family of 6 genera and about 75 species, aquatic herbs, cosmopolitan. References: Wiersema & Hellquist in FNA (1997); Schneider & Williamson in Kubitzki, Rohwer, & Bittrich (1993); Les et al. (1999).

1 Flowers nearly spherical, 2-5 cm in diameter; sepals 6 (in our species), petaloid, green to yellow, incurved; petals many, inconspicuous, scalelike or staminodial; leaves often of 2 types, the submersed leaves (when present) thinner in texture than the floating or emersed leaves; floating or emersed leaves having 60-90% of their surface area with vasculature derived from the midrib; rhizome with triangular or winged leaf scars; [subfamily *Nupharoideae*] ..... ***Nuphar***
1 Flowers hemispheric, 4-20 cm across; sepals 4, greenish, inconspicuous; petals spreading and ascending, white or yellow, showy; leaves of 1 type, floating; floating leaves having 25-40 % of their surface area with vasculature derived from the midrib; rhizome with circular leaf scars; [subfamily *Nymphaeoideae*] ..... ***Nymphaea***

Nuphar J.E. Smith 1809 (Spatterdock, Yellow Pondlily)

A genus of about 16 species, aquatic herbs, of north temperate areas. Beal (1956) recognized 8 taxa of *Nuphar* in North America, which he treated as subspecies of the European *N. lutea*. Voss's (1985) statement (about the genus in Michigan) "our plants are quite easily distinguished ... and they are treated here as closely related species" applies equally (or better!) in our area. Recent treatments (see references) recognize multiple species. References: Beal (1956)=Z; Wiersema & Hellquist in FNA (1997); Padgett (1999)=Y; Padgett (2007)=X; Schneider & Williamson in Kubitzki, Rohwer, & Bittrich (1993). Key based in large part on FNA.

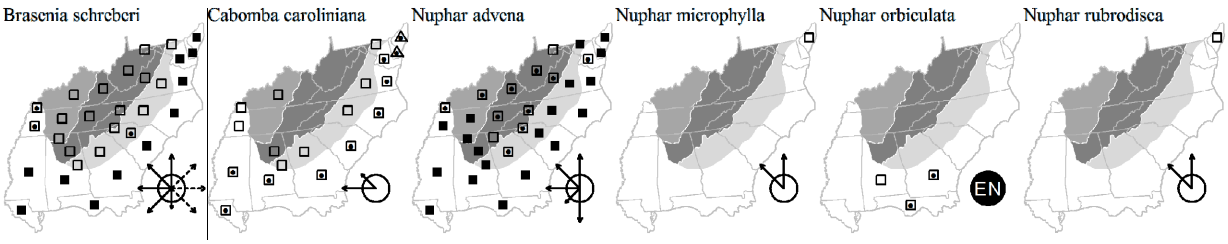
1 Sepals 5 (or 5-6 in *N. rubrodisca*); stigmatic disc red; fruit deeply contricted below the stigmatic disc; leaf blades 3.5-25 cm long; [section *Nuphar*].
  2 Anthers 1-3 mm long; stigmatic disc with 6-10 deep crenations; stigmatic rays terminating 0-0.2 mm from the margin of the disc; constriction below disc 1.5-5 mm in diameter; leaf sinus 2/3 or more the length of the midrib; leaf blades 3.5-10 (-13) cm long..... ***N. microphylla***
  2 Anthers (2-) 3-6 mm long; stigmatic disc with 8-15 shallow crenations; stigmatic rays terminating 0-1.6 mm from the margin of the disc; constriction below disc 5-10 mm in diameter; leaf sinus ca. 1/2 the length of the midrib; leaf blades 5-25 cm long..... ***N. rubrodisca***
1 Sepals 6-9 (-12); stigmatic disc yellow, green, or sometimes reddish; fruit slightly or not at all constricted below the stigmatic disc; leaf blades 7-50 cm long; [section *Astylus*].
  3 Floating leaf blades 2-6× as long as wide, the sinus < ¼ as long as the midrib; thin-textured submersed leaves often more abundant than the floating leaves; [of blackwater or tidal streams, rivers, and lakes of the Coastal Plain, se. VA, e. NC, e. SC, Panhandle FL, s. AL].
    4 Floating leaf blades 3-6× as long as wide; stigmatic rays elliptic, terminating < 1 mm from the edge of the disk; [of blackwater or tidal streams, rivers, and lakes of the Coastal Plain of se. VA to e. SC]..... ***N. sagittifolia***
    4 Floating leaf blades 2-3× as long as wide; stigmatic rays linear, mostly terminating 1-2 mm from the edge of the disk; [of blackwater streams and rivers, Panhandle FL and s. AL]..... ***N. ulvacea***
  3 Floating leaf blades 1-2× as long as wide, the sinus > ¼ as long as the midrib; thin-textured submersed leaves absent or at least fewer than floating or emersed leaves; [collectively of various habitats and distributions, but not as above].
    5 Leaf petiole flattened on the upper (adaxial) surface and winged along the margins; fruit usually purplish; sepals red or maroon at the base adaxially..... ***N. variegata***
    5 Leaf petiole terete or slightly flattened, not winged; fruit usually greenish or yellowish; sepals yellow or red at the base adaxially.
      6 Lower leaf surface glabrous to sparsely pubescent; leaves 7-30 cm wide, (1-) 1.5 (-2)× as long as wide, the lobes acute to broadly rounded; leaves mostly emersed; [widespread in our area]..... ***N. advena***
      6 Lower leaf surface densely silvery-pubescent; leaves 20-45 cm wide, ca. 1× as long as wide the lobes, broadly rounded; leaves mostly floating; [of AL, FL, and GA Coastal Plain]..... ***N. orbiculata***

Nuphar advena (Aiton) R. Brown ex Aiton f., Broadleaf Pondlily. Lakes, ponds, natural depression ponds, old millponds, slow-flowing rivers (blackwater and brownwater). April-October. The most widespread and common *Nuphar* in e. North America, ranging from ME west to WI, south to s. FL, Cuba, TX, and n. Mexico. See *N. sagittifolia* for discussion of the two taxa. [= C, FNA, WV; = *Nuphar luteum* (Linnaeus) Sibthorp & J.E. Smith ssp. *macrophyllum* (Small) E.O. Beal – RAB, GW, W, Z; > *Nuphar advena* – F, G; > *Nuphar fluviatile* (R.M. Harper) Standley – F, G; > *Nuphar puteorum* Fernald – F; = *Nuphar lutea* J.E. Smith ssp. *advena* (Aiton) Kartesz & Gandhi – K; > *Nymphaea advena* Aiton – S; > *Nymphaea chartacea* Miller & Standley – S; > *Nymphaea fluviatilis* R.M. Harper – S; = *Nuphar advena* ssp. *advena* – X, Y]

Nuphar microphylla (Persoon) Fernald. Lakes and ponds. June-September. NS, QC, and MB south to s. NJ, se. PA, MI, IL, and MN. [= C, FNA, X, Y; = *Nuphar microphyllum* – F, G; < *Nuphar lutea* ssp. *pumila* (Timm) E.O. Beal – K; < *Nuphar pumila* Timm; < *Nuphar luteum* ssp. *pumilum* (Timm) E.O. Beal – Z]

Nuphar orbiculata (Small) Standley. Quiet waters in blackwater swamps. May-October. A Southeastern Coastal Plain endemic: e. GA south to Panhandle FL and s. AL. [= FNA; = *Nuphar lutea* ssp. *orbiculata* (Small) E.O. Beal – K; > *Nymphaea orbiculata* Small – S; > *Nymphaea bombycina* (Miller & Standley) Standley – S; = *Nuphar advena* (Aiton) Aiton f. ssp. *orbiculata* (Small) D. Padgett – X, Y; = *Nuphar luteum* ssp. *orbiculatum* (Small) E.O. Beal – Z]

Nuphar rubrodisca Morong. Lakes and ponds. June-September. NB, QC, and ON south to NJ, PA, MI, and MN. [= FNA; = *Nuphar* ×*rubrodisca* Morong – C, X; = *Nuphar* ×*rubrodiscum* Morong – F; = *Nuphar rubrodiscum* – G; = *Nuphar lutea* J.E. Smith ssp. *rubrodisca* (Morong) Hellquist & Wiersema – K]



Nuphar sagittifolia (Walter) Pursh, Narrowleaf Pondlily, Bonnets. Blackwater streams, rivers, and lakes, in swift, sluggish, or stagnant water, extending downriver into freshwater tidal areas. April-October. Endemic to our area: e. VA south to ne. SC, very conspicuous and locally abundant on shallow bars along rivers such as the Northeast Cape Fear, Black, and Waccamaw, and forming dense colonies in Lake Waccamaw. Apparent hybrids with *N. advena* have been named *Nuphar* ×*interfluitans* Fernald. The submersed leaves have somewhat the texture and appearance of a thin leaf lettuce or the marine alga *Ulva*. This species appears to be closely related to *N. ulvacea* (Miller & Standley) Standley of blackwater rivers of Panhandle FL, another phytogeographic connection between se. NC and Panhandle FL. DePoe & Beal (1969) and Beal & Southall (1977) argue that this taxon and *N. advena* intergrade clinally, with *N. advena* inland and *N. sagittifolia* in the outer Coastal Plain, and that the two taxa are maintained by water temperatures. This ignores the fact that the two taxa often occur in close proximity to one another in both the inner and outer Coastal Plain. The frequency of so-called intermediates has also been exaggerated; few populations will present any difficulties in identification. I prefer to treat these taxa as species, with rare hybridization or introgression. Molecular data suggest that *N. sagittifolia* is more closely related to the boreal *N. variegata* than to *N. advena* (Padgett (2007). [= C, FNA, X; = *Nuphar luteum* (Linnaeus) Sibthorp & J.E. Smith ssp. *sagittifolium* (Walter) E.O. Beal – RAB, GW, Z; = *Nuphar sagittifolium* – F, G, orthographic variant; = *Nuphar lutea* J.E. Smith ssp. *sagittifolia* (Walter) E.O. Beal – K; = *Nymphaea sagittifolia* Walter – S]

Nuphar ulvacea (G.S. Miller & Standley) Standley, Sea-lettuce Pondlily. Blackwater streams. Endemic to Panhandle FL and s. AL. April-September. [= FNA; = *Nuphar luteum* (Linnaeus) Sibthorp & J.E. Smith ssp. *ulvaceum* (G.S. Miller & Standley) E.O. Beal – GW, K; = *Nymphaea ulvacea* G.S. Miller & Standley – S; = *Nuphar advena* (Aiton) R. Brown ssp. Ulvacea (G.S. Miller & Standley) D. Padgett – X]

Nuphar variegata Durand in G.W. Clinton. Lakes and ponds. Widespread in ne. North America, south to DE, NJ, PA, OH, IN, IL, IA, and NE. May-September. [= C, FNA, X; = *Nuphar variegatum* – F, G; = *Nuphar lutea* ssp. *variegata* (Durand) E.O. Beal – K; = *Nuphar luteum* ssp. *variegatum* (Durand) E.O. Beal – Z]

Nymphaea Linnaeus 1753 (Waterlily)

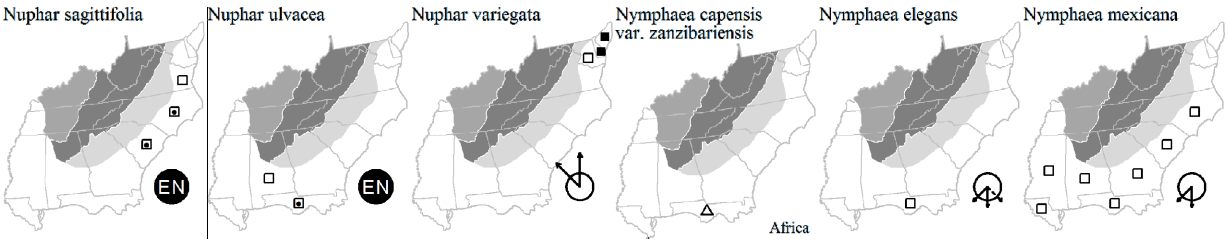
A genus of about 50 species, aquatic herbs, cosmopolitan. References: Wiersema in FNA (1997); Woods et al. (2005a, 2005b)=Z; Schneider & Williamson in Kubitzki, Rohwer, & Bittrich (1993).

1 Leaf margins sinuate-dentate ..... ***N. capensis** var. **zanzibariensis***
1 Leaf margins entire.
  2 Petals blue ..... ***N. elegans***
  2 Petals yellow or white (to pink).
    3 Petals yellow; plants producing stolons ..... ***N. mexicana***
    3 Petals white (to pink); plants not producing stolons.
      4 Petiole solid-colored; leaf length/width ratio (length measured from petiole attachment to tip of leaf, along midvein) (0.44-) avg. 0.56 (-0.71); two leaf lobes with rounded lobe tips; lower leaf surface reddish-purple ..... ***N. odorata** ssp. **odorata***
      4 Petiole striped; leaf length/width ratio (-.55-) 0.63 (-0.73); leaf lobes with pointed tips; lower leaf surface green ..... ***N. odorata** ssp. **tuberosa***

* ***Nymphaea capensis*** Thunberg *var.* ***zanzibariensis*** (Caspary) Conard, Cape Blue Waterlily. Ponds and canals; native of Africa. April-August. [= K, WH]

Nymphaea elegans Hooker, Tropical Blue Waterlily. Ponds, ditches, cypress swamps. April-August. FL west to TX, south into Mexico; Bahamas. [= K, WH]

Nymphaea mexicana Zuccarini, Banana Waterlily, Yellow Waterlily. Sluggish or stagnant waters; scattered in occurrence and possibly introduced from further south, but the introduction agents may well be wild ducks, such as canvasbacks. June-September. Ne. NC south to s. FL, west to TX, also in sw. United States and Mexico. [= RAB, FNA, K, Z; = *Castalia flava* (Leitner) Greene – S]



Nymphaea odorata W.T. Aiton *ssp.* ***odorata***, White Waterlily. Ponds, sluggish waters. June-September. NL (Newfoundland) west to MB, south to FL and TX; also scattered in the w. United States. *N. odorata* is polymorphic, leading to the naming of numerous species, subspecies, and varieties (see synonymy for a few of the named entities). Wiersema in FNA (1997) recognize ssp. *odorata* (all of our plants) and ssp. *tuberosa* (Paine) Wiersema & Hellquist, more western and northern, but approaching our area (see below). Other named entities warrant further evaluation. *N. odorata* var. *gigantea* [= *Castalia lekophylla* Small] occurs on the Coastal Plain, and is considered to differ from var. *odorata* in its larger leaves (1.5-6 dm in diameter vs. 0.5-2.5 dm), larger flowers (mostly > 15 cm wide vs. mostly < 10 cm), and leaves upturned at the margins (vs. flat). *N. odorata* var. *minor* [= *Castalia minor* (Sims) Nyar] is considered to differ from var. *odorata* in its generally smaller size, leaves 5-11 cm in diameter, flowers mostly < 8 cm wide (vs. mostly > 9 cm wide); it may be merely a dwarfed form of extremely nutrient-limited waters of the Coastal Plain. [= FNA, K, Z; < *N. odorata* – RAB, WV; >< *N. odorata* var. *odorata* – C; > *N. odorata* var. *odorata* – F, G; > *N. odorata* var. *gigantea* Tricker – C, F, G; > *N. odorata Schi*var. *stenopetala* Fernald – F; > *Castalia odorata* (W.T. Aiton) Wood – S; > *Castalia minor* (Sims) Nyar – S; > *Castalia lekophylla* Small – S]

Nymphaea odorata W.T. Aiton *ssp.* ***tuberosa*** (Paine) Wiersema & Hellquist, White Water-lily. Ponds and lakes. QC and MB south to MD, NJ, PA, OH, IN, IL, AR, and OK. [= FNA, K, Z; < *N. odorata* var. *odorata* – C; = *N. tuberosa* Paine – F, G]

7a. ILLICIACEAE A.C. Smith 1947 (Star-anise Family) [in AUSTROBAILEYALES]

A family of 1 genus and about 42 species, shrubs and trees, of temperate and subtropical se. Asia and se. North America (se. United States, Cuba, Haiti, and e. Mexico). The family is most closely related to the Schisandraceae, Austrobaileyaceae, and Trimeniaceae. References: Keng in Kubitzki, Rohwer, & Bittrich (1993).

Illicium Linnaeus 1759 (Star-anise)

A genus of about 42 species, shrubs and trees, of temperate and subtropical se. Asia and se. North America (se. United States, Cuba, Haiti, and e. Mexico). References: Morris et al. (2007) studied the evolution of the genus and revised its sectional taxonomy; New World and Old World taxa form seperate clades, treated as separate sections, our species being in section *Cymbostemon*. Vincent in FNA (1997); Morris et al. (2007); Keng in Kubitzki, Rohwer, & Bittrich (1993); Stone & Freeman (1968).

1 Flowers 2-5-5 cm across; tepals 21-33, red-maroon (rarely white or pinkish); leaf tips acute to acuminate ..... ***I. floridanum***
1 Flowers 0.8-1.2 cm across; tepals 11-16, yellowish green; leaf tips obtuse or rounded ..... ***I. parviflorum***

Illicium floridanum Ellis, Florida Star-anise. Acid ravines and small stream swamps. Sw. GA west to e. LA. Sparingly naturalized north of its native range from plantings, as along Black Creek, at Kalmia Gardens, Hartsville, Darlington County, SC (D. Hope, pers.comm. 2008). [= FNA, GW, K, S, WH]

* ***Illicium parviflorum*** Michaux ex Ventenat, Swamp Star-anise, Yellow Anise-tree, Ocala Anise-tree. Cultivated and persistent; native of central peninsular FL. April-June. This species occurs in swampy forests, evergreen hammocks, and bayheads and is endemic to scattered localities in central FL; it is in the horticultural trade and has been introduced in various places, including sw. and se. GA and sc. SC (Aiken County) (H. Shealy and R. McCartney, pers.comm. 2008). [= FNA, K, S, WH]

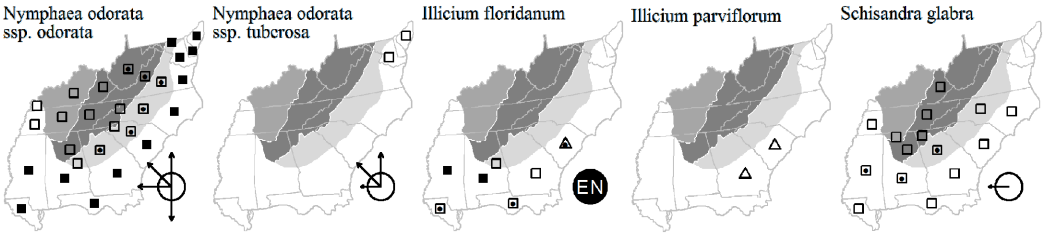
7b. SCHISANDRACEAE Blume 1830 (Star-vine Family) [in AUSTROBAILEYALES]

A family of 2 genera and about 40-60 species, woody vines, of e. Asia and e. North America (only our single species). The family is most closely related to the Illiciaceae, Austrobaileyaceae, and Trimeniaceae. In APG III (2009), Schisandraceae is included in Illiciaceae, but the differences seem sufficient to keep them separate. References: Saunders (2001); Keng in Kubitzki, Rohwer, & Bittrich (1993).

Schisandra Michaux 1803 (Star-vine)

A genus of about 25 species, woody vines, of e. Asia (about 24 species) and e. North America (1 species). References: Vincent in FNA (1997); Godfrey (1988)=Z; Saunders (2001)=Y; Stone (1968); Keng in Kubitzki, Rohwer, & Bittrich (1993).

Schisandra glabra (Brickell) Rehder, Star-vine, Climbing-magnolia, Magnolia-vine. Rich slopes adjacent to bottomland forests, mesic "islands" surrounded by bottomlands, moist hammocks. May-June; July-August. Ne. NC (Martin County), sc. NC (Gaston County), n. GA, w. TN, e. and se. KY, and e. AR south to the FL Panhandle and LA; Mexico (Sierra Madre Oriental, Hidalgo). [= RAB, K, WH, Y, Z; = *Schizandra coccinea* Michaux – S, orthographic variant; = *S. coccinea* Michaux – W]



11. SAURURACEAE E. Meyer 1827 (Lizard's-tail Family) [in PIPERALES]

A family of 4 genera and 6 species, perennial herbs, of temperate e. and se. Asia (*Saururus, Gymnotheca, Houttuynia*), w. North America (*Anemopsis*), and e. North America (*Saururus*). One other member of the family occurs in North America: *Anemopsis californica* Hooker & Arnott, primarily of the sw. United States. References: Buddell & Thieret in FNA (1997); Wood (1971); Cheng-Yih & Kubitzki in Kubitzki, Rohwer, & Bittrich (1993); Meng et al. (2003).

Houttuynia Thunberg

{genus info}

* ***Houttuynia cordata*** Thunberg. Disturbed areas; moist suburban forests; native of e. Asia.

Saururus Linnaeus 1753 (Lizard's-tail, Water-dragon)

A genus of 2 species, perennial herbs, our species in temperate e. North America, the other in e. Asia. References: Cheng-Yih & Kubitzki in Kubitzki, Rohwer, & Bittrich (1993).

Saururus cernuus Linnaeus, Lizard's-tail, Water-dragon. Swamps, overwash pools in stream floodplains, ditches, usually where water ponds seasonally or periodically. May-July; August-September. CT, s. QC, s. ON, and MI south to s. FL and e. TX. In swamps of the Coastal Plain, *Saururus* often is dominant in large patches. The elongate inflorescence, drooping at the tip, is distinctive, attractive, and the fanciful inspiration for the genus name, the specific epithet, and the common names. Thien et al. (1994) studied the reproductive biology of *Saururus cernuus*, and found that pollination was both by wind and by insects. [= RAB, C, F, FNA, G, GW, K, S, W, WH, WV]

12. PIPERACEAE C.A. Agardh 1824 (Pepper Family) [in PIPERALES]

A family of about 5-8 genera and 3000 species, shrubs, herbs, trees, and vines, of tropical and subtropical areas. References: Tebbs in Kubitzki, Rohwer, & Bittrich (1993).

Peperomia Ruiz & Pavón 1794 (Peperomia)

A genus of about 1000 species, of tropical and subtropical regions, especially America. References: Boufford in FNA (1997); Boufford (1982)=Z; Tebbs in Kubitzki, Rohwer, & Bittrich (1993).

1 Leaves opposite or whorled; stems pubescent ..... ***P. humilis***
1 Leaves alternate; stems glabrous ..... ***P. pellucida***

* ***Peperomia humilis*** A. Dietrich. Calcareous hammocks; native of Jamaica. Coast of FL, north to vicinity of Jacksonville, FL. [= FNA, K, Z; > *Micropiper humilis* (Vahl) Small – S; > *Micropiper leptostachyon* (Nuttall) Small – S]

* ***Peperomia pellucida*** (Linnaeus) Kunth, Pepper-elder, Man-to-man. Disturbed areas; introduced. *P. pellucida* has been collected escaped from cultivation in FL, LA, and GA (in the vicinity of Savannah). Boufford (1982) describes the species as showing "weedy tendencies" in the southeastern United States, where "first collected in 1957," and states that "it will be interesting to see if this plant will continue to expand its range". [= FNA, K, Z]

15. ARISTOLOCHIACEAE A. L. de Jussieu 1789 (Birthwort Family) [in PIPERALES]

A family of about 6-12 genera and 600 species, vines, shrubs, and herbs, of tropical, subtropical, and warm temperate regions. References: Barringer & Whittemore in FNA (1997); Ohi-Toma et al. (2006); Neinhuis et al. (2005); Huber in Kubitzki, Rohwer, & Bittrich (1993).

1 Acaulescent herb; calyx tube straight, radially symmetrical; stamens 12; [subfamily *Asaroideae*].
  2 Leaves deciduous, pubescent, paired ..... ***Asarum***
  2 Leaves evergreen, glabrous, not paired ..... ***Hexastylis***
1 Twining vine or caulescent herb; calyx tube bent, bilaterally symmetrical; stamens 6; [subfamily *Aristolochioideae*, tribe *Aristolochieae*].
  3 Woody, twining vine; leaves 8-35 cm wide; [subtribe *Isotrematinae*] ..... ***Isotrema***
  3 Low, erect or ascending herb; leaves 0.7-6.5 cm wide.
    4 Leaf blade as wide as long, or wider than long; leaf venation palmate; [subtribe *Aristolochiinae*] ..... ***Aristolochia***
    4 Leaf blade narrower than long; leaf venation pinnate; [subtribe *Isotrematinae*] ..... ***Endodeca***

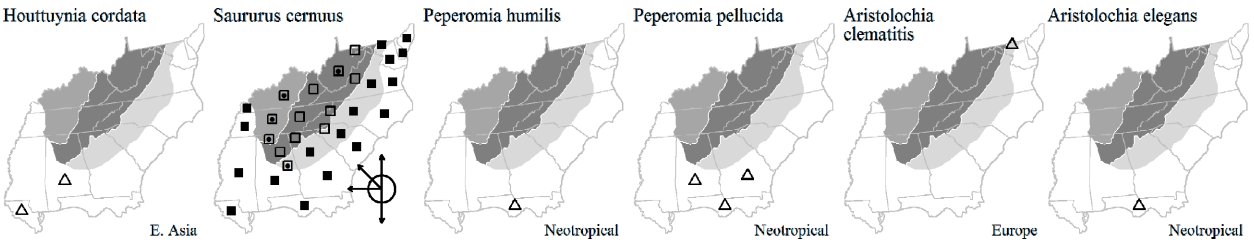
Aristolochia Linnaeus 1753 (Birthwort)

A genus of about 300 species, herbs and vines, once *Endodeca*, *Isotrema*, and *Pararistolochia* are excluded (Huber in Kubitzki 1993). Recent work has clarified that *Aristolochia* s.l. comprises 4 main clades, each of which is distinctive molecularly, morphologically, and in karyotype. These can be (as here) recognized as genera, or alternatively as four subgenera, grouped into two genera (*Aristolochia* including *Pararistolochia*, and *Isotrema* including *Endodeca*), as suggested by Ohi-Toma et al. (2006). References: Barringer in FNA (1997); Ohi-Toma et al. (2006); Kelly & González (2003); Huber in Kubitzki, Rohwer, & Bittrich (1993). [also see *Endodeca* and *Isotrema*]

1 Plant an herb; flowers yellowish, < 2 cm across ..... ***A. clematitis***
1 Plant a woody vine; flowers brownish-purple and white, ca. 10 cm across ..... ***A. elegans***

* ***Aristolochia clematitis*** Linnaeus, Birthwort. Disturbed areas; native of Europe. Naturalized in se. PA (Rhoads & Klein 1993) and MD (Barringer in FNA 1997). [= C, FNA, K]

* ***Aristolochia elegans*** Mast., Elegant Dutchman's-pipe, Calico Flower. Disturbed areas; native of Brazil. [? *A. littoralis* Parodi – WH]



Asarum Linnaeus 1753 (Wild Ginger)

See *Hexastylis* for discussion of generic limits. References: Whittemore, Mesler, & Lu in FNA (1997); Huber in Kubitzki, Rohwer, & Bittrich (1993).

1 Calyx lobes 5-10 (-12) mm long, strongly reflexed, often more-or-less appressed back against the calyx tube, acute or acuminate, the tubular tips 0-4 mm long..... ***A. reflexum***
1 Calyx lobes 10-35 mm long, spreading to ascending from the base, acuminate to caudate, the tubular tips 4-20 mm long.
2 Calyx tube 10-20 mm long; calyx lobes long-caudate, 15-35 mm long, erect ..... ***A. acuminatum***
2 Calyx tube 4-10 mm long; calyx lobes acuminate to short-caudate, 10-25 mm long, spreading..... ***A. canadense***

Asarum acuminatum (Ashe) Bicknell. Mt (NC, VA): rich deciduous forests; rare. Mainly west of the Blue Ridge; distribution unclear at this time. [< *A. canadense* var. *canadense* – C, G; < *A. canadense* – RAB, FNA, K, W; = *A. canadense* Linnaeus var. *acuminatum* Ashe – F; > *A. acuminatum* (Ashe) Bicknell – S; > *A. rubrocinctum* Peattie – S] {not yet mapped}

Asarum canadense Linnaeus, Common Wild Ginger. Mt (GA, NC, SC, VA), Pd (DE, GA, NC, SC, VA), Cp (DE, NC, SC, VA, WV): rich deciduous forests in circumneutral soils; common (uncommon in Piedmont of NC and SC, uncommon in VA Coastal Plain, rare in Coastal Plain in DE, NC, and SC). April-May. NB and QC west to MN, south to NC, AL, and n. LA. Taxa recognized at varietal or specific level in the past have recently often been ignored, but have some merit; they deserve further attention. [= S; < *A. canadense* var. *canadense* – C, G; < *A. canadense* – RAB, FNA, K, W; > *A. canadense* var. *ambiguum* (Bicknell) Farwell – F; > *A. canadense* var. *canadense* – F] {not yet mapped}

Asarum reflexum Bicknell. Mt (NC, VA?, WV?): rich deciduous forests in circumneutral soils; rare? April-May. CT west to s. MB, south to w. NC, KY, and MO. [= S = *A. canadense* Linnaeus var. *reflexum* (Bicknell) B.L. Robinson – C, F, G; < *A. canadense* – RAB, FNA, K, W; = *A. reflexum* Bicknell – S] {not yet mapped}

Endodeca Rafinesque 1828 (Turpentine-root)

A genus of 2 (or more?) species, of eastern and sc. North America. This genus is morphologically distinctive within *Aristolochia* (in the broad sense), and forms a clade with *Isotrema* distinctive from *Aristolochia* s.s. (Ohi-Toma et al. 2006). References: Barringer in FNA (1997); Ohi-Toma et al. (2006); Kelly & González (2003); Neinhuis et al. (2005); Huber in Kubitzki, Rohwer, & Bittrich (1993).

Endodeca serpentaria (Linnaeus) Rafinesque, Turpentine-root, Virginia Snakeroot. Dry to mesic forests, perhaps more restricted to mesic situations over acidic substrate, ranging into drier situations over calcareous or mafic substrates. May-June; June-July. CT and NY west to IL, MI, and MO, south to c. peninsular FL and TX. The tremendous variation in this species needs further study. Plants with sparingly pubescent, thin-textured, linear to lanceolate leaves have been called *Aristolochia hastata*. Plants with broadly ovate, densely pubescent leaves have been called *Aristolochia convolvulacea*. These may represent merely morphologic extremes of a polymorphic complex; alternatively, some taxonomic recognition of such plants as distinct from *A. serpentaria* may be warranted. [= *Aristolochia serpentaria* Linnaeus – RAB, C, FNA, G, K, W, WH; > *A. serpentaria* var. *hastata* (Nuttall) Duchartre – F; > *A. serpentaria* var. *serpentaria* – F; > *A. hastata* Nuttall – S; > *A. convolvulacea* Small – S; > *A. serpentaria* – S]

Hexastylis Rafinesque 1825 (Heartleaf)

A genus of 10 species, herbs, of se. North America, very possibly best expanded to include Asian taxa treated in *Heterotropa* and *Asiasarum*. Barringer (1993) and Kelly (1997, 1998) have recently employed a broad definition of *Asarum*, including *Hexastylis*. Over the last half-century various students of the group (emphasizing a range of fields of evidence) have arrayed themselves for and against the recognition of *Hexastylis* as a genus distinct from *Asarum.* A cladistic analysis (Kelly 1997, 1998) showed distinctive clades which could be interpreted as evidence for the recognition of *Hexastylis* (including the Asian *Heterotropa*), though the author preferred to recognize 2 subgenera. I choose here to follow the more traditional (at least in our area) separation of *Hexastylis* from *Asarum*, until and unless stronger evidence is presented for their combination. Electrophoretic and morphologic studies currently in progress validate the species / varietal level taxonomy presented, insofar as results are available (R. Wyatt, pers. comm.). A difficult genus, Hexastylis is made more frustrating by the fact that nearly all diagnostic features relate to the shape and size of the fleshy and brittle calyx – characters which are difficult to describe and are largely lost when specimens are pressed. The difficulty of identifying herbarium specimens has sometimes been (apparently) used as a justification for reducing (often drastically, as in C) the number of taxa recognized. To those familiar with this genus in the field, however, the taxa here recognized form geographically distinctive populations. Size and (to a lesser degree) shape of individual flowers show considerable variation and can be altered by environmental factors; individual flowers or plants can be difficult to identify if taken out of context. Populations, however, are usually readily identifiable. References: Whittemore & Gaddy in FNA (1997); Gaddy (1987a)=Z; Blomquist (1957)=Y; Barringer (1993)=X; Gaddy (1987b); Gaddy (1986); Gaddy in Wofford (1989); Sugawara (1987); Huber in Kubitzki, Rohwer, & Bittrich (1993). Key adapted from FNA, Gaddy in Wofford (1989), and Gaddy (1987a).

Identification notes: The photograph (Figure 1) in Gaddy (1987a) of the flowers of all species other than *H. arifolia* and *H. speciosa* is highly recommended as an aid to identification. The calyx tube orifice is measured on the inside – the diameter of the opening. The width of calyx lobes is measured from sinus tip to sinus tip.

1 Style extension bifid to stigma; leaves triangular to ovate-sagittate or subhastate, portions of the sides of nearly all leaves straight or concave; leaves mottled, the paler areas between the veins.
2 Calyx abruptly contracted near the middle, the lower portion narrowly cuplike, abruptly expanded into a much broader upper half; calyx tube with internal raised reticulations; calyx lobes spreading; [endemic near Montgomery, AL]..... ***H. speciosa***
2 Calyx gradually contracted to a smooth waist just below the calyx lobes; calyx tube smooth internally; calyx lobes spreading or erect; [collectively widespread in our area].
3 Calyx lobes erect, 2-4 mm long, 2-4 mm wide at base; [of the Mountains westward]..... ***H. arifolia*** *var.* ***ruthii***

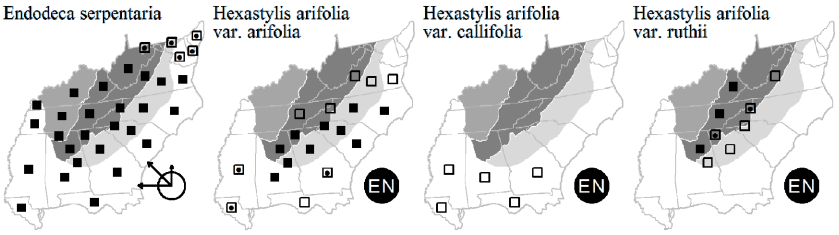
3 Calyx lobes spreading, 2.5-8 mm long, 3-9 mm wide at base; [of the Coastal Plain, Piedmont, and eastern Mountains].
4 Calyx tube 13-18 mm long, 6-10 mm wide; [of the Coastal Plain, Piedmont, and Mountains of s. VA, NC, SC, GA, and westward through AL and MS to se. LA]..... ***H. arifolia*** *var.* ***arifolia***
4 Calyx tube 20-25 mm long, 10-12 mm wide; [of the lower Gulf Coastal Plain, of sw. GA, FL Panhandle, s. AL, s. MS, and se. LA]... ***H. arifolia*** *var.* ***callifolia***

1 Style extension notched or divided at the apex, not bifid to the stigma; leaves rounded, with cordate base, all portions of the sides of the leaves convex; leaves mottled or unmottled, if mottled, the paler areas along the veins.
5 Inner surface of calyx lobes pilose with whitish hairs; plant rhizomatous, the rhizomes long-creeping..... ***H. lewisii***
5 Inner surface of calyx lobes puberulent; plant clumped or short-creeping.
6 Calyx tube broadly urceolate-campanulate or rhombic-ovate (broadest near the middle).
7 Calyx tube urceolate-campanulate; calyx lobes 10-22 mm wide at base.
8 Leaves scattered along the length of the rhizome; [of Coastal Plain and lower Piedmont of GA and AL]..... ***H. shuttleworthii*** *var.* ***harperi***
8 Leaves clustered at the tip of the rhizome; [of the Mountains and upper Piedmont of NC, SC, and GA]..... ***H. shuttleworthii*** *var.* ***shuttleworthii***
7 Calyx tube rhombic-ovate (broadest near the middle); calyx lobes 3-8 mm wide at base.
9 Internal ridged reticulation an open network raised < 1 mm or absent..... ***H. contracta***
9 Internal ridged reticulation a close network raised 1.5-2 mm..... ***H. rhombiformis***
6 Calyx tube cylindrical to narrowly cylindro-urceolate.
10 Calyx tube cylindrical to narrowly cylindro-urceolate; calyx lobes 2-4 mm long, erect to slightly spreading..... ***H. virginica***
10 Calyx tube cylindrical, calyx lobes 4-15 mm long, moderately spreading to reflexed.
12 Calyx tube longer than wide.
13 Calyx tube orifice 8-12 mm wide, > ½ the length of the calyx lobes; calyx lobes 6-17 mm wide; ovary superior; leaves usually solid green (sometimes variegated)..... ***H. heterophylla***
13 Calyx tube orifice 4-8 mm wide, < ½ the length of the calyx lobes; calyx lobes 4-7 mm wide; ovary half-inferior; leaves usually variegated..... ***H. naniflora***
12 Calyx tube about as wide as long (at widest point) or wider than long, flared.
14 Calyx tube about as wide as long; calyx tube orifice width < the length of the calyx lobes..... ***H. heterophylla***
14 Calyx tube wider at flare than long; calyx tube orifice width > the length of the calyx lobes.
15 Calyx tube 12-25 mm long; leaves always strongly variegated; [widespread in dry to moist upland forests of the Piedmont (and rarely Coastal Plain and low Mountains) of VA, NC, and SC]..... ***H. minor***
15 Calyx tube 8-18 mm long; leaves solid green or faintly variegated; [of pocosins and pocosin ecotones in the NC and SC sandhills, usually growing in or near *Sphagnum*]..... ***H. species 1***

Hexastylis arifolia (Michaux) Small var. ***arifolia***, Little Brown Jug, Arrowleaf Heartleaf. Dry to mesic deciduous forests. March-May. Se. VA, sw. VA, se. TN, and n. AL south to se. GA (Carter, Baker, & Morris 2009), Panhandle FL, s. MS, and se. LA, primarily on the Coastal Plain and Piedmont. [= C, FNA, K, W, Y, Z; < *H. arifolia* – RAB; = *Asarum arifolium* Michaux – F; = *H. arifolia* – G, S; < *Asarum arifolium* Michaux – WH; = ***Asarum arifolium*** Michaux *var.* ***arifolium*** – X]

Hexastylis arifolia (Michaux) Small *var.* ***callifolia*** (Small) Blomquist. Mesic forests. March-May. Sw. GA and Panhandle FL (?) west to se. LA, in the lower East Gulf Coastal Plain. [= FNA, K, Y, Z; = *H. callifolia* (Small) Small – S; = *Asarum callifolium* Small; < *Asarum arifolium* Michaux – WH; = ***Asarum arifolium*** Michaux *var.* ***callifolium*** (Small) Barringer – X]

Hexastylis arifolia (Michaux) Small var. ***ruthii*** (Ashe) Blomquist, Appalachian Little Brown Jug. Upland forests, ultramafic outcrop barrens, calcareous forests. March-June. A Southern Appalachian endemic: sw. VA, se. KY, w. NC, e. TN, n. AL, and n. GA. Perhaps warranting species status. At the Buck Creek olivine barren (Clay County, NC) this species carpets several hundred hectares, in association with *Packera paupercula* var. *appalachiana, Thalictrum macrostylum,* and *Sporobolus heterolepis*; various morphological differences, especially the rhizomatous habit, suggest that it may represent an undescribed taxon. [= C, FNA, K, W, Y, Z; < *H. arifolia* – RAB; = *Asarum ruthii* Ashe – F; = *H. ruthii* (Ashe) Small – G, S; = ***Asarum arifolium*** Michaux *var.* ***ruthii*** (Ashe) Barringer – X]



Hexastylis contracta Blomquist, Mountain Heartleaf. On acidic soils in deciduous forests with *Kalmia latifolia* and *Rhododendron maximum*. May-June. Endemic to the Cumberland Plateau of TN (Chester, Wofford, & Kral 1997) and KY, with a few disjunct populations in the Blue Ridge of NC and in the Ridge and Valley of sw. VA (Washington County) (J. Townsend, pers.comm. 2006). [= RAB, FNA, K, W, Y, Z; < *H. virginica* – C; < *Asarum contractum* (Blomquist) Barringer – X (also see *H. rhombiformis*); = ***Asarum contractum*** (Blomquist) Barringer]

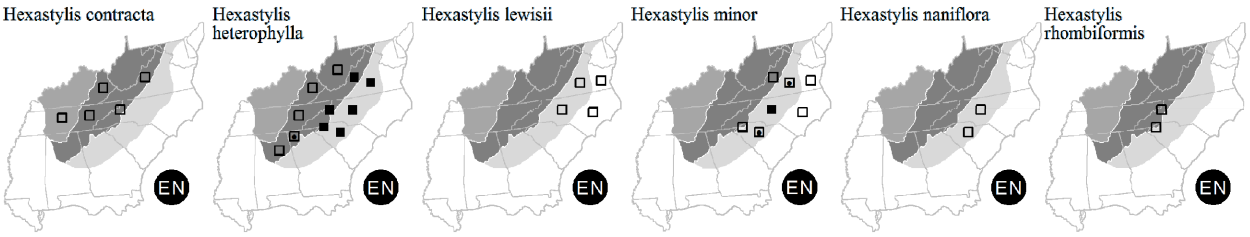
Hexastylis heterophylla (Ashe) Small, Variable-leaf Heartleaf. Slopes and bluffs in xeric to mesic forests, usually associated with *Kalmia latifolia*. March-late May. A broad Southern Appalachian endemic: w. VA and WV south through e. KY, ne. TN, and w. NC to nw. SC, n. GA, and n. AL. [= RAB, FNA, K, S, W, Y, Z; < *H. virginicum* – C; < *Asarum virginicum* Linnaeus – F, G; = ***Asarum heterophyllum*** Ashe – WV]

Hexastylis lewisii (Fernald) Blomquist & Oosting, Lewis's Heartleaf. Upland forests (pine or oak), pocosin ecotones. April-May. Endemic to the Piedmont of VA and the Piedmont and Coastal Plain of NC. [= RAB, FNA, K, Y, Z; < *H. shuttleworthii* – C; = ***Asarum lewisii*** Fernald – F]

Hexastylis minor (Ashe) Blomquist, Little Heartleaf. Upland or moist forests. February-May. Endemic to the Piedmont and adjacent Coastal Plain and Mountains of nc. VA, NC, and nc. SC. [= RAB, FNA, K, W, Z; < *Asarum virginicum* Linnaeus – F; < *H. virginica* – C, G, S; = ***Asarum minus*** Ashe; = *Hexastylis minus* – Y, a grammatical error]

Hexastylis naniflora Blomquist, Dwarf-flower Heartleaf. Acidic, sandy loam on bluffs and ravines in deciduous forests, frequently associated with *Kalmia latifolia*. March-June. Endemic to the upper Piedmont of s. NC and n. SC. [= RAB, FNA, K, W, Y, Z; < *H. virginica* – S; = ***Asarum species 2***]

Hexastylis rhombiformis Gaddy, French Broad Heartleaf. In deciduous forests on sandy river bluffs or in ravines with *Kalmia latifolia* and *Rhododendron maximum*. Late March-June. Endemic to the southern Blue Ridge of NC and SC, known only from Henderson, Polk, Buncombe, and Transylvania counties. Following Gaddy's (1986) naming of this species, Barringer (1993) considered the species merely a form of *Asarum contractum*, but electrophoretic and morphologic studies indicate that it is distinct from *H. contracta*, and more closely related to *H. virginica* (Murrell et al. 1998; R. Wyatt, pers. comm.). [= FNA, K, W, Z; < *Asarum contractum* (Blomquist) Barringer – X; = ***Asarum species 3***]



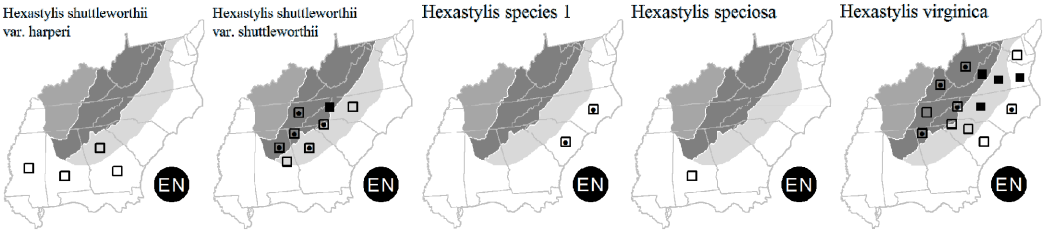
Hexastylis shuttleworthii (Britten & Baker f.) Small *var.* ***harperi*** Gaddy, Harper's Heartleaf. Bogs, acid hammocks. C. GA, c. AL, and ne. MS, south and west of (and allopatric from) var. *shuttleworthii* (Gaddy 1987b); it approaches SC and should be sought there. [= FNA, K, Z; < *H. shuttleworthii* – S; = ***Asarum shuttleworthii*** Britten & Baker f. *var.* ***harperi*** (Gaddy) Barringer – X]

Hexastylis shuttleworthii (Britten & Baker f.) Small var. ***shuttleworthii***, Large-flower Heartleaf. Acidic soils in deciduous and deciduous-coniferous forests, often along creeks under *Rhododendron maximum*. May-July. Endemic to the Southern Appalachians: W. NC and e. TN to nw. SC, n. GA, and ne. AL; previous reports of *H. shuttleworthii* for VA and WV are apparently based on large-flowered individuals of *H. heterophylla* (J. Townsend, pers. comm. 2008). [= FNA, K, Z; < *H. shuttleworthii* – RAB, G, S, W, Y; < *H. shuttleworthii* – C (also see *H. lewisii)*; < *Asarum shuttleworthii* Britten & Baker – F; = ***Asarum shuttleworthii*** Britten & Baker f. *var.* ***shuttleworthii*** – X]

Hexastylis species 1, Sandhill Heartleaf. Seepage bogs, pocosins. Endemic to Sandhills region of NC and SC. For addituional information, see Gaddy [in prep.]. [= ***Asarum virginicum*** Linnaeus *var.* ***1***] {not yet keyed}

Hexastylis speciosa R.M. Harper. Shaded forests alng streams and bogs. April-May. Endemic to a small area in central AL (Autauga, Chilton, and Elmore counties, north of Montgomery). [= FNA, K, S, Y, Z; = ***Asarum speciosum*** (R.M. Harper) Barringer – X]

Hexastylis virginica (Linnaeus) Small, Virginia Heartleaf. Upland forests. April-June. A relatively widespread species, occurring throughout NC and VA, extending west into WV, e. KY, and ne. TN (Chester, Wofford, & Kral 1997). *H. memmingeri*, a doubtful taxon close to *H. virginica*, with the calyx very small (< 1.5 cm long), narrowly cylindro-urceolate, and the calyx lobes very short (ca. 2 mm long) will key here. Gaddy does not recognize it, considering it a small form of *H. virginica*, but it may warrant varietal rank. It is known from NC, VA, and WV, in the Piedmont and Mountains. [= RAB, FNA, K, W, Y, Z; < *H. virginica* – C (also see *H. contracta*, *H. heterophylla, H. minor*, and *H. naniflora*); >< *Asarum virginicum* Linnaeus – F (also see *H. heterophylla* and *H. minor*); > *Asarum virginicum* – WV; > *Asarum memmingeri* Ashe – F, WV; < *H. virginica* – G; > *H. virginica* – S; > *H. memmingeri* (Ashe) Small – S; = ***Asarum virginicum*** Linnaeus *var.* ***virginicum***]



Isotrema Rafinesque 1819 (Dutchman's-pipe)

A genus of about 50 species, of temperate and tropical Asia, se. North America, and Central America. References: Barringer in FNA (1997); Ohi-Toma et al. (2006); Kelly & González (2003); Huber in Kubitzki, Rohwer, & Bittrich (1993).

1 Plant nearly glabrous; leaves abruptly pointed; calyx purple or brown; [of the Mountains]..... ***I. macrophyllum***
1 Plant soft pubescent; leaves blunt; calyx yellow, with a purple mouth; [largely of west or south of the Appalachians, also locally spread from cultivation]..... ***I. tomentosum***

Isotrema macrophyllum (Lamarck) C.F. Reed, Pipevine, Dutchman's-pipe. Cove forests and other mesic mountain forests. May-June; August-September. A southern-central Appalachian endemic: sw. PA to c. TN and n. GA. [= *Aristolochia macrophylla* Lamarck – RAB, C, FNA, K, S, W; = *A. durior* Hill – F, G]

Isotrema tomentosum (Sims) H. Huber, Woolly Dutchman's-pipe, Pipevine. Floodplain forests, disturbed areas. S. IN, s. MO, and se. OK, south to sw. GA, Panhandle FL, and TX. FNA also reports that it is escaped in VA. [= *Aristolochia tomentosa* Sims – RAB, C, F, FNA, G, GW, K, S, WH]

17. MAGNOLIACEAE A.L. de Jussieu 1789 (Magnolia Family) [in MAGNOLIALES]

A family of about 7 genera and 223 species, trees and shrubs, tropical and warm temperate, of e. and se. Asia, and from e. North America south through West Indies and Central America to Brazil. References: Hardin (1972); Hardin & Jones (1989)=Z; Meyer in FNA (1997); Figlar & Nooteboom (2004); Frodin & Govaerts (1996); Nooteboom in Kubitzki, Rohwer, & Bittrich (1993); Kim et al. (2001).

1 Leaves about as broad as long, (2-) 4 (-8)-lobed; fruit a 2-seeded, indehiscent samara; [subfamily *Liriodendroideae*] ..... ***Liriodendron***
1 Leaves longer than broad, not lobed (in some species the leaves auriculate-cordate basally); fruit a cone-like aggregate, each follicle dehiscing to reveal the scarlet seed, at first connected to the follicle by a thread-like strand; [subfamily *Magnolioideae*] ..... ***Magnolia***

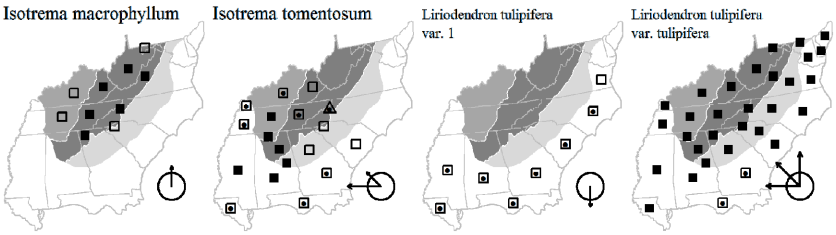
Liriodendron Linnaeus (Tulip-tree)

A genus of 2 species, trees, relictually distributed, with *L. tulipifera* in e. North America and *L. chinense* (Hemsley) Sargent in c. China and n. Vietnam. References: Nooteboom in Kubitzki, Rohwer, & Bittrich (1993); Weakley & Parks (in prep.)=Z.

1 Leaves large, 4-8-lobed, the terminal lobes acute; [of the Mountains, Piedmont, and Coastal Plain (especially brownwater rivers and mesic bluffs and slopes)] ..... ***L. tulipifera*** *var.* ***tulipifera***
1 Leaves small, 0-4-lobed, the terminal lobes obtuse to broadly rounded; [of the Coastal Plain, especially fire-maintained, acidic, and peaty sites] ..... ***L. tulipifera*** *var.* ***1***

Liriodendron tulipifera Linnaeus *var.* ***tulipifera***, Tulip-tree, Yellow Poplar, Whitewood. Mesic forests, cove forests in the Mountains to at least 1500m in elevation, bottomland forests and swamps. April-June; September-October. Widespread in e. North America, south to Panhandle FL. An important timber tree in the Southern Appalachians. [= Z; < *L. tulipifera* – RAB, C, F, FNA, G, GW, K, S, W, WH, WV, Z]

Liriodendron tulipifera Linnaeus *var.* ***1***, Coastal Plain Tulip-tree, Southern Yellow Poplar. Blackwater swamps, streamhead pocosins in the fall-line sandhills. April-June; September-October. Its occurrence in fire-maintained, acid soil habitats in the Coastal Plain is surprising to people used to *Liriodendron* as a tree of mesic, rich soil forests. It is, however, a typical species of streamhead pocosins in the fall-line sandhills, growing with *Pinus serotina*, *Nyssa biflora*, and *Acer rubrum*, and often with scorch marks twenty feet up the trunk. [= Z; < *L. tulipifera* – RAB, C, F, FNA, G, GW, K, S, W, WH, Z]



Magnolia Linnaeus 1753 (Magnolia, Cucumber-tree)

A genus of about 130 species, trees and shrubs, of e. Asia (Himalayas and Sri Lanka to Japan and w. Malaysia) and America (e. North America to West Indies, Central America, and South America). Molecular phylogenetics show *Magnolia virginiana* and *M. grandiflora* as closely related in a New World primarily subtropical clade, *M. macrophylla* in a clade with its close relatives, *M. fraseri* and *M. pyramidata* together, *M. acuminata* as basal in a clade that is otherwise Asian (equivalent to subgenus *Yulania*), and *M. tripetala* grouped in another clade that is otherwise Asian (Azuma et al. 2001). The sections used follow Figlar & Nooteboom (2004). References: Tobe (1998)=Y; Spongberg (1998)=X; Frodin & Govaerts (1996)=V; Palmarola-Bejerano, Romanov, & Bobrov (2008)=U; Azuma, Thien, & Kawano (1999); Azuma et al. (2001); Figlar & Nooteboom (2004); Nooteboom in Kubitzki, Rohwer, & Bittrich (1993); Kim et al. (2001); Hunt (1998).

1 Leaves cordate-auriculate at base; [subgenus *Magnolia*].
  2 Leaves glaucous and finely appressed-pubescent beneath; buds and twigs pubescent; [subgenus *Magnolia*, section *Macrophylla*].
    3 Conelike aggregate fruit (follicetum) 2.5-6.5 cm long, 1.5-4 cm in diameter; leaf blade 17-56 cm long; stamens 170-350; pistils 20-50; small tree (to 12 m tall); [of Panhandle FL] ..... ***M. ashei***
    3 Conelike aggregate fruit (follicetum) 5-8 cm long, 5-7 cm in diameter; leaf blade 50-110 cm long; stamens (300-) 350-580; pistils 50-80; medium to large tree (to 32 m tall); [widespread, but not of Panhandle FL] ..... ***M. macrophylla***
  2 Leaves green and glabrous beneath; buds and twigs glabrous; [subgenus *Magnolia*, section *Auriculata*].
    4 Stamens 8-15 mm long; leaves (most of them) over 25 cm long; conelike aggregate fruit (follicetum) 6.5-11 (-14) cm long; ;of the Mountains and Piedmont] ..... ***M. fraseri***
    4 Stamens 4-8 (-10.5) mm long; leaves (most of them) < 25 cm long; conelike aggregate fruit (follicetum) 3.5-5.5 (-6) cm long; [of the Coastal Plain] ..... ***M. pyramidata***
1 Leaves cuneate to rounded (subcordate) at base.

5 Leaves evergreen, coriaceous in texture, glossy dark green above as if varnished, rusty tomentose or green beneath; [subgenus *Magnolia*, section *Magnolia*] .....***M. grandiflora***
5 Leaves variably evergreen to deciduous, herbaceous or subcoriaceous in texture, medium green above with a slightly glossy or dull finish; glaucous or green beneath.
6 Leaves evergreen to deciduous, aromatic when fresh, 8-20 cm long, elliptic, strongly glaucous beneath; [subgenus *Magnolia*, section *Magnolia*].
7 Leaves evergreen; previous year's stems densely pubescent; mature leaves with pubescent midveins; flowers opening near sundown (2-5 hours later than var. *virginiana*); medium to large tree, to >20 m tall; [of the Gulf Coast and inland, north and east to s. SC (e. NC?)].....***M. virginiana* var. *australis***
7 Leaves evergreen to deciduous (at least tardily); previous year's stems glabrous; mature leaves with few hairs along the midvein below; flowers opening mid-afternoon; shrub to multi-stemmed small tree, to 10 m (rarely to 15 m) tall; [of the Atlantic Coastal Plain and inland, south and west to s. SC and w. NC].....***M. virginiana* var. *virginiana***
6 Leaves deciduous, non-aromatic,4-50 cm long, either ovate, obovate, or oblanceolate, green beneath.
8 Leaf base cuneate-attenuate; leaf blade obovate or oblanceolate (broader toward the tip); buds **either** glabrous **or** sericeous.
9 Leaf blades 3-16 cm long; buds densely sericeous; [alien]; [{classification}].....***M. kobus***
9 Leaf blades 15-50 cm long; buds glabrous; [native]; [subgenus *Magnolia*, section *Rhytidospermum*, subsection *Rhytidospermum*]..
.....***M. tripetala***
8 Leaf base rounded to subcordate (often cuneate to widely cuneate in *M. acuminata* var. *subcordata*); leaves 10-30 cm long, broader near the middle or toward the base, borne scattered along the twig; buds pubescent; [subgenus *Yulania*, section *Yulania*, subsection *Tulipastrum*].
10 Twigs of the current year glabrous; petals greenish or greenish-yellow; medium to large tree .....***M. acuminata* var. *acuminata***
10 Twigs of the current year pubescent, or at least with persistent hair-bases, petals golden-yellow above, light-yellow below; small tree (rarely larger).....***M. acuminata* var. *subcordata***

Magnolia acuminata (Linnaeus) Linnaeus *var.* ***acuminata***, Cucumber-tree, Cucumber Magnolia. Mesic to subxeric forests, especially (but by no means strictly) over mafic or calcareous rocks, up to at least 1550m (where growing with *Betula alleghaniensis, Abies fraseri, Picea rubens,* and *Sorbus americana*), ultramafic outcrop barrens (where codominant with *Pinus rigida* and *Quercus alba*). April-June; July-August. S. ME, MY, c. IN, s. MO, and e. OK, south to c. GA, Panhandle FL, s. AL, s. MS, and w. LA. The recognition of two varieties is uncertain (see discussion below). [= C, F, G, V, W, X, Y; < *M. acuminata* – RAB, FNA, K, WV, Z; = *Tulipastrum acuminatum* (Linnaeus) Small – S; ; = *Yulania acuminata* (Linnaeus) D.L. Fu var. *1*]

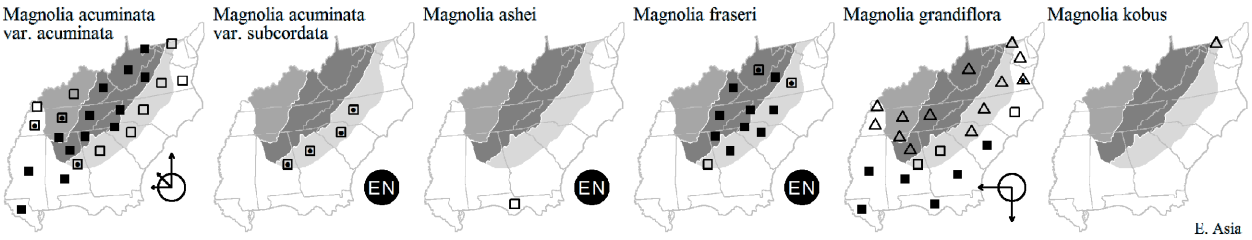
Magnolia acuminata (Linnaeus) Linnaeus *var.* ***subcordata*** (Spach) Dandy, Yellow Cucumber-tree, Showy Cucumber Magnolia. Moist to dry slopes and bottomlands over mafic or calcareous rocks. Var. *subcordata* ranges from sc. NC south to AL. It has been treated variously as a variety, a species, or merged with *M. acuminata*. Coker (1943) discusses its history, distribution, and taxonomic status. Additional study is needed. [= V, X, Y; < *M. acuminata* – RAB, FNA, K, W, Z; = *Tulipastrum cordatum* (Michaux) Small – S; = *Magnolia cordata* Michaux; = *Yulania acuminata* (Linnaeus) D.L. Fu var. *2*]

Magnolia ashei Weatherby, Ashe's Magnolia. Moist to wet hammocks. Endemic to FL Panhandle. [= FNA, K, Z; = *M. macrophylla* Michaux var. *ashei* (Weatherby) D.L. Johnson – WH; = *M. macrophylla* ssp. *ashei* (Weatherby) Spongberg – V, X, Y]

Magnolia fraseri Walter, Fraser Magnolia, Earleaf Umbrella-tree. Mt (GA, NC, SC, VA, WV), Pd (GA, NC, SC, VA): mesic forests; common (uncommon in upper Piedmont only, uncommon in WV). April-May; July-August. A Southern Appalachian endemic: KY and w. VA south through w. NC and e. TN to nw. SC, n. GA, and ne. AL. [= RAB, C, F, FNA, G, K, S, W, Z; = *M. fraseri* var. *fraseri* – V, X; = *M. fraseri* ssp. *fraseri* – Y]

Magnolia grandiflora Linnaeus, Southern Magnolia, Bull Bay. Maritime forests, mesic Coastal Plain bluffs and flats, bottomlands, now also widely naturalized, spreading from cultivation into wet to mesic forests. April-June; September-October. The pre-Columbian range was apparently from se. NC south to c. peninsular FL, west to e. TX, largely on the Coastal Plain, now somewhat expanded northwards and inland by naturalization from centuries of horticultural planting. Curtis (1860) states that "the northern limit of this tree is in Brunswick County, south of the Cape Fear; but it flourishes in cultivation through all the lower part of the State." This is, of course, the classic "southern magnolia," along with live oak (*Quercus virginiana*), and bald-cypress (*Taxodium distichum*), one of the totem trees of the Deep South. [= RAB, C, FNA, GW, K, S, V, Y, Z; *Magnolia s.s.*]

Magnolia kobus DC., Kobus Magnolia, Kobushi Magnolia. Suburban woodlands; native of Japan. {add to synonymy}



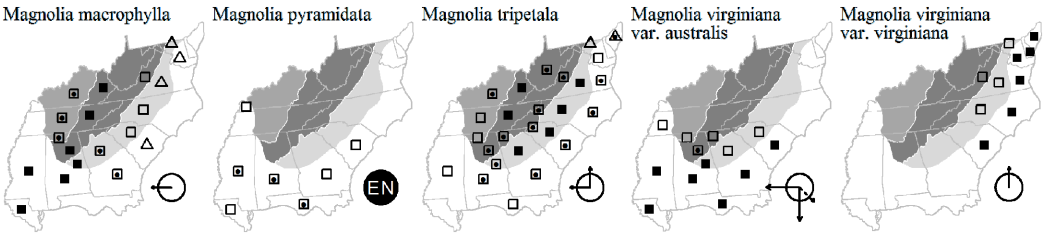
Magnolia macrophylla Michaux, Bigleaf Magnolia. Mesic forests, primarily over limestone, other calcareous sedimentary rocks (calcareous shales, sandstones, etc.), or mafic rocks (east of the Blue Ridge), mesic hammocks in the Coastal Plain. May-June; July-August. The range of this species is often stated in such a way as to imply that it is a tree of the southern mountains. Actually, it avoids the Southern Blue Ridge, reaching its greatest abundance in the sedimentary rock Appalachians west of the Blue Ridge, particularly the Cumberland Plateau, and occurs east of the Blue Ridge only as a rare disjunct. *M. macrophylla* ranges from s. OH and sw. VA south through e. TN to w. GA, west to AL, MS, n. LA, and se. AR (Sundell et al. 1999); disjunct on Crowleys Ridge in ne. AR (population now extirpated), c. and nc. SC, and e. SC (where probably not native). The leaves are up to 1.1 meter long and 3.5 dm wide. See Williams (1999) for additional information about the discovery and nomenclature of this species. The Gulf Coast endemic *Magnolia ashei* Weatherby is related and is sometimes treated as a variety or subspecies of *M. macrophylla*. [= RAB, C, F, FNA, G, K, S, W, Z; = *M. macrophylla* ssp. *macrophylla* – V, X, Y]

Magnolia pyramidata Bartram, Pyramid Magnolia. Mesic hammocks, mesic forests, especially of bluffs and ravines. April-May; August. A Southeastern Coastal Plain endemic: c. SC south to Panhandle FL, west to e. TX. Sometimes treated as a variety or subspecies of *M. fraseri*, to which it is clearly closely related, but the distributional and morphological differences are discrete and specific status seems warranted. [= RAB, FNA, K, S, WH, Z; = *M. fraseri* Walter var. *pyramidata* (Bartram) Pampinini – V, X; = *M. fraseri* Walter ssp. *pyramidata* (Bartram) E. Murray – Y]

Magnolia tripetala (Linnaeus) Linnaeus, Umbrella Magnolia, Umbrella-tree. Mesic forests, ravines. April-May; July-October. Centered in the Southern Appalachians, but avoiding higher elevations, and therefore occurring primarily "around" the Blue Ridge; ranging from sc. and sw. PA, s. OH, s. IN south to SC, GA, Panhandle FL (Tobe 2007), AL, and MS; also disjunct in the Ouachita Mountains of c. AR and e. OK. [= RAB, C, F, FNA, G, K, S, V, W, WH, WV, X, Y, Z; *Houpoëa sp. 1*]

Magnolia virginiana Linnaeus *var.* ***australis*** Sargent, Southern Sweet Bay. Pocosins, bay forests, and swamps in the Coastal Plain, streamhead pocosins, swamps, and sandhill seeps in the Sandhills, bogs and peaty swamps in the Piedmont and Mountains. April-July; July-October. S. SC (se. NC?) south to s. FL, and west to e. TX, rarely extending into adjacent, more interior provinces; disjunct in nw. Cuba. *Magnolia virginiana* was recently discovered in Cuba, the single population named as ssp. *oviedoae* A. Palmarola, M.S. Romanov, & A.V. Bobrov (Palmarola-Bejerano, Romanov, & Bobrov 2008), but based on molecular results of Azuma et al. (2011), it seems better to consider this population as part of *M. virginiana* var. *australis*. Morphological, molecular, and chemical studies have shown strong variation in *M. virginiana* in North America, but the patterns are not clear based on the limited current studies (Azuma, Thien, & Kawano 1999). Based on the studies of Azuma et al. (2011), Azuma, Thien, & Kawano (1999), Tobe (1998), and McDaniel (1966), the recognition of two varieties seems clearly warranted, with a strong genetic break occurring in SC (a secondary and less strong genetic break separates West Gulf Coastal Plain populations from more eastern populations) (Azuma et al. 2011). Additional study is needed to understand the exact distributions of the two taxa in the area of contact (SC and adjacent GA and NC), whether species status is warranted, as suggested by Azuma et al. (2011), and the correlation between morphological traits and genetic variation. [= F, Y; < *M. virginiana* – RAB, C, FNA, G, GW, K, S, V, W, WH, X, Z; = *M. virginiana* ssp. *australis* (Sargent) A.E. Murray – U]

Magnolia virginiana Linnaeus *var.* ***virginiana***, Northern Sweet Bay. Pocosins, bay forests, and swamps in the Coastal Plain, streamhead pocosins, swamps, and sandhill seeps in the Sandhills, bogs and peaty swamps in the Piedmont. April-July; July-October. Se. MA south to w. NC, s. SC, and e. GA. [= F, Y; < *M. virginiana* – RAB, C, FNA, G, GW, K, S, V, W, X, Z; = *M. virginiana* ssp. *virginiana* – U]



21. ANNONACEAE A.L. de Jussieu 1789 (Custard-apple Family) [in MAGNOLIALES]

A family of about 128-130 genera and about 2200-2300 species, trees, shrubs, and lianas, mostly tropical. Kessler in Kubitzki, Rohwer, & Bittrich (1993).

Asimina Adanson 1763 (Pawpaw)

A genus of 10 species of shrubs and small trees, endemic to e. North America. Here circumscribed to include *Deeringothamnus* of peninsular FL. References: Kral (1960)=Z; Wilbur (1970a)=Y; Godfrey (1988)=X; Kral in FNA (1997); Ward (2001); Kessler in Kubitzki, Rohwer, & Bittrich (1993).

Identification notes: Hybrids are known between some of the pineland species, notably *A. angustifolia* × *incana* [= *A.* ×*nashii* Kral], and should be expected where two species are present.

1 Leaves herbaceous in texture, obovate, >6 cm wide, acute-acuminate at the apex; peduncles with bracts; flowers reddish-maroon; [shrubs and trees]; [collectively widespread in our area]..
  2 Flowering peduncles 3-8 mm long, the hairs tan to rusty; leaves 6-15 (-20) cm long; sepals 4-7 mm long; outer petals 10-13 mm long; fruit 1-3 (-6) cm long; plant a shrub to 2 m (rarely to 5 m) tall; [primarily of the Coastal Plain in our area, extending into the Piedmont in NC and SC, and into the Mountains in SC] ..... ***A. parviflora***
  2 Flowering peduncles (10-) 15-20 (-25) mm long, the hairs dark reddish-brown; leaves 15-35 cm long; sepals 8-12 mm long; outer petals 15-25 mm long; fruit (3-) 7-15 cm long; plant a tree to 15 m tall; [widespread in our area] ..... ***A. triloba***
1 Leaves coriaceous in texture, linear to oval, blunt at the tip (or acute-acuminate); peduncles lacking bracts; flowers maroon, pale pink, yellow, cream, or white; [shrubs to 1.75 m tall]; [of e. GA, very rarely e. SC, and southward].
  3 Flowers borne on growth of the previous year, appearing before or with leaf expansion; leaves 1.5-4× as long as broad, 4-10 cm long, 1-6 cm long; flowers with a sweet odor.
    4 Newly emergent leaf blades densely tomentose on both surfaces with pale blonde or tan pubescence; outer petals white to yellowish, inner petals yellowish with a deep yellow corrugated zone; [of dry pinelands] ..... ***A. incana***
    4 Newly emergent leaf blades densely tomentose on the lower surface with the hairs near the midrib reddish, the upper surface sparsely pubescent; outer petals white, inner petals white, yellowish, or pink, with a maroon or purple corrugated zone; [of wet pinelands]..... ***A. reticulata***

3 Flowers borne on growth of the current year, appearing after leaf expansion; leaves 3-15× as long as wide, 4-20 cm long, 0.5-4 cm wide; flowers with a sweet or fetid odor.
5 Flowers terminal; pubescence of new growth, petiole, lower leaf surface and peduncle dense, tomentose, and bright red.....***A. obovata***
5 Flowers axillary; pubescence sparser and/or tan to rusty red.
6 Outer petals maroon or red, 1.5-3 cm long; leaves erect and secund, 4-11 cm long, 1-4 cm wide, averaging 3-5× as long as wide; leaf tips obtuse, rounded, or rounded-emarginate (rarely somewhat acute); shrubs to 3 (-5) dm tall.....***A. pygmaea***
6 Outer petals yellowish white or pale pink, 3-10 cm long; leaves erect and secund, or not, 5-15 (-20) cm long, 0.5-3 cm wide, averaging 6-15× as long as wide; leaf tips acute or obtuse; shrubs 10-17.5 dm tall.
7 Leaves widest at or shortly above the middle, mostly 10-15× as long as wide; leaf margins revolute; outer petals white; new growth pubescent, becoming glabrous with age.....***A. angustifolia***
7 Leaves widest near the tip, mostly 6-12× as long as wide; leaf margins slightly revolute; outer petals white or pink; new growth glabrous or very sparsely pubescent, becoming glabrous with age.....***A. spatulata***

Asimina angustifolia Rafinesque, Slimleaf Pawpaw. Dry pinelands. Se. GA south to c. peninsular FL, west to about the Suwannee River in the e. Panhandle of FL. [= *A. longifolia* var. *longifolia* – FNA, X, Z; < *Asimina angustifolia* – K, WH, Y; < *Pityothamnus angustifolius* (Rafinesque) Small – S]

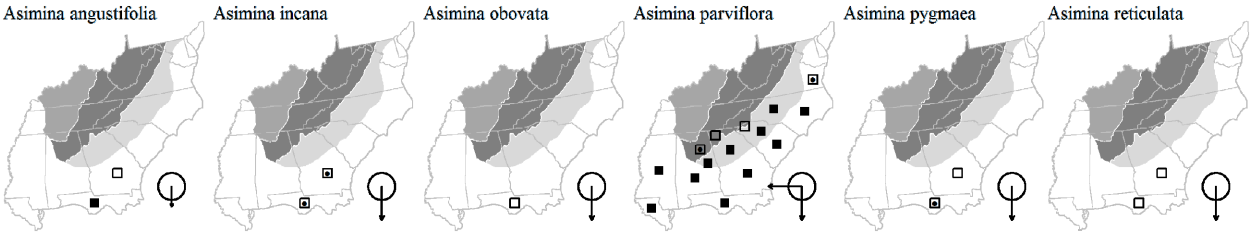
Asimina incana (W. Bartram) Exell, Flag Pawpaw, Polecat Bush, Woolly Pawpaw. Dry pinelands. E. GA south to c. peninsular FL, occurring in dry pinelands. [= FNA, K, WH, Y; = *Pityothamnus incanus* (W. Bartram) Small – S; = *A. speciosa* Nash – Z; = *A. incarna* – X, orthographic variant]

Asimina obovata (Willdenow) Nash. Scrub, sandhills, open dry hammocks. FL peninsula, north to Clay County. [= FNA, K, WH, X, Y, Z; = *Pityothamnus obovatus* (Willdenow) Small – S]

Asimina parviflora (Michaux) Dunal, Small-flowered Pawpaw, Small-fruited Pawpaw. Sandy or rocky, dry to fairly moist forests. April-May; July-September. Se. VA south to c. peninsular FL, west to se. TX, primarily on the Coastal Plain, but inland to sw. SC, n. GA, sc. TN, and n. MS. [= RAB, C, F, G, FNA, K, S, W, WH, X, Y, Z]

Asimina pygmaea (W. Bartram) Dunal, Dwarf Pawpaw. Pine flatwoods, wet savannas. Se. GA south to c. peninsular FL. It is a dwarf shrub 2-3 dm tall of pine flatwoods, occupying wetter sites than the other "pineland pawpaws." [= FNA, GW, X, Z; = *A. pygmea* – K, WH, Y, orthographic variant; = *Pityothamnus pygmeus* (W. Bartram) Small – S]

Asimina reticulata Chapman, Netleaf Pawpaw. Wet flatwoods, savannas. S. GA south to s. peninsular FL. Reported for GA by GAHP (2003) and Kartesz (1999). [= FNA, K, WH, X, Y, Z; = *Pityothamnus reticulatus* (Shuttleworth ex Chapman) Small – S; = *A. cuneata* Shuttleworth ex A. Gray] {synonymy incomplete}



Asimina spatulata (Kral) D.B. Ward, Slimleaf Pawpaw. Dry pinelands, dry maritime forests. S. SC south to n. FL, west to Panhandle FL and s. AL; disjunct in Charleston County, SC (Gramling 2010, as *A. angustifolia*; P. McMillan, pers.comm. 2004). [= *Asimina longifolia* Kral var. *spatulata* Kral – FNA, X, Z; < *Pityothamnus angustifolius* (Rafinesque) Small – S; < *A. angustifolia* Rafinesque – K, WH, Y]

Asimina triloba (Linnaeus) Dunal, Common Pawpaw, Indian-banana. Alluvial forests, other moist, nutrient-rich forests. March-May; August-October. NJ, w. NY, and s. ON west to s. MI and e. NE, south to Panhandle FL, s. LA, and ne. TX. [= RAB, C, F, FNA, G, K, S, W, WH, X, Y, Z]

22. CALYCANTHACEAE Lindley 1819 (Sweet-shrub Family) [in LAURALES]

A family of 4 genera and about 8 species, shrubs and trees, of temperate e. China, temperate e. North America, temperate w. North America, and tropical ne. Australia. References: Nicely (1965); Wood (1958); Li et al. (2004); Kubitzki in Kubitzki, Rohwer, & Bittrich (1993).

Calycanthus Linnaeus 1759 (Sweet-shrub)

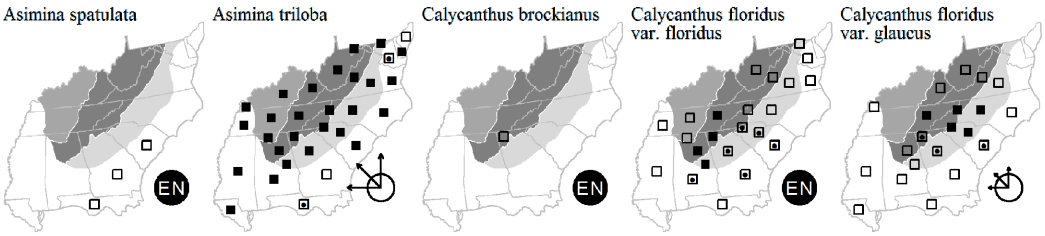
A genus of 2-4 species, 1 (or 2) of e. North America, 1 of w. North America, and 1 of China (the latter sometimes segregated as a separate genus, *Sinocalycanthus*). References: Johnson in FNA (1997); Kubitzki in Kubitzki, Rohwer, & Bittrich (1993); Nicely (1965)=Z; Ferry & Ferry (1987)=Y.

1 Tepals pale yellowish-green; seeds ca. 6 mm in diameter, with short, curved hairs.....***C. brockianus***
1 Tepals reddish brown; seeds ca. 10 mm in diameter, with long, straighter hairs.....***C. floridus***

Calycanthus brockianus Ferry & Ferry, Brock's Sweet-shrub. Moist slopes. Endemic to mesic hardwood forests in GA. Its taxonomic validity is uncertain and controversial. [= *C. brockiana* – K, Y, orthographic variant; < *C. floridus* Linnaeus var. *floridus* – FNA]

Calycanthus floridus Linnaeus, Sweet-shrub, Strawberry-shrub, Carolina Allspice, Sweet Bubby-bush. Forested slopes and streambanks. April-May; August-September. PA, WV, and KY, south to GA, nw. FL, AL, and s. MS. Two varieties have

traditionally been recognized, var. *floridus* with pubescent twigs, petioles, and leaf undersurfaces, and var. *glaucus* with glabrous (or sparsely pubescent) twigs, petioles, and leaf undersurfaces. They have broadly overlapping distributions and variable characters and seem best considered as taxonomically uninformative variation. The natural original distribution is somewhat unclear, because of extensive cultivation for centuries. [> *C. floridus* Linnaeus var. *floridus* – FNA, GW, K, RAB, Y, Z; > *C. floridus* Linnaeus var. *glaucus* (Willdenow) Torrey & A. Gray – C, FNA, K, Y; < *C. floridus* Linnaeus var. *floridus* – FNA; > *C. floridus* var. *laevigatus* (Willdenow) Torrey & A. Gray – GW, RAB, Z; > *C. floridus* – F; > *C. floridus* – S; > *C. mohrii* Small – S; > *C. fertilis* Walter – F, G; > *C. fertilis* – S; > *C. nanus* Loiseleur – S; > *C. floridus* var. *oblongifolius* (Nuttall) Boufford & Spongberg]



28. LAURACEAE A.L. de Jussieu 1789 (Laurel Family) [in LAURALES]

A family of about 50 genera and 2500-3500 species, trees and shrubs, of tropical, subtropical, and (rarely) warm temperate regions. *Laurus nobilis* Linnaeus, Laurel, Bay, native to the Mediterranean region of Europe and the bay leaf of commerce; planted as an ornamental and spice, especially in warmer parts of our area, but is not known to escape in our area. References: van der Werff in FNA (1997); van der Werff & Richter (1996); Rohwer in Kubitzki, Rohwer, & Bittrich (1993).

1 Leaves evergreen; flowers perfect; [tribe *Perseeae*].
  2 Leaves glabrous, bright green, with yellow callosities in the principal vein axils; crushed leaves with the odor of camphor ..... ***Cinnamomum***
  2 Leaves pubescent to glabrate, dark green, without yellow callosities in the principal vein axils; crushed leaves with the odor of bay..... ***Persea***
1 Leaves deciduous; flowers imperfect; [tribe *Laureae*].
  3 Some of the leaves with 1-2 (-5) rounded lobes; small to medium trees..... ***Sassafras***
  3 None of the leaves lobed; medium to large shrubs.
    4 Leaves 4-16 cm long, 2-6 cm wide, obovate, ovate, or broadly elliptic ..... ***Lindera***
    4 Leaves 1.2-4 cm long, 0.5-1.5 (-1.9) cm wide, narrowly elliptic ..... ***Litsea***

Cinnamomum Schaeff 1760 (Cinnamon)

A genus of about 350 species, trees and shrubs, of e. and se. Asia, Oceania, and tropical America. References: Rohwer in Kubitzki, Rohwer, & Bittrich (1993); van der Werff in FNA (1997).

* ***Cinnamomum camphora*** (Linnaeus) J. Presl, Camphortree. Disturbed areas, suburban woodlands, increasingly in natural forests; native of e. Asia. April-May. A serious invasive, especially southward. Reported as escaped and apparently naturalized in South Carolina by Hill & Horn (1997). In NC, reported for Moore County. [= FNA, K, WH; = *Camphora camphora* (Linnaeus) Karsten – S]

Lindera Thunberg 1783 (Spicebush, Benzoin)

A genus of about 100 species, trees and shrubs, of tropical and temperate Asia, Australia, and e. North America. References: Wofford (1983)=Z; Wofford in FNA (1997); Steyermark (1949); McCartney, Wurdack, & Moore (1989); Rohwer in Kubitzki, Rohwer, & Bittrich (1993).

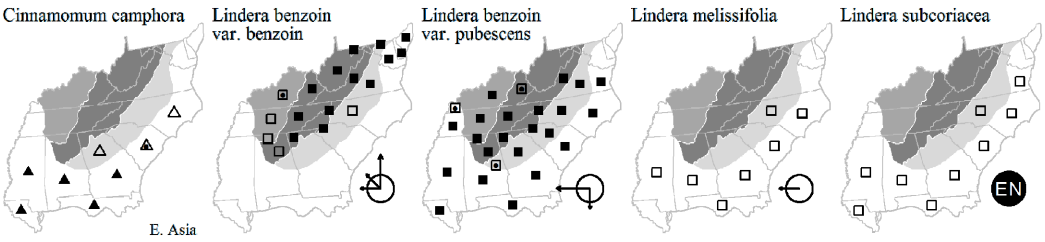
1 Leaves typically with a thick, subcoriaceous texture (though sometimes thinner in texture if growing in shade), 4-8 cm long, 2-3.5 cm wide, narrowly obovate to oblanceolate, pubescent and strongly whitened below; leaves and bark aromatic, the odor lemony ..... ***L. subcoriacea***
1 Leaves with a thin, membranous texture, 6-16 cm long, 2-6 cm wide, obovate, elliptic, or ovate, glabrous to pubescent below, but not strongly whitened; leaves and bark strongly aromatic, the odor spicy or like sassafras.
  2 Leaf base cuneate; leaves widely obovate, plane (not rugose), with a short-acuminate apex, glabrous above, borne horizontally, spicy-fragrant when crushed; shrubs not colonial, often multi-stemmed from base, short to tall (to 5 m tall) ..... ***L. benzoin***
  2 Leaf base widely cuneate to rounded; leaves narrowly ovate, reticulate-rugose, with an acute apex, pubescent above, drooping, fragrant when crushed with an odor like sassafras; shrubs colonial, short (to 2 m tall)..... ***L. melissifolia***

Lindera benzoin (Linnaeus) Blume, Northern Spicebush. Rich alluvial forests, mesic forests on slopes with circumneutral soils, bottomlands, swamps. March-April; August-September. ME, s. ON, and MI, south to Panhandle FL and e. TX; disjunct in Edwards Plateau of c. TX. Where occurring on upland slopes, *L. benzoin* is an excellent indicator of base-rich soils, generally derived from calcareous sedimentary rocks or mafic metamorphic or igneous rocks. Some floristic treatments recognize two varieties based on whether the leaves and young twigs are pubescent (var. *pubescens*) or not (var. *benzoin*) but the varieties so recognized overlap broadly in distribution; it seems best to regard this as mere variation within the species. [= FNA, GW, RAB, W,

WV, Z; > *L. benzoin* var. *benzoin* – C, F, G, K; > *L. benzoin* (Linnaeus) Blume var. *pubescens* (Palmer & Steyermark) Rehder = C, F, G, K; < *L. benzoin* – RAB, FNA, GW, W, WV, Z; = *Benzoin aestivale* (Linnaeus) Nees – S]

Lindera melissifolia (Walter) Blume, Southern Spicebush, Pondberry. Wet flats and depressions, generally with pocosin shrubs. March-April; August-September. This species is southern in range, with a very scattered distribution in se. and c. NC, e. SC, e. & sw. GA, nw. FL, sw. AL (?), nw. MS, se. MO-AR, and se. AR-LA (recent collections unknown from FL and LA). It is nearly extirpated in NC, currently known only from three populations, in Sampson, Bladen, and Cumberland counties. A historic record from Orange County, NC (in the lower Piedmont), collected by Elisha Mitchell in 1820 and 1822, appears to be bonafide (McVaugh, McVaugh, & Ayers 1996). [= FNA, K, WH, Z; = *L. melissaefolia* – RAB, F, GW, orthographic variant; = *Benzoin melissaefolium* (Walter) Nees – S]

Lindera subcoriacea B.E. Wofford, Bog Spicebush. Peaty seepage bogs in headwaters of blackwater streams, in the sandhills and immediately adjacent Piedmont, with other pocosin shrubs. March-April; July-August. The overall range of this newly described species is still poorly known; it appears to be a Southeastern Coastal Plain endemic, ranging from se. VA (perhaps s. NJ) south to FL and west to LA. Occurring in our area primarily in a scattering of small populations in the fall line Sandhills of NC and SC, with an outlier or two in "Piedmont pocosins" just west of the Sandhills. Distinctive characteristics of sun-grown plants include the rounded apex of the leaf, the leaf strongly whitened beneath and borne in an ascending to even appressed position in relation to the twigs, and a typically fastigiate or virgate branching pattern, with multiple stems or branches ascending vertically and nearly parallel to one another. Shade plants have a different form. [= FNA, K, Z; < *L. benzoin* – WH]



Litsea Lamarck 1792 (Pondspice)

A genus of about 400 species, trees and shrubs, of warm temperate and tropical areas, especially se. Asia and Australia. The genus is very heterogeneous and probably needs division into more natural groups. References: van der Werff in FNA (1997); Rohwer in Kubitzki, Rohwer, & Bittrich (1993).

Litsea aestivalis (Linnaeus) Fernald, Pondspice. Margins of limesink ponds and Carolina bays, less commonly in wet depressions and wet stringers dominated by shrubs. March-April; May-June. A Southeastern Coastal Plain endemic: e. MD (Wicomico County) and se. VA (York and Isle of Wight counties) south to n. FL (and allegedly also in LA, based on an old and poorly labeled specimen). The fine, zigzag twigs are distinctive. It grows to 6 m tall, characteristically forming a rounded bush. [= RAB, F, FNA, GW, K, WH]

Persea P. Miller 1754 (Bay)

A genus of about 150-200 species, trees and shrubs, of Asia and America. The avocado is a member of this genus, *Persea americana* P. Miller. References: Wofford in FNA (1997); Godfrey (1988); Clewell (1985); Rohwer in Kubitzki, Rohwer, & Bittrich (1993).

1 Twigs glabrous or glabrate; lower surfaces of leaves with minute, silvery to shining-golden hairs (the color depending on age), appressed to the surface; peduncles 1-3 cm long; leaves tending to be smaller and blunter ..... ***P. borbonia***
1 Twigs densely rusty-pubescent; lower surfaces of leaves with longer, rusty, often crooked hairs, not appressed, especially evident along the midrib and principal veins; peduncles 4-7 cm long; leaves tending to be larger and more acute ..... ***P. palustris***

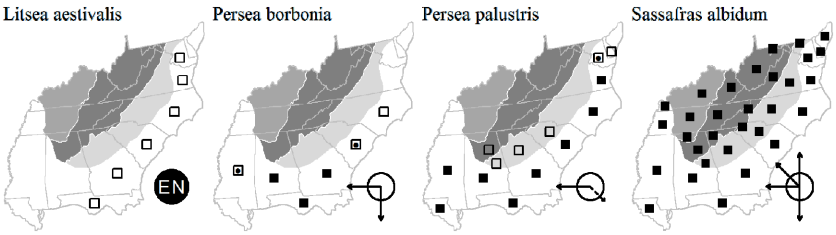
Persea borbonia (Linnaeus) Sprengel, Red Bay. Dunes, maritime forests, in dry sandy soils on barrier islands, known only north to Carteret County, NC. May-June; September-October. E. NC (Carteret County) south to FL and west to se. TX; reports of the species north of NC are based on the inclusion of *P. palustris* in a broadly defined *P. borbonia*, or are simply in error, based on less hairy plants of *P. palustris*. This species is rare north of Florida and becoming rarer with the destruction of most maritime and near coastal upland forests for the construction of vacation homes and tourist accomodations. [= FNA, G, GW, K, WH; < *P. borbonia* – RAB, F (also see *P. palustris*); = *Tamala borbonia* (Linnaeus) Rafinesque – S; = *P. borbonia* var. *borbonia*]

Persea palustris (Rafinesque) Sargent, Swamp Bay. Swamps, pocosins, bay forests, maritime forests, generally in wet peaty soils, but also in fairly dry, sandy soils in maritime forests. May-June; September-October. A Southeastern Coastal Plain endemic: DE, e. MD, and se. VA south to FL and west to se. TX; also in the Bahamas. Though variable in amount of hairs on the leaves, the hairs of *P. palustris* are always of a distinctly different character than those of *P. borbonia*. [= C, FNA, G, GW, K, WH; < *P. borbonia* – RAB, F; = *Tamala pubescens* (Pursh) Small – S; = *P. borbonia* var. *pubescens* (Pursh) Little]

Sassafras Presl 1825 (Sassafras)

A genus of 3 species, trees, of temperate e. Asia (2 species) and e. North America (1 species). References: van der Werff in FNA (1997); Rohwer in Kubitzki, Rohwer, & Bittrich (1993).

Sassafras albidum (Nuttall) Nees, Sassafras. A wide variety of forests, old fields, disturbed areas, fencerows. March-April; June-July. S. ME, s. ON, MI, and s. WI, south to c. peninsular FL, s.AL, s. MS, and se. TX. The original source of "root beer." [= RAB, C, FNA, G, K, W, WH; > *S. albidum* var. *molle* (Rafinesque) Fernald – F, WV; > *S. albidum* var. *albidum* – F, WV]



SECTION 5: MONOCOTYLEDONAE (MONOCOTS)

29. ACORACEAE Martinov 1820 (Calamus Family) [in ACORALES]

The family consists only of *Acorus*. Although traditionally treated as part of the Araceae, a wide variety of morphological, anatomical, and embryological evidence supports the segregation of the Acoraceae (Grayum 1987), a segregation additionally supported by molecular studies (Duvall et al. 1993, Chase et al. 1993). The spathe in *Acorus* is not morphologically equivalent to the spathe of the Araceae. References: Thompson in FNA (2000); Bogner & Mayo in Kubitzki (1998b).

Acorus Linnaeus 1753 (Calamus, Sweetflag)

A genus of 2-4 species, widespread in north temperate and subtropical regions. References: Thompson in FNA (2000); Grayum 1987; Haines (2000).

1 Midvein of the leaves not well-developed, about equally as prominent as 1-5 well-developed lateral veins; mature fruits produced; vegetative leaves (0.3-) avg. 0.8 (-1.3) cm wide ..... ***A. americanus***
1 Midvein of the leaves well-developed, distinctly more prominent than the lateral veins (though there are better-developed lateral veins, they are distinctly less prominent than the midvein); mature fruits not produced; vegetative leaves (0.5-) avg. 1.2 (-2.0) cm wide ..... ***A. calamus***

Acorus americanus (Rafinesque) Rafinesque, American Calamus, Sweetflag. Marshes, wet meadows, other wet areas, limey seeps. May-June. Widespread in ne. North America. This species is apparently a fertile diploid. Because this species has not generally been recognized in floras, its distribution is poorly known; additional distributional records should be expected and sought. [= FNA, K; < *A. calamus* Linnaeus – RAB, C, F, G, GW; < *A. americanus* – W]

* ***Acorus calamus*** Linnaeus, European Calamus, Sweetflag. Marshes, wet meadows, other wet areas; native of Eurasia, now widespread in e. North America. May-June. The aromatic rhizome and leaves have been used medicinally and candied as a confection. Populations of *A. calamus* in our area are apparently sterile triploids introduced from Europe, though diploid and tetraploid populations of *A. calamus* are known from Asia. [= FNA, K; < *A. calamus* Linnaeus – RAB, C, F, G, GW (also see *A. americanus*); < *A. americanus* – W]

30. ARACEAE A.L de Jussieu 1789 (Arum Family) [in ALISMATALES]

A family of about 100-110 genera and about 3000-4000 species, herbs and reduced aquatic herbs, cosmopolitan, but mostly tropical and subtropical. The Lemnaceae is phylogenetically embedded in the Araceae, and is here included in it as subfamily Lemnoideae (Angiosperm Phylogeny Group 1998, 2003; Keating 2004). References: Thompson in FNA (2000); Cusimano et al. (2011); Mayo, Bogner, & Boyce in Kubitzki (1998b); Keating (2004); Serviss, McDaniel, & Bryson (2000); Landolt in FNA (2000); Landolt (1980); Landolt (1986); Landolt in Kubitzki (1998b); Les & Crawford (1999); Bown (2000).

1 Plant a floating aquatic (or stranded), the individual leaves <2 cm long; [subfamily *Lemnoideae*].
  2 Fronds rootless; fronds without nerves; reproductive pouch 1, terminal.
    3 Fronds thick, globoid, < 2 mm long ..... ***6. Wolffia***
    3 Fronds flat, elongate and curved, 4-14 mm long ..... ***7. Wolffiella***
  2 Fronds with roots; fronds with 1 or more nerves; reproductive pouches 2, lateral.
    4 Roots 1 per frond; fronds with 1-5 (-7) nerves ..... ***4. Lemna***
    4 Roots (1-) 2-21 per frond; fronds with (3-) 5-21 nerves.
      5 Roots (1-) 2-7 (-12) per frond; fronds with (3-) 5-7 nerves; fronds 1.5-3× as long as wide; all of the roots perforating the scalelike leaflet ..... ***5. Landoltia***
      5 Roots 7-21 per frond; fronds with 7-16 (-21) nerves; fronds 1-1.5× as long as wide; only some of the roots perforating the scalelike leaflet (borne on the underside) ..... ***3. Spirodela***
1 Plant terrestrial, rooted in wetlands, or a floating aquatic (if a floating aquatic – *Pistia* – the individual leaves > 2 cm long).
  6 Plant a floating aquatic, with gray-green, velvety, cabbage-like leaves; [subfamily *Aroideae*, tribe *Pistieae*] ..... ***11. Pistia***
  6 Plant rooted (even when growing in water), the leaves various, but not as above.
    7 Leaves compound; [subfamily *Aroideae*, tribe *Arisaemateae*].
      8 Bulblets lacking on the petiole; spadix free from the spathe; [native, common in our area] ..... ***13. Arisaema***
      8 Bulblets present at base and summit of the petiole; spadix fused to the spadix; [alien, rare] ..... ***14. Pinellia***
    7 Leaves simple.
      9 Leaves peltate and cordate-hastate; [subfamily *Aroideae*, tribe *Colocasieae*] ..... ***12. Colocasia***
      9 Leaves not peltate, either cuneate, rounded, cordate, or hastate.
        10 Spathe absent or obscure; leaf blade 2.5-4× as long as wide, cuneate at the base, lanceolate or narrowly elliptic; leaf venation parallel; [subfamily *Orontioideae*, tribe *Orontieae*] ..... ***1. Orontium***
        10 Spathe present, surrounding the spadix, at least at its base; leaf blade 1-2.5× as long as wide, either hastate at the base (*Arum*, *Peltandra*, and *Xanthosoma*), or rounded (*Symplocarpus*), or cordate (*Calla*), broadly ovate in outline.
          11 Spathe white; leaves cordate; plants from elongate rhizomes; [MD northward]; [subfamily *Calloideae*] ..... ***8. Calla***
          11 Spathe green or white; leaves hastate or rounded at base; plants from fibrous roots, a short thick rhizome, tuber, or a corm; [collectively widespread].
            12 Leaves ovate, rounded or subcordate at the base; spathe purple, or purple flecked with white; [subfamily *Orontioideae*, tribe *Symplocarpeae*] ..... ***2. Symplocarpus***
            12 Leaves hastate at the base (somewhat arrowhead-shaped); spathe green or white; [subfamily *Aroideae*].

13 Larger leaf blades > 5 dm long; longer petioles 10-20 dm long; [subfamily *Aroideae*, tribe *Caladieae*] ..... ***9. Xanthosoma***
13 Larger leaf blades < 5 dm long; longer petioles < 7 dm long.
14 Plant from a horizontal tuber; leaves variegated; [alien, of moist soils]; [subfamily *Aroideae*, tribe *Areae*] ..... ***15. Arum***
14 Plant from fibrous roots; leaves not variegated; [native, of wetlands]; [subfamily *Aroideae*, tribe *Peltandreae*] ..... ***10. Peltandra***

1. Orontium Linnaeus 1753 (Golden Club)

A monotypic genus, an aquatic herb, of e. North America. References: Thompson in FNA (2000); Mayo, Bogner, & Boyce in Kubitzki (1998b).

Orontium aquaticum Linnaeus, Golden Club, Bog Torches, Never-wet. Generally in peaty and stagnant water, such as beaver ponds, blackwater streams, swamps, pools in low pocosins, streambeds in the Piedmont, bogs and swamps in the mountains. March-April. MA and c. NY south to s. FL and west to LA, north in the inland to w. NC, KY, and WV, primarily but by no means strictly Coastal Plain. Fresh leaves are unwettable, silvery-glistening when forced under water. [= RAB, C, F, FNA, G, GW, K, S, W, WH, WV]

2. Symplocarpus R.A. Salisbury ex Nuttall 1818 (Skunk Cabbage)

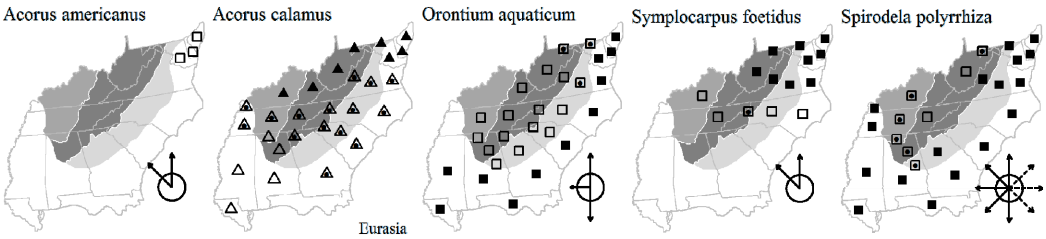
A genus of 3 species, of north temperate e. North America and ne. Asia. References: Thompson in FNA (2000); Mayo, Bogner, & Boyce in Kubitzki (1998b).

Symplocarpus foetidus (Linnaeus) Salisbury ex W.P.C. Barton, Skunk Cabbage. Seepage-fed bogs and nonalluvial swamps. January-March; July-September. NS and s. QC west to MN, south to n. NC, ne. TN, s. OH, and IL. [= RAB, C, F, FNA, G, GW, K, W, WV; = *Spathyema foetida* (Linnaeus) Rafinesque – S]

3. Spirodela Schleiden 1839

A genus of 2 species (with *Landoltia* removed), cosmopolitan. References: Landolt in FNA (2000); Landolt (1980)=Z; Landolt (1986)=Y; Landolt in Kubitzki (1998b); Les & Crawford (1999)=X. [also see *Landoltia*]

Spirodela polyrrhiza (Linnaeus) Schleiden, Greater Duckweed, Minnow-fole. Still to slowly moving waters of ponds, lakes, beaver ponds, and swamps. Widespread worldwide. [= RAB, FNA, K, X, Y, Z; = *S. polyrhiza* – C, F, G, GW, S, W, WH, WV, orthographic variant]



4. Lemna Linnaeus 1753 (Duckweed)

A genus of 13 species, cosmopolitan. References: Landolt (1980)=Z; Landolt (1986)=Y; Landolt in Kubitzki (1998b); Landolt in FNA (2000). Key adapted closely from Landolt (1980, 1986) and Landolt in FNA (2000).

1 Margin of fronds denticulate in the distal portion; fronds narrowed basally to an elongated, persistent, green stalk, the fronds therefore cohering in long, often branched chains of 3-50 fronds; fronds submerged (except when flowering or fruiting); [section *Hydrophylla*] ..... ***L. trisulca***
1 Margin of fronds entire; fronds rounded basally, with a very small white stipe soon decaying, the fronds therefore cohering in simple clusters of 2-5; fronds normally floating.
2 Fronds with (0-) 1 nerve; anthocyanin absent in fronds (fronds green); [section *Uninerves*].
3 Fronds 1-2× as long as wide; nerve indistinct to fairly prominent, reaching at most 2/3 of the distance from node to apex (nerve about as long as or shorter than the aerenchymatous portion of the frond); fruit 0.6-1.0 mm long ..... ***L. minuta***
3 Fronds 1.3-3× as long as wide; nerve mostly prominent, reaching at least 3/4 of the distance from node to apex (nerve longer than the aerenchymatous portion of the frond); fruit 1.0-1.35 mm long ..... ***L. valdiviana***
2 Fronds with 3-5 (-7) nerves; anthocyanin absent or present in fronds (fronds green or red).
4 Root sheath winged at the base; root tip sharply pointed; roots not longer than 3 cm long; anthocyanin absent in fronds; [section *Alatae*].
5 Seeds with 8-26 prominent ribs, brownish, falling from the fruit when ripe; fronds with only 1 papilla above the node, which is smaller than the papule at the apex; wing of the root sheath 1-2.5× as long as wide ..... ***L. aequinoctialis***
5 Seeds with 35-70 obscure ribs, whitish, remaining in the fruit when ripe; fronds very often with 2-3 papilla above the node, which are larger than the papule at the apex; wing of the root sheath 2-3× as long as wide ..... ***L. perpusilla***

4 Root sheath not winged at the base; root tip mostly rounded; roots often longer than 3 cm long; anthocyanin present or absent in fronds; [section *Lemna*].
6 Plants forming small, olive-brown rootless turions, 0.8-1.6 mm in diameter, which sink to the bottom ..... ***L. turionifera***
6 Plants without distinct turions.
7 Fronds not reddish on the lower surface (or if so only slightly so and much less so than on the upper surface); greatest spacing of veins near the middle of the frond or towards its base ..... ***L. minor***
7 Fronds often reddish on the lower surface (and more intensely so than on the upper surface); greatest spacing between the veins near the middle of the frond or towards its tip.
8 Fronds often gibbous; fronds with very distinct papillae above the node and near the apex on the upper surface, but not between the node and the apex; seeds with 10-16 distinct ribs ..... ***L. obscura***
8 Fronds flat; fronds with mostly distinct papillae on the midline on the upper surface; seeds with 3-60 indistinct ribs ..... ***L. turionifera***

Lemna aequinoctialis Welwitsch, Lesser Duckweed. Still to slowly moving waters of ponds, lakes, beaver ponds, and swamps. Widespread worldwide, except in n. North America and n. Eurasia. [= FNA, K, WH, Y, Z]

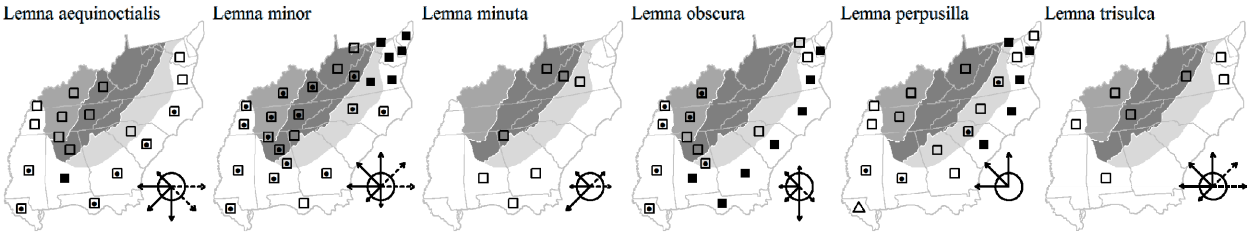
Lemna minor Linnaeus, Common Duckweed. Still to slowly moving waters of ponds, lakes, beaver ponds, and swamps. Widespread in the Northern Hemisphere; scattered in the Southern Hemisphere, where perhaps in part introduced. [= FNA, K, WH, Y, Z; < *L. minor* – RAB, C, F, G, W, WV (also see *L. obscura*)]

Lemna minuta Kunth, Least Duckweed. Quiet waters, seepages. Widespread in North America, Central America, and South America; more local in Europe and Japan. [= C, FNA, K, WH; = *L. valdiviana* Philippi var. *abbreviata* Hegelmann – F; = *L. minuscula* Herter – Y, Z]

Lemna obscura (Austin) Daubs, Little Duckweed. Still to slowly moving waters of ponds, lakes, beaver ponds, and swamps. NY west to MN and NE, south to s. FL, TX, Mexico, and the Bahamas. [= FNA, K, WH, Y, Z; < *L. minor* – RAB, C, F]

Lemna perpusilla Torrey, Tiny Duckweed. Still to slowly moving waters of ponds, lakes, beaver ponds, and swamps. QC west to MN, south to NC, TN, and TX. [= RAB, C, F, FNA, G, K, W, Y, Z]

Lemna trisulca Linnaeus, Star Duckweed, Ivy-leaved Duckweed. Still to slowly moving waters of ponds, lakes, beaver ponds, and swamps. Widespread in the Northern Hemisphere; scattered in the Southern Hemisphere. [= C, F, FNA, G, K, W, Y, Z]



Lemna turionifera Landolt, Turion Duckweed, Red Duckweed. Mesotrophic to eutrophic, quiet waters. Circumboreal, in North America from NL (Newfoundland) west to AK, south to c. PA (Rhoads & Klein 1993), WV, KY, n. AL (FNA), TX, NM, AZ, and CA. [= FNA, K; < *L. minor* Linnaeus – C]

Lemna valdiviana Philippi, Pale Duckweed. Still to slowly moving waters of ponds, lakes, beaver ponds, and swamps. Widespread in North America, Central America, and South America. [= RAB, C, FNA, G, K, W, WH, WV, Y, Z; = *L. valdiviana* var. *valdiviana* – F]

5. Landoltia D.H. Les & D.J. Crawford (Duckmeat)

A monotypic genus, now cosmopolitan. References: Landolt in FNA (2000); Landolt (1980)=Z; Landolt (1986)=Y; Landolt in Kubitzki (1998b); Les & Crawford (1999)=X.

* ***Landoltia punctata*** (G.F.W. Meyer) D.H. Les & D.J. Crawford, Dotted Duckmeat. Still to slowly moving waters of ponds, lakes, beaver ponds, and swamps; native of the Southern Hemisphere. Widespread worldwide. An introduced aquarium plant. Les & Crawford (1999) make a good case for recognition of this species in the monotypic genus *Landoltia*, very possibly more closely related to *Lemna* than to *Spirodela*. [= FNA, X; = *Spirodela punctata* (G.F.W. Meyer) C.H. Thompson – C, GW, K, Y, Z; = *Spirodela oligorrhiza* (Kurz) Hegelmann – RAB, F, G]

6. Wolffia Horkel ex Schleiden 1844 (Watermeal, Mud-mary, Rootless-duckweed)

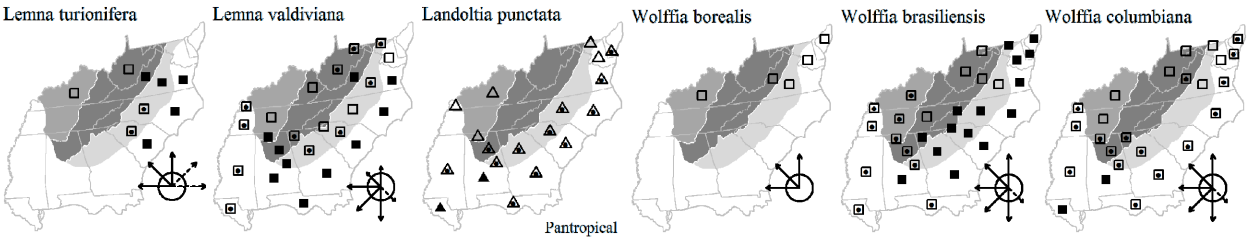
A genus of 11 species, cosmopolitan. References: Landolt in FNA (2000); Landolt (1980)=Z; Landolt (1986)=Y; Landolt in Kubitzki (1998b).

1 Fronds globoid to ovoid, 1-1.5× as deep as wide; thallus not brownish punctate above
2 Fronds 1.0-1.3× as long as wide, 0.4-1.2 mm wide ..... ***W. columbiana***
2 Fronds 1.3-2.0× as long as wide, 0.3-0.5 mm wide ..... ***W. globosa***
1 Fronds nutshell-like, 0.5-1.0× as deep as wide; thallus punctate above with brownish pigment cells (most visible on dead fronds).
3 Frond 1.3-2.0× as long as wide, the upper side slightly convex, with an upward point apically ..... ***W. borealis***
3 Frond 1.0-1.5× as long as wide, the upper side with a prominent papilla centrally ..... ***W. brasiliensis***

Wolffia borealis (Engelmann) Landolt, Northern Watermeal. Still to slowly moving waters of ponds, lakes, beaver ponds, and swamps. QC west to BC, south to PA, VA (?), KY, TN, MO, and CA. The occurrence in VA is uncertain. [= FNA, K, Y, Z; = *W. punctata* Grisebach – C, F, G, GW, misapplied; < *Bruneria punctata* (Grisebach) Nieuwland – S, misapplied]

Wolffia brasiliensis Weddell, Brazilian Watermeal. Still to slowly moving waters of ponds, lakes, beaver ponds, and swamps. Widespread in e. North America, Central America, and South America. [= FNA, K, W, WH, Y, Z; = *W. papulifera* C. Thompson – RAB, C, F, G, GW; < *Bruneria punctata* (Grisebach) Nieuwland – S; = *Wolffia punctata* – WV]

Wolffia columbiana Karsten, Colombian Watermeal. Still to slowly moving waters of ponds, lakes, beaver ponds, and swamps. Widespread in North America, Central America, and South America. [= RAB, C, F, FNA, G, GW, K, WH, Y, Z; = *Bruneria columbiana* (Karsten) Nieuwland – S]



* ***Wolffia globosa*** (Roxburgh) den Hartog & Plas, Asian Watermeal. Still to slowly moving waters of ponds, lakes, beaver ponds, and swamps; native of Asia. [= FNA]

7. Wolffiella Hegelmann 1895

A genus of 10 species, cosmopolitan. References: Landolt in FNA (2000); Landolt (1980)=Z; Landolt (1986)=Y; Landolt in Kubitzki (1998b).

1 Fronds (4-) 6-15 (-20)× as long as wide; angle of pouch 25-50° ..... ***W. gladiata***
1 Fronds 1.5-8× as long as wide; angle of pouch 45-90° ..... ***W. oblonga***

Wolffiella gladiata (Hegelmaier) Hegelmaier, Mud-midgets. Ponds, ditches, beaver-ponds millponds. April-June. MA and n. IL (s. WI?) south to s. FL and TX; Mexico. [= FNA, K, WH, Y, Z; > *Wolffiella floridana* (Donnell-Smith) C. Thompson – RAB, C, F, G, GW, S; > *W. gladiata* – GW]

Wolffiella oblonga (Philippi) Hegelmaier. Quiet waters. N. peninsular FL, MS (?), LA, TX, south to Mexico, Central America, South America; West Indies. [= FNA, GW, K, WH]

8. Calla Linnaeus 1753 (Calla)

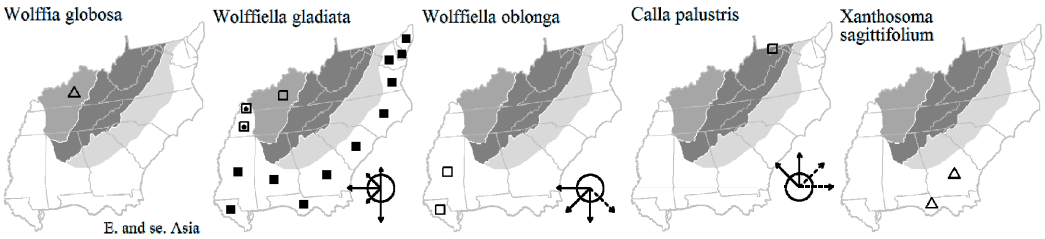
A monotypic genus, of circumboreal distribution. References: Thompson in FNA (2000); Mayo, Bogner, & Boyce in Kubitzki (1998b).

Calla palustris Linnaeus, Wild Calla, Water-arum. Swamps. A circumpolar species of seepage swamps, ranging south in North America to sw. PA, w. MD, n. IL, c. MN, and BC. [= C, F, FNA, G, K]

9. Xanthosoma Schott 1832

A genus of about 60 species, herbs, of tropical Central and South America. References: Mayo, Bogner, & Boyce in Kubitzki (1998b); Serviss, McDaniel, & Bryson (2000)=Z.

* ***Xanthosoma sagittifolium*** (Linnaeus) Schott, Elephant-ear. Ditches; native of tropical America. It can be seen in ditches adjacent to ornamental plantings; it is uncertain whether it can be considered naturalized in the more northern parts of our area. It is superficially similar to *Colocasia*, differing in its non-peltate leaves. [= K, WH, Z; = *Xanthosma sagittifolium* – GW, orthographic error]



10. Peltandra Rafinesque 1819 (Arrow-arum)

A genus of 2 species, endemic to e. North America. References: Thompson in FNA (2000); Blackwell & Blackwell (1974)=Z; Mayo, Bogner, & Boyce in Kubitzki (1998b).

Identification notes: *Peltandra* is often confused in vegetative condition with *Pontederia* and *Sagittaria*, superficially similar emergent aquatics with hastate or sagittate leaves. *Peltandra* leaves have pinnate venation, a prominent midvein, a prominent vein running parallel to the leaf margin, and the hastate lobes with rounded to acute apices. *Pontederia* leaves have parallel venation, lack a prominent midvein and a prominent vein parallel to the leaf margin, and have hastate lobes with broadly rounded apices. The leaves of sagittate species of *Sagittaria* have parallel venation, a prominent midrib, a vein at 90 degrees to the midrib at the junction of the main blade and each of the hastate lobes that forks, with at least one fork directed apically and at least one fork directed into the basal lobe, lack a prominent vein parallel to the margin, and have hastate-sagittate lobes with acuminate apices.

1 Spathe green at base, bright white above (the white portion not merely a margin), flared open and therefore only loosely surrounding the spadix, succulent below, the white portion thin and herbaceous, the margins generally nearly entire and plane; fruits red; distal portion of leaf blade lacking broad, coarse veins similar to the midvein (all the veins alike and fine)..... ***P. sagittifolia***
1 Spathe green (rarely with a narrow cream-colored or whitish margin up to 1.7 cm wide), tightly surrounding the spadix, thick and succulent throughout, the margins crisped; fruits green to dark purplish-green; distal portion of leaf blade often with several broad, coarse veins similar to the midvein, the remainder of the veins fine (sometimes the distal portion of the leaf with fine veins only)..... ***P. virginica***

Peltandra sagittifolia (Michaux) Morong, Spoonflower, White Arrow-arum. Pocosins of the outer Coastal Plain, sphagnous swamps. July-August. A Southeastern Coastal Plain endemic: e. NC south to c. peninsular FL and west to se. LA. The reduction of *P. sagittifolia* to a subspecies of *P. virginica* (Blackwell & Blackwell 1974) was based on confusion of true *P. sagittifolia* with forms of *P. virginica*. The two species are distinct. [= FNA, GW, K, WH; = *P. sagittaefolia* (Michaux) Morong – RAB (an orthographic variant); = *P. glauca* (Elliott) Feay – S; = *P. virginica* ssp. *luteospadix* (Fernald) Blackwell & Blackwell – Z]

Peltandra virginica (Linnaeus) Schott, Green Arrow-arum, Tuckahoe. Marshes, bogs, beaver ponds, pocosins, other stagnant, aquatic situations. May-June. ME, s. QC, and n. MI south to s. FL and e. TX. [= RAB, C, FNA, G, GW, K, S, W, WH; > *P. virginica* – F; > *P. luteospadix* Fernald – F; > *P. virginica* ssp. *virginica* – Z]

11. Pistia Linnaeus 1753 (Water Lettuce)

A genus of probably a single species, widespread in the tropics of both hemispheres. References: Thompson in FNA (2000); Mayo, Bogner, & Boyce in Kubitzki (1998b).

Pistia stratiotes Linnaeus, Water Lettuce. Stagnant or slow-moving waters of rivers, sometimes cultivated in ponds, where it persists for a while (presumably eventually eliminated by cold winters). This floating aquatic, pantropically distributed, appeared in the Waccamaw River of SC (downstream from NC) in 1990 and 1991, apparently successfully overwintering (Nelson 1993). Further south it is variously and paradoxically considered as native and a noxious water-weed. Its occurrence as a naturalized component of GA's flora is undocumented; it is at least present as a cultivated plant in water gardens and presumably escapes. The original distribution is unclear. [= FNA, GW, K, S, WH]

12. Colocasia Schott 1832 (Elephant's-ear, Taro, Dasheen)

A genus of about 8 species, of tropical Asia. References: Thompson in FNA (2000); Mayo, Bogner, & Boyce in Kubitzki (1998b); Serviss, McDaniel, & Bryson (2000)=Z.

* ***Colocasia esculenta*** (Linnaeus) Schott, Elephant's-ear, Taro, Dasheen. Ditches, shores, bottomland hardwood forests; native of the Tropics. Frequently planted for its "tropical" appearance, becoming naturalized, for instance at Lake Waccamaw, Columbus County, NC, where it grows scattered along much of the shoreline, spread by fragments of rhizome. In our area, it is generally infertile. In the Tropics, *Colocasia* is a food crop cultivated for its rhizomes and shoots. The rhizomes are the source of "poi," a starchy staple of the Hawaiian Islands. See Serviss, McDaniel, & Bryson (2000) for a discussion of various varieties cultivated in the southeastern United States, their identification, and their weediness. [= FNA, GW, K, WH; > *C. antiquorum* Schott – S; > *C. esculenta* var. *antiquorum* (Schott) Hubb. & Rehder – Z; > *C. esculenta* var. *esculenta* – Z]

13. Arisaema Martius 1831 (Jack-in-the-pulpit, Indian-turnip)

A genus of about 150-170 species, of Asia, e. North America, e. Africa, and Arabia. Some of the taxa here recognized as subspecies of *A. triphyllum* might better be considered as species with relatively subtle morphological distinctions. They are broadly sympatric, and sometimes occur together in mixed populations with little sign of introgression or hybridization. Ssp. *triphyllum* is tetraploid and does not produce fertile seed when crossed with the other (diploid) subspecies (Treiber 1980). References: Thompson in FNA (2000); Huttleston (1981)=Z; Treiber (1980)=Y; Huttleston (1949)=X; Gusman & Gusman (2002)=Q; Renner, Zhang, & Murata (2004); Mayo, Bogner, & Boyce in Kubitzki (1998b). Key based on the references.

1 Leaf with (5-) 7-15 leaflets, arranged pedately on a semicircular axis; spadix 9-20 cm long, attenuate, long-exserted from the spathe; [section *Tortuosa*] ..... ***A. dracontium***
1 Leaf with 3-5 leaflets, arranged palmately; spadix 3.5-8 cm long, clavate or cylindrical and blunt, included in the spathe; [section *Pedatisecta*].
  2 Leaves glaucous beneath at maturity; spathe flange 2-9 mm broad; spathe hood green, or green with purple stripes; sterile spadix (appendix) clavate or cylindrical.

3 Lateral leaflets (of primary leaf if more than one) 2-parted or 2-lobed (rarely unlobed); sterile spadix 1-3 mm in diameter, cylindrical, curved outward; spathe hood green ..... ***A. triphyllum*** *ssp.* ***quinatum***

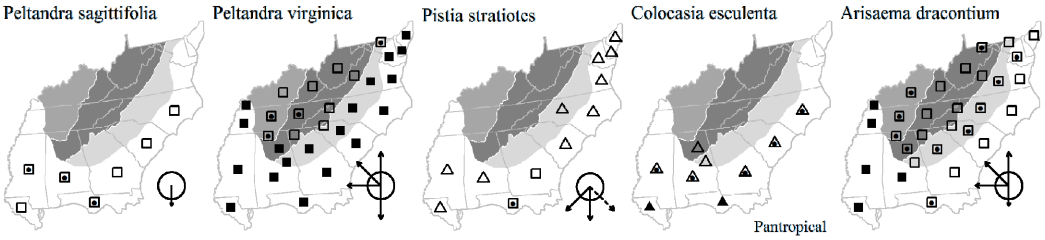
3 Lateral leaflets (of primary leaf if more than one) undivided (rarely lobed); sterile spadix 4-10 mm in diameter, clavate, straight; spathe hood green, or green striped with purple ..... ***A. triphyllum*** *ssp.* ***triphyllum***

2 Leaves green beneath at maturity (very rarely glaucous); spathe flange 1-3 mm broad; spathe hood green with white stripes, green with purple stripes, solid green, or solid purple; sterile spadix (appendix) cylindrical.

4 Spathe tube not fluted (rarely weakly fluted); spathe hood solid green or solid purple ..... ***A. triphyllum*** *ssp.* ***pusillum***

4 Spathe tube strongly fluted; spathe hood green with white or purple stripes..... ***A. triphyllum*** *ssp.* ***stewardsonii***

Arisaema dracontium (Linnaeus) Schott, Green Dragon. Bottomlands and floodplains. May; July. S. QC, MI, and WI, south to n. peninsular FL and e. TX. [= RAB, C, F, FNA, G, GW, K, Q, W, WH; = *Muricauda dracontium* (Linnaeus) Small – S]



Arisaema triphyllum (Linnaeus) Schott *ssp.* ***pusillum*** (Peck) Huttleston, Small Jack-in-the-pulpit. Swamps and moist forests. March-May. CT, NY, and IN, south to FL and LA. This taxon is diploid (2n=28). [= K, X, Z; < *A. triphyllum* – RAB, F, FNA, GW, W, WH; = *A. triphyllum* var. *pusillum* Peck – C, G; > *A. pusillum* (Peck) Nash – S; > *A. acuminatum* Small – S; < *A. triphyllum* ssp. *pusillum* – Q, Y (also see ssp. *quinatum*); = ***A. pusillum*** (Peck) Nash]

Arisaema triphyllum (Linnaeus) Schott *ssp.* ***quinatum*** (Nuttall) Huttleston, Southern Jack-in-the-pulpit, Preacher John. Mesic forests. March-April. Sc. NC, sw. NC, se. TN south to Panhandle FL and e. TX. This taxon is of uncertain validity; Treiber lumps it with ssp. *pusillum*, while Huttleston recognizes it as a full species (Huttleston 1949) or as a subspecies (Huttleston 1981). This taxon is diploid (2n=28). [= K, Z; < *A. triphyllum* – RAB, FNA, W; = ***A. quinatum*** (Nuttall) Schott – GW, S, WH, X; < *A. triphyllum* ssp. *pusillum* – Q, Y; ? *A. polymorphum* Buckley]

Arisaema triphyllum (Linnaeus) Schott *ssp.* ***stewardsonii*** (Britton) Huttleston, Bog Jack-in-the-pulpit. Bogs and peaty swamps. April-May. NS west to MN, south to w. NC, e. TN, and n. IN (Treiber 1980). This subspecies is the most northern, and also has the most distinctive habitat, being restricted to distinctly wet, peaty sites. This taxon is diploid (2n=28). [= K, Q, X, Y, Z; < *A. triphyllum* – RAB, FNA, GW, W; = *A. triphyllum* var. *stewardsonii* (Britton) G.T. Stevens – C, G; = ***A. stewardsonii*** Britton – F]

Arisaema triphyllum (Linnaeus) Schott *ssp.* ***triphyllum***, Common Jack-in-the-pulpit. Mesic forests. March-April. NB west to se. MB, south to FL, LA, and e. TX (Treiber 1980). This taxon is tetraploid (2n=56). [= K, Q, X, Y, Z; < *A. triphyllum* – RAB, FNA, GW, W, WH; = *A. triphyllum* var. *triphyllum* – C; > *A. triphyllum* – F; > *A. atrorubens* (Aiton) Blume – F; = ***A. triphyllum*** – S]

14. Pinellia Tenore 1839 (Pinellia)

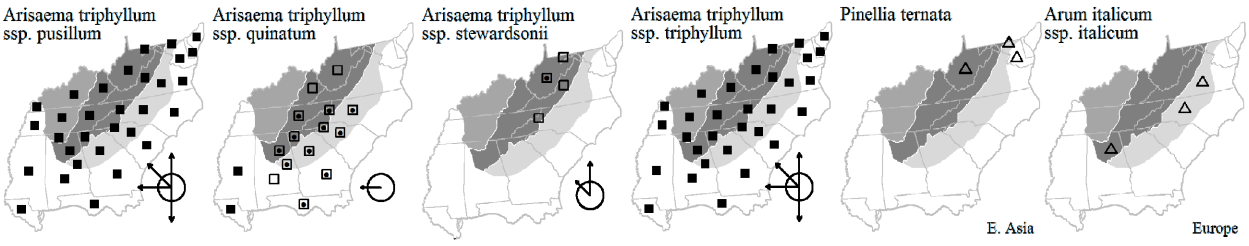
A genus of about 6 species, herbs, of temperate e. Asia. References: Thompson in FNA (2000); Mayo, Bogner, & Boyce in Kubitzki (1998b).

* ***Pinellia ternata*** (Thunberg) Makino ex Breitenbach, Pinellia. Suburban woodlands; native of Japan. Introduced from Japan and rarely naturalized, at least in the northern portion of our area, as in DC, se. PA, NJ, and s. NY. [= C, F, FNA, G, K]

15. Arum Linnaeus 1753 (Arum)

A genus of about 26 species, of temperate Eurasia. References: Thompson in FNA (2000); Boyce (1993)= Z; Linz et al. 2010); Mayo, Bogner, & Boyce in Kubitzki (1998b).

* ***Arum italicum*** Linnaeus *ssp.* ***italicum***, Arum. Suburban woodlands; native of Europe and n. Africa, weakly naturalizing from horticultural use. It has a large (> 10 cm long) white spathe. Reported for Fairfax County, VA (Steury 2010). [= Z; < *A. italicum* – FNA]



31. TOFIELDIACEAE Takhtajan 1994 (False-asphodel Family) [in ALISMATALES]

A family of 5 genera and about 30 species, of disjunct distribution in north temperate and subarctic areas, and in the Guayana Shield and northern Andes areas of n. South America. Reveal & Zomlefer (1998) place the Tofieldiaceae in the monotypic order Tofieldiales, only distantly related to the Liliaceae. Tamura in Kubitzki (1998a) treats this group as subfamily Tofieldioideae of the Nartheciaceae. References: Zomlefer (1997c, 1999); Tamura in Kubitzki (1998a).

1 Inflorescence 1-flowered; tepals yellow; seeds yellowish; [endemic to Panhandle FL] ..... ***Harperocallis***
1 Inflorescence a raceme or thyrse; tepals white to pale cream (fading to yellowish on dried specimens); seeds brown; [collectively widespread].
  2 Bracts of the inflorescence large, spathelike, acuminate-aristate at the tip; tepals 9-17 mm long; stamens (6-) 9 (-12)..... ***Pleea***
  2 Bracts of the inflorescence minute; tepals 2.5-5 mm long; stamens 6.
    3 Inflorescence a raceme (the flower pedicels attached to the scape singly); scape smooth; flowering (late August-) late September-October ..... ***Tofieldia***
    3 Inflorecence a thyrse (flower pedicels attached to the scape in groups of 3-7); scape scurfy-scabrous; flowering June-August ... ***Triantha***

Harperocallis McDaniel 1968 (Harper's Beauty)

A monotypic genus, perennial, of southeastern United States. References: McDaniel (1968)=Y; Zomlefer (1997c)=Z; Utech & Anderson in FNA (2002a).

Harperocallis flava McDaniel, Harper's Beauty. Pineland bogs, nearby road margins. Endemic to FL Panhandle (Franklin, Liberty, and Bay counties) (Keppner & Anderson 2008). [= FNA, K, Y, WH, Z]

Pleea Michaux 1803 (Rush-featherling)

A monotypic genus, of se. North America, sometimes included in *Tofieldia*. References: Zomlefer (1997c)=Z; Tamura in Kubitzki (1998a); Packer in FNA (2002a).

Pleea tenuifolia Michaux, Rush-featherling. Locally abundant in wet savannas, pocosin margins, usually in peaty soil, locally abundant in a few counties in se. NC, rare inland (very rarely as far as Cumberland County, NC). September-October; October-November. A Southeastern Coastal Plain endemic: se. NC and ne. SC south to sw. GA, n. FL and s. AL, but apparently absent from s. SC and ne. GA. When in flower in wet savannas and powerline rights-of-way in Brunswick County, *Pleea* visually dominates areas up to hundreds of hectares. In sterile condition, it is recognizable by its leathery equitant leaves, bright red at their bases. [= RAB, FNA, GW, K, S, WH; = *Tofieldia tenuifolia* (Michaux) Utech – Z]

Tofieldia Hudson 1778 (Bog Asphodel)

A genus of about 7-8 species, of temperate to subarctic North America and Eurasia. There is controversy about the circumscription of *Tofieldia*.relative to the related genera *Pleea* and *Triantha* (here recognized, but sometimes subsumed into *Tofieldia*). Some believe that *Tofieldia*, *Triantha*, and *Pleea* should be treated together in a broadly circumscribed *Tofieldia* (Utech 1978, Zomlefer 1997c); others that all three should be treated separately (Ambrose 1980; Packer 1993; Cruden 1991). Packer in FNA (2002a) has recently recognized *Triantha*, *Pleea*, and *Tofieldia* as separate genera, a conclusion followed here in part because of the ancient, relictual nature of these units. References: Zomlefer (1997c)=Z; Packer (1993); Ambrose (1980); Utech (1978); Hitchcock (1944)=Y; Tamura in Kubitzki (1998a); Packer in FNA (2002a); Cruden (1991).

Identification notes: In sterile condition, *Tofieldia glabra* can be distinguished from *Iris verna* by its minutely upwardly-scabrous margins (*Iris* has smooth margins).

Tofieldia glabra Nuttall, Carolina Bog Asphodel, White Asphodel. Savanna-pocosin ecotones, wet savannas, seepage bogs. (Late August-) late September-October; October-November. Endemic to the Coastal Plain (including Sandhills) of NC and northern SC; reports from GA are dubious. [= RAB, FNA, GW, K, S, Z]

Triantha (Nuttall) Baker (Bog Asphodel)

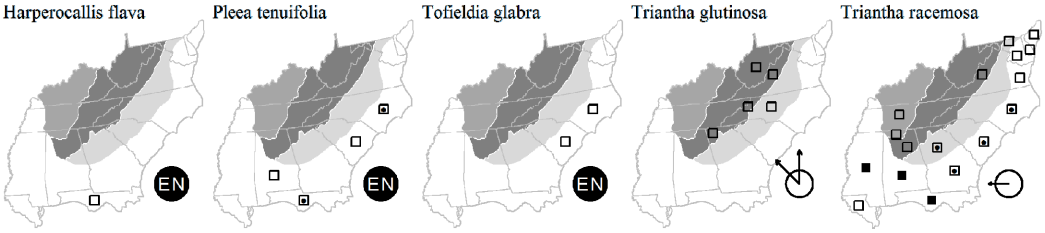
A genus of ca. 4 species, herbs, of North America and Japan. References: Zomlefer (1997c)=Z; Hitchcock (1944)=Y; Cruden (1991).

1 Perianth equal to or longer than the capsule; seeds with tails 1/2 or less as long as the body..... ***Tr. racemosa***
1 Perianth shorter than the capsule; seeds with at least 1 tail equal to or longer than the body ..... ***Tr. glutinosa***

Triantha glutinosa (Michaux) Baker, Northern Bog Asphodel, Sticky Bog Asphodel. Bogs and seeps, especially over mafic or calcareous rocks. July-August; September-October. NL (Newfoundland) west to BC, south to w. NC, ne. GA (Jones & Coile 1988), WV, OH, n. IN, WI, MT, and OR. [= FNA, K, S; = *Tofieldia racemosa* var. *glutinosa* (Michaux) Ahles – RAB; = *Tofieldia glutinosa* (Michaux) Persoon – F, G, GW, W, WV; > *Tofieldia glutinosa* ssp. *glutinosa* – Y, Z; > *Tofieldia glutinosa* var. *glutinosa* – C]

Triantha racemosa (Walter) Small, Southern Bog Asphodel, Coastal Plain Bog Asphodel. Savannas, savanna-pocosin ecotones, seepage bogs, sinkhole ponds (dolines) in the mountains of VA. June-early August; late September-October. NJ south

to nw. FL, west to e. TX; disjunct in c. TN. [= FNA, K, S; = *Tofieldia racemosa* var. *racemosa* – RAB; = *Tofieldia racemosa* (Walter) Britton, Sterns, & Poggenburg – C, F, G, GW, W, WH, Z]



32. ALISMATACEAE Ventenat 1799 (Water-plantain Family) [in ALISMATALES]

A family of about 12 genera and 80 species, herbs, subcosmopolitan in distribution. References: Haynes & Hellquist in FNA (2000); Rogers (1983); Haynes, Les, & Holm-Nielsen in Kubitzki (1998b).

1 Pistils in a single whorl, borne on a flat receptacle; stamens 6; inflorescence compound, many of the primary nodes bearing whorled branches which in turn bear whorled branches or whorled flowers .....***Alisma***
1 Pistils spiraled in several to many whorls, borne on a globose receptacle; stamens 6-many; inflorescence racemose (or in some species of both *Echinodorus* and *Sagittaria* somewhat compound, with the lowermost node or two bearing branches which in turn bear whorled flowers).
  2 Achenes turgid, with ribs or ridges; flower whorls subtended by 3 bracts and additional bracteoles .....***Echinodorus***
  2 Achenes flattened, with winged margins and often also with irregular corky ornamentations on the faces; flower whorls subtended by 3 bracts, with no additional bracteoles .....***Sagittaria***

Alisma Linnaeus 1753 (Water-plantain)

A genus of about 9 species, herbs, subcosmopolitan in distribution. References: Haynes & Hellquist in FNA (2000); Haynes, Les, & Holm-Nielsen in Kubitzki (1998b).

1 Leaf blades 2.7-5× as long as wide (or even narrower on submerged leaves), tapering at the base; petals pink, 2.3-3.7 mm long; achene with a dorsal ridge flanked by two dorsal grooves .....***A. gramineum***
1 Leaf blades 1.3-2.5 (2.7)× as long as wide, rounded to subcordate at the base; petals white, **either** 1.8-2.5 mm **or** 3.8-4.5 mm long; achene with a single dorsal groove.
  2 Petals 1.8-2.5 mm long, 1.4-2.0 mm wide.....***A. subcordatum***
  2 Petals 3.8-4.5 mm long, 3.0-3.9 mm wide.....***A. triviale***

Alisma gramineum Lejeune, Grassleaf Water-plantain. In seasonally flooded areas in impoundments. June-August. This species is circumboreal, ranging in North America south to e. VA, NY, WI, MO, NM, and CA. The occurrence of this species in our area may be the result of dispersal by waterfowl; first reported for our area by Wieboldt et al. (1998). [= C, F, FNA, K; < *A. plantago-aquatica* Linnaeus var. *americanum* J.A. Schultes – G]

Alisma subcordatum Rafinesque, Southern Water-plantain. Marshes, ponds, stream edges. April-November. MA west to ND, south to GA and TX. [= RAB, C, F, FNA, G, GW, K, S, W, WV; = *A. plantago-aquatica* Linnaeus ssp. *subcordatum* (Rafinesque) Hultén; *A. plantago-aquatica* var. *parviflorum* (Pursh) Torrey]

Alisma triviale Pursh, Northern Water-plantain. Marshes and swamps. NL (Newfoundland) west to AK, south to s. NJ, s. PA, OH, IN, AR, OK, NM, AZ, CA, and n. Mexico (and according to Fernald to MD and WV). [= C, F, FNA, K, WV; < *A. plantago-aquatica* Linnaeus var. *americanum* J.A. Schultes – G]

Echinodorus L.C. Richard ex Engelmann 1848 (Burhead)

A genus of about 27 species, herbs, primarily of the American tropics and subtropics. References: Haynes & Hellquist in FNA (2000); Haynes, Les, & Holm-Nielsen in Kubitzki (1998b).

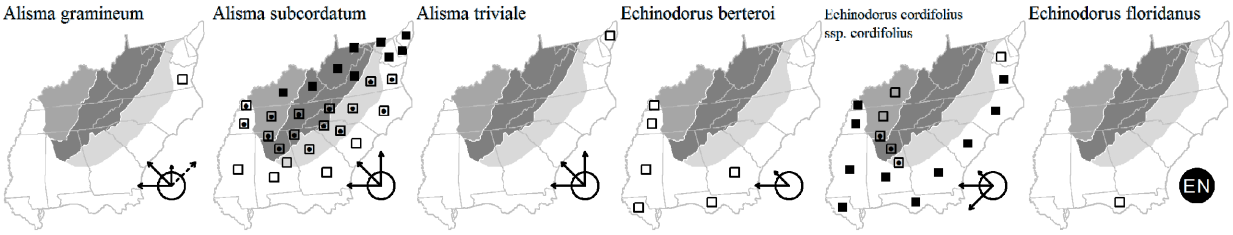
1 Leaf blades 1-3 cm long, 0.2-2 cm wide; achenes 10-20 per head; stamens 6 or 9; petals 1-3 mm long; scapes 5-10 cm tall, erect; [subgenus *Helanthium*].....***E. tenellus***
1 Leaf blades 5-20 cm long, 3-15 cm wide; achenes 40 or more per head; stamens ca. 21; petals 6-12 mm long, scapes 20-120 cm tall, erect or arching/reclining; [subgenus *Echinodorus*].
  2 Scapes arching and rooting down at maturity; veins of the sepals papillose-roughened ..... ***E. cordifolius ssp. cordifolius***
  2 Scapes rigidly erect at maturity; veins of the sepals smooth.
    3 Stamens 9-15; plants to 70 cm tall .....***E. berteroi***
    3 Stamens 21; plants to 200 cm tall ..... ***E. floridanus***

Echinodorus berteroi (Sprengel) Fassett, Tall Burhead. Ponds, marshes, ditches. OH, IL, and ND south to e. Panhandle FL, sw. GA, and TX. [= FNA, K, WH; > *E. berteroi* var. *lanceolatus* (Engelmann ex S. Watson & Coulter) Fassett – C; = *E. cordifolius* – S, misapplied; ? *E. rostratus* (Nuttall) Engelmann – GW] {synonymy}

Echinodorus cordifolius (Linnaeus) Grisebach *ssp.* ***cordifolius***, Creeping Burhead. Swamps, ditches, wet thickets, especially on base-rich substrates, such as over calcareous or mafic rocks. June-November. MD south to c. peninsular FL, west

to TX, south into tropical America, and north in the interior (primarily in the Mississippi Embayment) to s. IL. [= FNA; < *E. cordifolius* – RAB, F, G, GW, K, WH; = *E. cordifolius* var. *cordifolius* – C; = *E. radicans* (Nuttall) Engelmann – S]

Echinodorus floridanus R.R. Haynes & J.R. Burkhalter, Florida Burhead. Swamps. A recently named endemic, known only from Escambia County, FL. [= FNA, K, WH]



Echinodorus tenellus (Martius) Buchenau, Mud-babies, Dwarf Burhead. On drawdown zones of Coastal Plain ponds, pineland ponds, blackwater riverbanks, or ponds in the Mountains with Coastal Plain affinities (Augusta County, VA). MA west to MN, south to c. peninsular FL and e. TX, but widely scattered and disjunct in that range. See Belden et al. (2004) for a discussion of the species in Virginia. [= FNA, G, K, WH; > *E. parvulus* Engelmann – G, GW; > *E. tenellus* (Martius) Buchenau var. *parvulus* (Engelmann) Fassett – C; > *Helanthium parvulum* (Engelmann) Britton – S]

Sagittaria Linnaeus 1753 (Arrowhead)

A genus of about 25 species, herbs, primarily of the Americas. References: Haynes & Hellquist in FNA (2000); Bogin (1955)=Z; Wooten (1973)=Y; Beal, Wooten, & Kaul (1982)=X; Sorrie, Keener, and Edwards (2007); Preston & Adams (1961); Haynes, Les, & Holm-Nielsen in Kubitzki (1998b).

Identification notes: Portions of this key (and treatment) are provisional. The taxonomy and best characters to use in the linear-leaved species is particularly problematic.

1 Leaf blades sagittate or cordate (at least some of the leaves on a plant with sagittate or cordate basal lobes; some species are keyed both here and below).
2 Leaf blades pubescent; [subgenus *Sagittaria*] ..... ***S. latifolia*** *var.* ***pubescens***
2 Leaf blades glabrous.
3 Sepals appressed in fruit; lower flowers perfect, the stamens either functional or not; stamen filaments roughened with minute scales (except glabrous in *S. spatulata*); [subgenus *Lophotocarpus*].
4 Leaves primarily phyllodial, lanceolate or spatulate (sagittate leaves rare in the population and few on a given plant); flowers in 1-2 (-3) whorls; stamen filaments glabrous (use 10×); [native, of tidal marshes] ..... ***S. spatulata***
4 Leaves primarily sagittate (phyllodial leaves rare in the population and few on a given plant); flowers in 3-12 whorls; stamen filaments roughened with minute scales (use 10×); [**either** introduced aliens, sometimes in tidal marshes, **or** native, found in inland alkaline sites].
5 Petals white, immaculate; stamens of pistillate flowers functional; [of inland sites, native or introduced at a given locality] ..... ***S. calycina***
5 Petals white, with a purple spot at the base; stamens of pistillate flowers generally nonfunctional; [exotic, introduced around coastal ports] ..... ***S. montevidensis***
3 Sepals reflexed or at least widely spreading in fruit; lower flowers pistillate; stamens glabrous (except roughened with minute scales in *S. rigida*); [subgenus *Sagittaria*].
6 Leaves cordate basally, floating; stalks of the pistillate flowers stout, reflexed in fruit; stamens mostly fewer than 15 ..... ***S. filiformis***
6 Leaves sagittate basally, emersed; stalks of the pitillate not notably stout, ascending in fruit; stamens 15 or more.
7 Beak of the achene lateral (at a right angle to the long axis of the achene); bracts of the inflorescence 2-14 mm long, boat-shaped, obtuse or broadly acute.
8 Lowermost (pistillate) flowers on long pedicels (at least 20 mm), the pedicels of the lowermost flowers longer than those in whorls above; inflorescence normally not bent; stamen filaments glabrous ..... ***S. latifolia*** *var.* ***latifolia***
8 Lowermost (pistillate) flowers sessile or on short pedicels (to 5 mm or rarely 10 mm long), the pedicels of the lowermost flowers notably shorter than those in whorls above; inflorescence normally bent at the lowest whorl of flowers; stamen filaments minutely roughened with minute scales ..... ***S. rigida***
7 Beak of the achene terminal (extending along the long axis of the achene; bracts of the inflorescence 5-40 mm long, either blunt or acuminate, not boat-shaped.
9 Bracts of the inflorescence thick and herbaceous, 5-25 mm long, rounded at the tip; flowers in 2-4 whorls; achenes with facial resin-ducts; [of acidic, blackwater habitats of the Coastal Plain] ..... ***S. engelmanniana***
9 Bracts of the inflorescence papery and tan, 7-40 mm long, acuminate at the tip; flowers in 5-12 whorls; achenes without resin-ducts; [primarily of other habitats, commectively widespread].
10 Petiole sharply 5-wing-angled in cross-section; inflorescence unbranched; fruiting heads 1.0-1.5 cm in diameter, globular ..... ***S. australis***
10 Petiole corrugated but not wing-angled in cross-section; inflorescence often branched at the base; fruiting heads (1.2-) 1.7-2.2 cm in diameter, often globular-depressed ..... ***S. brevirostra***
1 Leaf blades linear or lanceolate, or modified as linear, bladeless phyllodia, these often of spongy texture.
11 Stalks of the pistillate flowers reflexed in fruit, often stout; stamen filaments glabrous (except roughened with minute scales in *S. platyphylla* and *S. calycina*).
12 Sepals appressed in fruit; lower flowers perfect, the stamens either functional or not; [subgenus *Lophotocarpus*].
13 Leaves generally primarily sagittate (phyllodial leaves generally rare in the population); flowers in 3-12 whorls; stamen filaments roughened with minute scales (use 10× magnification); [of inland alkaline sites] ..... ***S. calycina***

13 Leaves primarily phyllodial, lanceolate or spatulate (sagittate leaves rare in the population and few on a given plant); flowers in 1-2 (-3) whorls; stamen filaments glabrous (use 10× magnification); [of tidal marshes] ..... ***S. spatulata***

12 Sepals reflexed or at least widely spreading in fruit; lower flowers pistillate; [subgenus *Sagittaria*].

14 Plant generally with erect, emersed leaves with well-developed blades with firm texture, the blades lanceolate, elliptic, or ovate, 2-8 cm wide; stamen filaments roughened with minute scales ..... ***S. platyphylla***

14 Plant with all leaves phyllodial, if expanded at the summit, the expanded blade of weak texture, floating.

15 Leaves 2-10 (-30) cm long, 3-8 mm wide (sometimes with dilated tip to 20 mm wide); [of tidal, fresh to brackish waters] ..... ***S. subulata***

15 Leaves 30-300 (or more) cm long, **either** 1-3 **or** 7-14 mm wide; [of nontidal waters].

16 Leaves very variable from population to population, in swiftly flowing black water typically about 100 cm long and 1-3 mm wide, in more stagnant water (or when emersed by dropping water levels, typically with lax petioles and floating blades, the blades lanceolate, or elliptic, the base cuneate, rounded, or cordate; [of blackwater streams and ponds, MA south to FL, west to s. AL] ..... ***S. filiformis***

16 Leaves 100-300 (or more) cm long, 7-14 mm wide; [of springs and spring-runs, endemic to FL] ..... ***S. kurziana***

11 Stalks of the pistillate flowers ascending or spreading in fruit, not notably stout; stamen filaments roughened with minute scales (except glabrous in *S. engelmanniana* and *S. papillosa*).

17 Stamen filaments linear, less thick than the anther, changing little in diameter from near base to near summit.

18 Leaves all phyllodial, without flattened blades; bracts of the inflorescence strongly papillose; [of s. MS westwards] ..... ***S. papillosa***

18 Leaves with flattened blades; bracts of the inflorescence smooth, papillose, or longitudinally striate; [collectively widespread]

19 Bracts of the inflorescence firm in texture, smooth; stamen filaments glabrous; [of inland acidic wetlands] ..... ***S. engelmanniana***

19 Bracts of the inflorescence either papillose or longitudinally striate-ribbed; stamen filaments roughened with minute scales; [of estuarine areas and associated nontidal wetlands].

20 Bracts and sepals striate-ribbed; stamen filaments 2-5 mm long; [rare, from e. SC southward] ..... ***S. lancifolia*** *var.* ***lancifolia***

20 Bracts and sepals papillose; stamen filaments 1.5-3.5 mm long; [common, throughout our coastal area] ..... ***S. lancifolia*** *var.* ***media***

17 Stamen filaments **either** distinctly dilated toward the base (often broadly conic) **or** thickened throughout, the filament (at least basally) as thick or thicker than the anther.

21 Lowermost (pistillate) flowers sessile or on short pedicels (to 5 mm or rarely 10 mm long); inflorescence normally bent at the lowest whorl of flowers ..... ***S. rigida***

21 Lowermost (pistillate) flowers on longer pedicels; inflorescence normally not bent.

22 Leaves all phyllodia, the phyllodia terete or nearly so.

23 Phyllodia of emersed flowering plants elongate (1/2-1× as long as scape), slender, emersed or laxly ascending and submersed in water; phyllodia of stranded flowering plants elongate (1/3-1× as long as scape, but may be shorter), relatively stiff; [of se. NC and southward] ..... ***S. isoetiformis***

23 Phyllodia of emersed flowering plants short (2-8 cm), very thick, deeply submersed; when plants are stranded, phyllodia of stranded flowering plants elongate (1/2-1× as long as scape), slender, stiffly erect; [of DE-MD and northward] ..... ***S. teres***

22 Leaves with blades and petioles, or if all phyllodia, the phyllodia flattened on upper surface or triangular in cross-section; [collectively widespread].

24 Plants with corms and/or stolons, lacking coarse rhizomes.

25 Blades of emersed leaves lanceolate, narrowly spatulate, > 5 mm wide; [of Mountain and upper Piedmont bogs, swamp forests, and adjacent ditches] ..... ***S. fasciculata***

25 Blades of emersed leaves linear (< 3 mm wide, rarely to 4 mm) or phyllodial; [coastal plain depression ponds and impoundments]

26 Achenes 1.5-2.0 (-2.5) mm long; achene faces with 3 or more keels and 2 or more resin ducts; inflorescence bracts connate for > 50% of length; [of se. NC and southward] ..... ***S. isoetiformis***

26 Achenes (2.2-) 2.4-3.0 mm long; achene faces with 2-3 keels and 1-2 resin ducts; inflorescence bracts connate for < 40% of length; [restricted to Sandhills region of NC and SC, likely in e GA] ..... ***S. macrocarpa***

24 Plants with coarse rhizomes, lacking corms and stolons.

27 Abaxial wing of fruit scalloped or toothed; [plants of n. AL and nw. GA] ..... ***S. secundifolia***

27 Abaxial wing of fruit entire; [plants collectively widespread].

28 Larger phyllodes 0.8-2.5 cm wide, the apices blunt (rarely acute); longer pistillate pedicels 2-5 (-6.5) cm long; median resin duct of mature achene linear, about as wide as the posterior duct (or ducts absent) ..... ***S. weatherbiana***

28 Larger phyllodes to 1 cm wide (except sometimes wider in *S. chapmanii*), the apices avute; longer pistillate pedicels 1-4 cm long; median resin duct of mature achene club-shaped and 2× the diameter of the posterior duct.

29 Inflorescence branched at the base (in at least some plants of a population); bracts of the inflorescence only slightly connate, the free tips narrowly triangular, 6-15 mm long ..... ***S. chapmanii***

29 Inflorescence unbranched at the base; bracts of the inflorescence slightly to almost fully connate ..... ***S. graminea***

Sagittaria australis (J.G. Smith) Small. Marshes, swamps, margins of ponds and lakes. June-October. NY west to s. IN and se. MO, south to SC, Panhandle FL, and MS. [= C, F, FNA, K, W, WV, X; > *S. australis* – S; > *S. longirostra* – S, misapplied; = *S. longirostra* – RAB, misapplied; = *S. engelmanniana* J.G. Smith ssp. *longirostra* – G, GW, Z, misapplied]

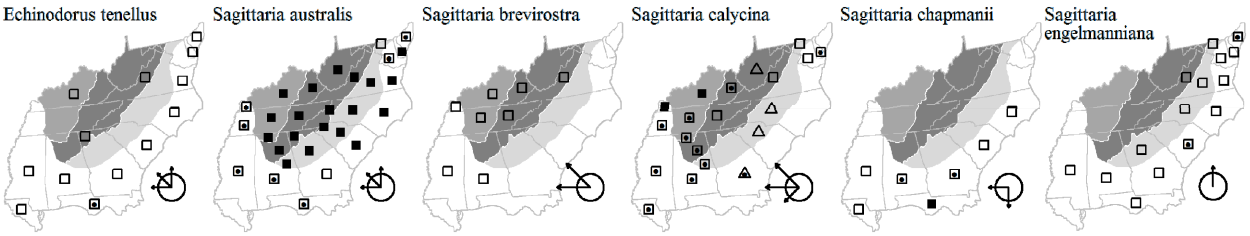
Sagittaria brevirostra Mackenzie & Bush, Midwestern Arrowhead. {habitat}. June-October. OH west to ND, south to w. VA, e. TN, AL, and TX. [= C, F, FNA, K, W, X; = *S. engelmanniana* J.G. Smith ssp. *brevirostra* (Mackenzie & Bush) Bogin – G, Z]

Sagittaria calycina Engelmann. Ponds. May-September. N. OH and MI west to SD and CO, south to sw. VA, c. TN, LA, TX, and Mexico; disjunct in CA. Presumably only introduced in NC and SC. First reported for SC by Hill & Horn (1997). [= RAB, C, W; = *Lophotocarpus calycinus* (Engelmann) J.G. Smith – F, WV; = *S. montevidensis* Chamisso & Schlechtendahl ssp. *calycina* (Engelmann) Bogin – FNA, G, GW, Z; > *S. calycina* var. *calycina* – K, WH]

Sagittaria chapmanii (J.G. Smith) C. Mohr, Chapman's Arrowhead. Limesink (doline) ponds with drawdown hydrology, mucky ditches. May-September. Se. NC south to s. FL, west to LA, AR, and TX (Sorrie & LeBlond 2008). First reported for SC by Nelson & Kely (1997), and for AR, LA, and TX by Sorrie & LeBlond (2008). Analyses of allozyme variation in the *S. graminea* complex revealed great differentiation between *S. graminea*, *S. chapmanii*, and *S. platyphylla*; *S. graminea* and *S. platyphylla* appeared to be more closely related to one another than either was to *S. chapmanii* (Hauber & Legé 1999).

Therefore, it seems best to treat these three taxa at equal rank and at the species level. [= S; = *S. graminea* Michaux ssp. *chapmanii* (J.G. Smith) R.R. Haynes & C.B. Hellquist – FNA; = *S. graminea* Michaux var. *chapmanii* J.G. Smith – GW, K, WH, Y; = *S. graminea* Michaux var. *chapmani* J.G. Smith – Z, orthographic variant]

Sagittaria engelmanniana J.G. Smith. Blackwater streambanks, sphagnum bogs, pocosins, beaver ponds. June-October. MA and NY south to n. FL and s. MS, primarily on the Coastal Plain. [= RAB, C, F, FNA, K, W, X; = *S. engelmanniana* ssp. *engelmanniana* – G, GW, Z]



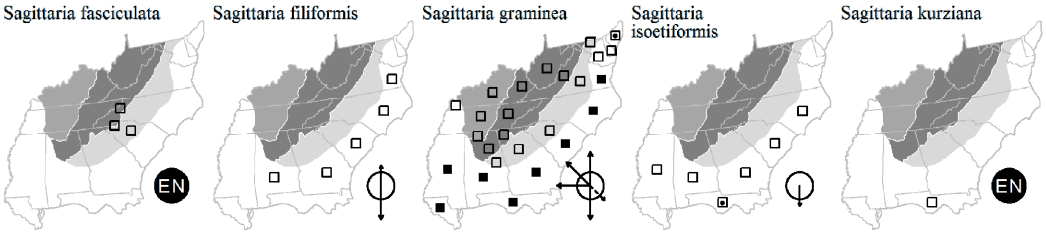
Sagittaria fasciculata E.O. Beal, Bunched Arrowhead. Bogs, ditches adjacent to drained bogs, wooded seepage areas. May-July. Endemic to a several-county area in sw. NC and nw. SC, where most of its former habitat has been drained. [= RAB, FNA, GW, K, W, Y; = *S. macrocarpa* J.G. Smith – S, misapplied; < *S. graminea* Michaux var. *macrocarpa* (J.G. Smith) Bogin – Z, mostly misapplied]

Sagittaria filiformis J.G. Smith. Swiftly flowing water of blackwater rivers and streams, blackwater lake shores. May-September. As conceived here, probably ranging from MA south to FL and s. AL. The forms growing in swiftly flowing black water are remarkable and unlikely to be recognized as a *Sagittaria* unless in flower, with linear leaves over 100 cm long and only 1-3 mm wide, with 5-7 parallel ribbed veins, resembling *S. kurziana*. The proper taxonomic treatment and associated nomenclature to apply to these plants remains unclear (see synonymy). [= FNA, K; = *S. subulata* (Linnaeus) Buchenau var. *gracillima* (S. Watson) J.G. Smith – RAB, F, G, Z; = *S. stagnorum* Small – GW; < *S. subulata* – C, in part; > *S. filiformis* – S; > *S. lorata* (Chapman) Small – S; > *S. stagnorum* – S]

Sagittaria graminea Michaux. Marshes, ponds, tidal areas. May-November. NL (Newfoundland) and NL (Labrador) west to MN and SD, south to s. FL and c. TX; West Indies. [= *S. graminea* Michaux var. *graminea* – RAB, C, G, GW, K, WH, Y; > *S. graminea* – F; > *S. eatonii* J.G. Smith – F; = *S. graminea* ssp. *graminea* – FNA; > *S. graminea* – S; > *S. cycloptera* (J.G. Smith) C. Mohr – S; < *S. graminea* – W; < *S. graminea* var. *graminea* – Z (also see *S. isoetiformis*); = *S. graminea* – WV]

Sagittaria isoetiformis J.G. Smith. Pineland ponds, clay-based Carolina bays, other seasonally flooded depressions. June-September. Se. NC south to s. peninsular FL, west to s. MS (Sorrie & Leonard 1999). See Godfrey & Adams (1964) for additional discussion of this species. [= FNA, GW, K, S, Y; < *S. teres* – RAB, S, misapplied; < *S. graminea* Michaux var. *graminea* – Z]

Sagittaria kurziana Glück, Spring-tape. Spring-runs. Panhandle and n. peninsular FL. [= GW, K, S, WH; = *S. subulata* (Linnaeus) Buchenau var. *kurziana* (Glück) Bogin – Z]



Sagittaria lancifolia Linnaeus *var.* ***lancifolia***. Marshes, swamps. May-June. E. SC south to s. FL, west to FL Panhandle; West Indies; n. South America. [= C; = *S. lancifolia* – RAB; = *S. lancifolia* ssp. *lancifolia* – FNA, GW, K, WH, Z; > *S. angustifolia* Lindley – S; > *S. lancifolia* – S, in a narrow sense]

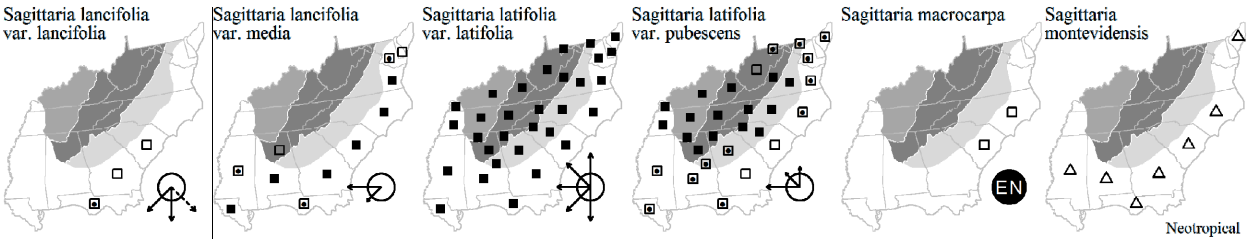
Sagittaria lancifolia Linnaeus *var.* ***media*** Micheli. Freshwater to brackish tidal marshes, ditches. June-October. S. DE south to ne. FL, FL Panhandle, west to TX; scattered in Central America. If recognized as a species, this taxon is *S. falcata*. [= C; = *S. falcata* Pursh – RAB, F, G, S; = *S. lancifolia* ssp. *media* (Micheli) Bogin – FNA, GW, K, WH, Z]

Sagittaria latifolia Willdenow *var.* ***latifolia***. July-October. Marshes, swamps, farm ponds, ditches, bogs. June-September. NS west to BC, south to tropical America (rare in the Appalachian region). In addition to the pubescence difference, var. *latifolia* and var. *pubescens* can be separated by the presence (var. *latifolia*) or absence (var. *pubescens*) of resin-ducts on the achene-faces. [= C, G, GW, W, Z; > *S. latifolia* var. *latifolia* – RAB, F; > *S. latifolia* var. *obtusa* (Engelmann) Wiegand – RAB, F; > *S. planipes* Fernald – F; < *S. latifolia* – FNA, K, WH; > *S. latifolia* – S; > *S. ornithorhyncha* Small – S; > *S. viscosa* C. Mohr – S; = *S. latifolia* – WV]

Sagittaria latifolia Willdenow *var.* ***pubescens*** (Muhlenberg ex Nuttall) J.G. Smith. Bogs, marshes. July-October. C. PA, OH, and TN, south to n. FL and e. TX, primarily in the Appalachians. [= RAB, C, F, G, GW, W, Z; < *S. latifolia* – FNA, K, WH; = *S. pubescens* Muhlenberg ex Nuttall – S, WV]

Sagittaria macrocarpa J.G. Smith. Beaverponds, old millponds. Apparently endemic to the Coastal Plain of the Carolinas; potentially to be expected in e. GA. See Sorrie, Keener, & Edwards (2007) for detailed discussion. [< *S. graminea* Michaux var. *macrocarpa* (J.G. Smith) Bogin – Z, misapplied]

* ***Sagittaria montevidensis*** Chamisso & Schlechtendahl. Disturbed areas, marshes; native of South America. July. Most of the collections from the southeastern United States are old collections around major seaports, suggesting that this plant was introduced on the ballast of sailing ships. [= RAB, K, S, WH; = *S. montevidensis* ssp. *montevidensis* – FNA, GW, Z]



Sagittaria papillosa Buchenau, Nipple-bract Arrowhead. Bogs, swamps, ditches, depressions. C. AR and se. OK south to s. LA and c. TX; rarely disjunct east of the Mississippi in se. LA and s. MS. [= FNA, GW, K] {add synonymy}

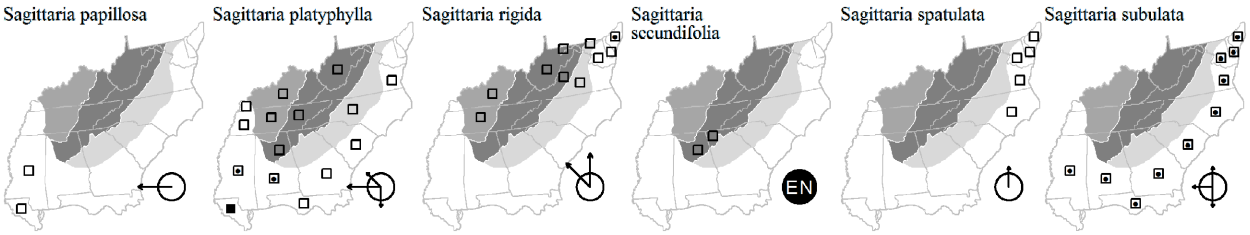
Sagittaria platyphylla (Engelmann) J.G. Smith. Marshes, ditches, farm ponds. June. The distribution of this species is primarily in the Mississippi drainage; occurrences east of the Appalachians may be introduced, either by humans or by waterfowl. First reported for VA by Wieboldt et al. (1998). Known from numerous counties in sc. GA (Jones & Coile 1988). [= F, FNA, K, WH, Y; = *S. graminea* Michaux var. *platyphylla* Engelmann – RAB, G, Z; > *S. platyphylla* – S; > *S. mohrii* J.G. Smith – S]

Sagittaria rigida Pursh, Sessile-fruited Arrowhead. Mountain ponds, wet meadows. July-October. ME and MN, south to w. VA, nc. TN, MO, and NE. [= C, F, FNA, G, K, S, W, WV, Y, Z]

Sagittaria secundifolia Kral, Little River Water-plantain. Crevices in sandstone bedrock in streambeds. Nw. GA and nc. AL. See Kral (1982) and Threlkeld & Soehren (2003) for additional information. [= FNA, K]

Sagittaria spatulata (J.G. Smith) Buchenau. Tidal marshes. May-September. NB south to e. NC along the coast. [= C, G; > *Lophotocarpus spongiosus* (Engelmann) J.G. Smith – F; > *S. calycina* var. *spongiosa* Engelmann – K, WH; > *S. montevidensis* Chamisso & Schlechtendahl ssp. *spongiosa* (Engelmann) Bogin – FNA, Z]

Sagittaria subulata (Linnaeus) Buchenau. Tidal marshes and mud flats. May-September. MA and NY south to n. peninsular FL and AL. [= FNA, GW, K, S, WH; = *S. subulata* var. *subulata* – RAB, G, Z; < *S. subulata* – C (also see *S. stagnorum*); > *S. subulata* var. *subulata* – F; > *S. subulata* var. *natans* (Michaux) J.G. Smith – F]



Sagittaria teres S. Watson. Ponds. MA south to s. NJ. [= C, F, FNA, G, K; = *S. graminea* Michaux var. *teres* (S. Watson) Bogin – Z]

Sagittaria weatherbiana Fernald. Fresh to brackish marshes, streambanks, pineland pools. April-June. Se. VA south to Panhandle FL. Isozyme studies by Hauber & Legé (1999) provide evidence that this taxon should be given species status; its genetic identity with var. *graminea* is low, and comparable to the difference between *S. graminea* (in the narrow sense) and *S. platyphylla*. [= F; = *S. graminea* Michaux var. *weatherbiana* (Fernald) Bogin – RAB, C, G, GW, K, WH, Y, Z; = *S. graminea* Michaux ssp. *weatherbiana* (Fernald) R.R. Haynes & C.B. Hellquist – FNA]

34. HYDROCHARITACEAE A.L. de Jussieu 1789 (Frog's-bit Family) [in ALISMATALES]

A family of about 18 genera and 120 species, aquatic herbs, cosmopolitan. Here circumscribed to include *Najas*, often traditionally placed in its own family, following the suggestion of Haynes, Holm-Nielsen, & Les in Kubitzki (1998b) and APG (2003, 2009). References: Haynes in FNA (2000), Cook in Kubitzki (1998b), Haynes (1979)=Z; Haynes & Hellquist (1996); Haynes, Holm-Nielsen, & Les in Kubitzki (1998b).

1 Leaves basal, either elongate with parallel sides, or petiolate with a leaf blade.
  2 Leaves differentiated into petiole and blade, the blade ovate to orbicular ..... ***Limnobium***
  2 Leaves straplike, elongate, linear, the sides parallel and not differentiated into petiole and blade.
    3 Leaves to 35 cm long; [saltwater] ..... ***Thalassia***
    3 Leaves usually > 40 cm long; [freshwater] ..... ***Vallisneria***
1 Leaves along the stem or at its summit.
  4 Leaves at only 2-3 closely spaced nodes at the summit of the stem, appearing verticillate or whorled; leaves to 10 cm long; [saltwater] ..... ***Halophila***
  4 Leaves at many nodes along the stem, opposite or in whorls of 2-8, < 4 cm long; [freshwater].
    5 Leaves opposite or in whorls of 3 (-4) (no whorls with > 4 leaves).
      6 Leaves slightly narrowed or straight-sided to base, sessile; perianth present ..... ***Elodea***
      6 Leaves broadened and sheathing at base, narrowing upwards via "shoulders"; perianth absent ..... ***Najas***
    5 Leaves in whorls of (3-) 4-8 (some or most whorls with 4 or more leaves).
      7 Leaves mostly 2-3 cm long, finely toothed with slender, weak teeth on the margins and rarely also the midrib beneath; fresh leaves not noticeably rough to the touch; leaf whorls generally crowded on all stems; petals white, 9-11 mm long ..... ***Egeria***
      7 Leaves mostly 1-2 cm long, toothed with stout, sharp teeth on the margins and also on conical bases along the midrib beneath; fresh leaves noticeably rough to the touch; leaf whorls crowded on terminal portions of stems, remote on older stems; petals translucent, 2-5 mm long ..... ***Hydrilla***

Egeria Planchon 1849 (South American Waterweed)

A genus of 2 species, aquatic herbs, native of tropical America (now subcosmopolitan in tropical and warm temerate regions by naturalization). References: Haynes in FNA (2000), Cook in Kubitzki (1998b).

* ***Egeria densa*** Planchon, Brazilian Waterweed, "Elodea," "Anacharis." Ponds and stagnant water of streams or rivers; native of South America. May-November. This is the "Elodea" or "Anacharis" of the aquarium trade. [= RAB, FNA, GW, K, W, WH; = *Elodea densa* (Planchon) Caspary – F; = *Anacharis densa* (Planchon) Victorin – G; = *Philotria densa* (Planchon) Small & St. John – S]

Elodea Michaux 1803 (Waterweed)

A genus of about 5-12 species, aquatic herbs, native of temperate America. References: Haynes in FNA (2000); Cook in Kubitzki (1998b).

1 Well-developed leaves (1-) avg. 2 (-5) mm wide, mostly 2-5× as long as wide; staminate spathe 4-8 (-15) mm long, the flower at anthesis on an elongated, very slender, flexuous stalk; sepals of pistillate flowers 2-4.5 mm long ..... ***E. canadensis***
1 Well-developed leaves (0.3-) avg. 1.3 (-2) mm wide, mostly 5-10× as long as wide; staminate spathe 2-3 mm long, the flower at anthesis separating from the spathe (and plant) at maturity; sepals of pistillate flowers 1-1.5 mm long ..... ***E. nuttallii***

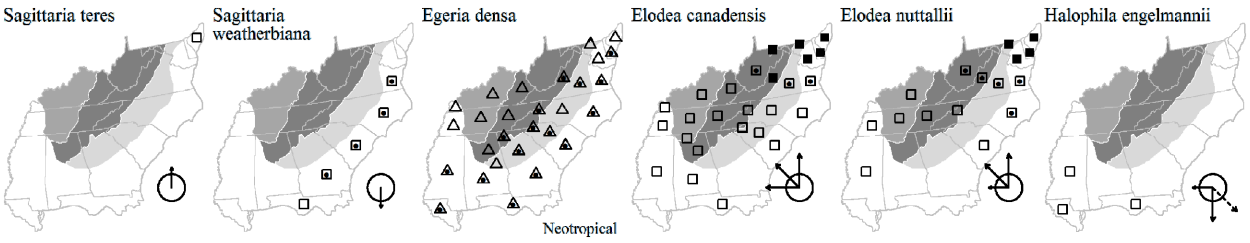
Elodea canadensis Michaux, Common Waterweed. Rivers, lakes, ponds, stagnant waters of streams. July-September. QC west to SK, south to NC, Panhandle FL, OK, NM, and CA. [= RAB, C, F, FNA, GW, K, W, WH, WV; = *Anacharis canadensis* (Michaux) Planchon – G; < *Philotria canadensis* (Michaux) Britton – S (also see *E. nuttallii*)]

Elodea nuttallii (Planchon) St. John, Nuttall's Waterweed, Free-flowered Waterweed. Lakes, ponds, stagnant waters of streams. July-September. ME and QC west to MN and ID, south to NC, TN, OK, and NM. [= RAB, C, F, FNA, GW, K, W, WV; = *Anacharis nuttallii* Planchon – G; >< *Philotria canadensis* – S; > *Philotria linearis* Rydberg – S]

Halophila Thouars 1806 (Seagrass)

A genus of about 10 species, seagrasses, of tropical and warm temperate waters of the Caribbean Sea and the Indian/Pacific oceans.

Halophila engelmannii Ascherson ex Neumayer, Engelmann's Seagrass. Estuarine waters. S. FL, west along Gulf Coast (MS, LA) to TX; Bahamas; West Indies. [= K, WH]



Hydrilla L.C. Richard 1814 (Hydrilla)

A monotypic genus, an aquatic herb, native to the Old World. References: Haynes in FNA (2000); Cook in Kubitzki (1998b).

* ***Hydrilla verticillata*** (Linnaeus f.) Royle, Hydrilla. Ponds, lakes, rivers, often locally abundant; native of the Old World. June-August. This species has become a serious aquatic weed. Reported for SC by Nelson & Kelly (1997). [= C, FNA, GW, K]

Limnobium L.C. Richard 1814 (Frog's-bit)

A genus of 1-2 species, of se. North America and tropical America. References: Haynes in FNA (2000); Cook in Kubitzki (1998b).

Limnobium spongia (Bosc) L.C. Richard ex Steudel, American Frog's-bit, Spongeplant. Swamps, marshes, ponds, pools. June-September. DE and MD south to s. FL, west to e. TX, north in the interior in the Mississippi Embayment to s. MO and s. IL; disjunct around the Great Lakes (as in n. IN and w. NY); also in tropical America. Often free-floating, the leaves with prominently large cells below. [= RAB, C, F, FNA, G, GW, K, S, WH]

Najas Linnaeus 1753 (Naiad, Bushy-pondweed, Water-nymph)

A genus of about 40 species, nearly cosmopolitan. References: Haynes in FNA (2000); Haynes (1979)=Z; Haynes & Hellquist (1996); Haynes, Holm-Nielsen, & Les in Kubitzki (1998b).

Identification notes: Counts of leaf-teeth do not include the broadened, sheathing base of the leaf. Seeds are necessary for the identification of most species.

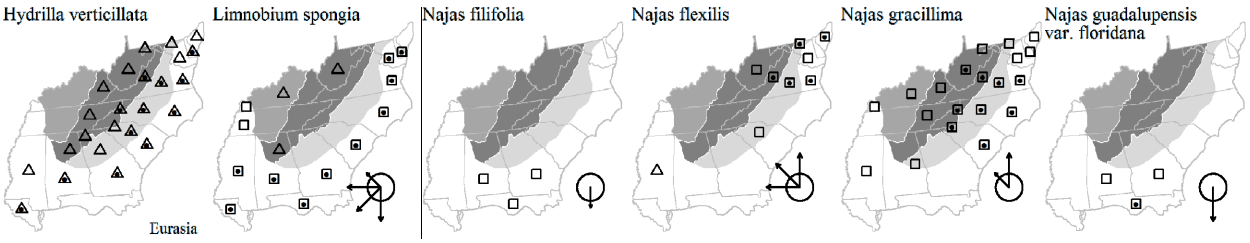
1 Plants dioecious; lower side of the midvein of the leaves prickly; [subgenus *Najas*] ..... ***N. marina***
1 Plants monoecious; lower side of the midvein of the leaves smooth; [subgenus *Caulinia*].
2 Leaf-teeth multicellular, evident at 10× magnification, 7-15 per side; leaves becoming recurved late in the season; seed-coat pitted, the areoles distinctly wider than long, in ca. 12-18 ladder-like rows ..... ***N. minor***
2 Leaf-teeth unicellular, not evident at 10× magnification, > 20 per side (except 13-17 per side in *N. gracillima*); leaves spreading to ascending; seed-coat smooth or pitted, if present the areoles longer than wide or about as long as wide.
3 Seeds smooth, glossy, obovate, broadest above the middle; anthers 1-locular ..... ***N. flexilis***
3 Seeds pitted, dull, cylindric, fusiform, or elliptic, broadest at the middle; anthers 1- or 4-locular.
4 Style offset from the apex of the seed; anthers unilocular ..... ***N. gracillima***
4 Style at the apex of the seed; anthers 4-locular ..... ***N. guadalupensis*** *var.* ***guadalupensis***

Najas filifolia Haynes, Narrowleaf Naiad. Lakes; rare. Sw. GA (Jones & Coile 1988) to FL (Haynes in FNA 2000). [= FNA, K, Z; = *Najas ancistrocarpa* A. Braun – GW] {not yet keyed}

Najas flexilis (Willdenow) Rostkovius & Schmidt, Northern Naiad. Lakes and rivers. July-August. NL (Newfoundland) west to ON, south to VA, MD, MO, and NE; also in the west from AB and SK south to OR and UT. [= C, F, FNA, G, K, S, W, WV, Z; = *Naias flexilis* – S, orthographic variant]

Najas gracillima (A. Braun ex Engelmann) Magnus, Slender Naiad, Bushy Naiad. Ponds and lakes. July-October. NS west to MN, south to NC, AL, and MO; disjunct in CA (where likely alien). Haynes (1979) reports that this species cannot tolerate pollution and is apparently declining in abundance. [= RAB, C, F, FNA, G, K, W, WV, Z]

Najas guadalupensis (Sprengel) Magnus *var.* ***floridana*** Haynes & Wentz. Lakes and streams. GA and FL. [= Z; = *Najas guadalupensis* ssp. *floridana* Haynes & Wentz) Haynes & C.B. Hellquist – FNA, K; < *Najas guadelupensis* – GW; < *Naias guadelupensis* – S, orthographic variant] {not yet keyed}



Najas guadalupensis (Sprengel) Magnus *var.* ***guadalupensis***, Common Naiad, Southern Naiad. Lakes and rivers. July-October. Var. *guadalupensis* ranges from ME west to AB and WA, south to n. South America. Haynes (1979) interprets the species as including 3 other varieties – var. *floridana* Haynes & Wentz (in FL, north to AL and GA and to be sought in SC), var. *muenscheri* (Clausen) Haynes (endemic to the Hudson River), and var. *olivacea* (Rosendahl & Butters) Haynes (nearly limited to states bordering the Great Lakes). They differ in characteristics of the leaf and seed (see Haynes 1979). Haynes & Hellquist (1996) treat all infraspecific taxa as subspecies rather than varieties. [= C, Z; < *Najas guadalupensis* – RAB, F, G, GW, W; = *Najas guadalupensis* ssp. *guadalupensis* – FNA, K; < *Naias guadelupensis* – S, orthographic variant]

Najas marina Linnaeus, Holly-leaf Naiad. Brackish or calcareous waters. [= C, F, FNA, G, K; = *Naias marina* – S, orthographic variant]

* ***Najas minor*** Allioni, Spinyleaf Naiad. Ponds, lakes, and reservoirs, particularly where eutrophic; native of Eurasia. July-October. This species is apparently a rather recent introduction to North America, now widespread in e. North America. Haynes (1979) reports that it is becoming more abundant in e. North America because of its tolerance for polluted, eutrophic waters. [= RAB, C, F, FNA, G, GW, K, W, WV, Z]

Thalassia Banks & Solander ex Koenig (Turtlegrass)

A genus of 2 species, seagrasses, of tropical and warm temperate waters of the Caribbean Sea and the Indian/Pacific oceans.

Thalassia testudinum Banks & Solander ex Koenig, Turtlegrass. Seagrass beds in estuarine waters. January-December. E. coast of c. peninsular FL to s. FL, north along the west coast of FL to the Panhandle, and in MS, LA, and TX. [= K, WH]

Vallisneria Linnaeus 1753 (Water-celery, Eelgrass)

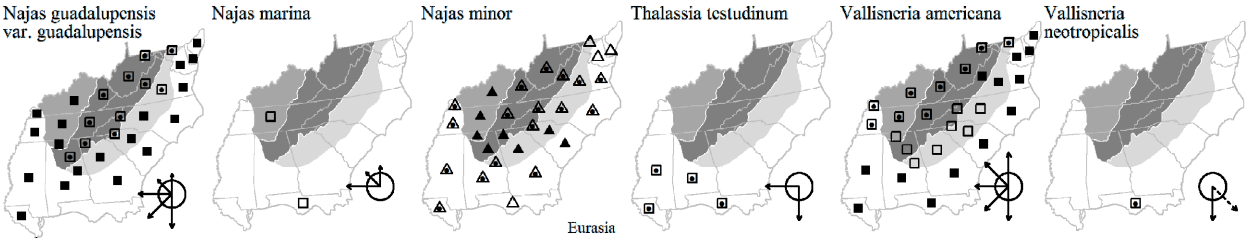
A genus of ca. 15 species, aquatic herbs, of tropical and warm temperate regions of the Old and New World. References: Les et al. (2008)=Z; Haynes in FNA (2000); Frère Marie-Victorin (1943)=Y; Cook in Kubitzki (1998b).

1 Sepals 2-3 mm long; leaves 5-6 (-10) mm wide; leaves lacking red-purple longitudinal stripes ..... ***V. americana***
1 Sepals 4-5.5 mm long; leaves 15-20 mm wide; leaves with red or purple longitudinal stripes ..... ***V. neotropicalis***

Vallisneria americana Michaux, Vallisneria, Water-celery, Tapegrass, Eelgrass. Lakes, rivers, estuaries, sounds. July-October. NS and QC west to ND, south to FL, TX, NM, AZ; south into tropical America {or is this all or partly *V.*

neotropicalis?}. [= Y, Z; < *V. americana* – FNA, GW, K, WH; ? *V. americana* – RAB, F, G, W, WV; ? *V. americana* var. *americana* – C; > *V. americana* – S; > *V. spiralis* Linnaeus – S]

Vallisneria neotropicalis Marie-Victorin, Large Water-celery, Large Eelgrass. Spring runs; other aquatic habitats. FL Panhandle, s. FL; Cuba. The distinctiveness of this taxon has been defended by Les et al (2008) on morphological and molecular grounds. [= Y, Z; < *V. americana* – FNA, GW, K, WH]



35. SCHEUCHZERIACEAE F. Rudolphi 1830 (Scheuchzeria Family) [in ALISMATALES]

A monotypic family, circumboreal in arctic and cold temperate regions. References: Nienaber in FNA (2000); Haynes, Les, & Holm-Nielsen in Kubitzki (1998b).

Scheuchzeria Linnaeus (Scheuchzeria, Pod-grass)

A monotypic genus, circumboreal in arctic and cold temperate regions. References: Nienaber in FNA (2000); Haynes, Les, & Holm-Nielsen in Kubitzki (1998b).

Scheuchzeria palustris Linnaeus *var.* ***americana*** Fernald, Pod-grass. *Sphagnum* bogs. NL (Labrador) and AK south to s. NJ, e. WV (Cranberry Glades, Pocahontas County), sc. PA (Rhoads & Klein 1993), IN, IL, IA, WY, and CA. [= F; < *S. palustris* – C, FNA, G, WV; = *S. palustris* ssp. *americana* (Fernald) Hultén – K; = *S. americana* (Fernald) G.N. Jones]

37. JUNCAGINACEAE L.C. Richard 1808 (Arrowgrass Family) [in ALISMATALES]

A family of 3-4 genera and 20 species, of temperate and boreal regions of the Old and New World. References: Haynes & Hellquist in FNA (2000); Thieret (1988); Haynes, Les, & Holm-Nielsen in Kubitzki (1998b).

Triglochin Linnaeus 1753 (Arrowgrass)

A genus of about 12 species, cosmopolitan. References: Haynes & Hellquist in FNA (2000); Thieret (1988)=Z; Haynes, Les, & Holm-Nielsen in Kubitzki (1998b).

1 Pistils 6, all fertile; fruits 2-4.5 mm long; central axis between the carpels not winged; [of NJ northward] ..... ***T. maritima***
1 Pistils 6, 3 fertile and 3 sterile; fruits 1-2 mm long; central axis between the carpels broadly winged; [of DE and MD southward] ..... ***T. striata***

Triglochin striata Ruiz & Pavón, Southern Arrowgrass. Brackish to nearly freshwater marshes. May-October. The species has an extensive range, occurring in tropical Central and South America, Africa, and Australia; in North America, it ranges from MD and DE south to s. FL and west to LA, and also on the west coast in CA and OR. [= F, FNA, G, K, WH; = *T. striatum* – RAB, C, GW, S, Z, orthographic variant]

Triglochin maritima Linnaeus. Brackish coastal habitats and inland bogs. Circumboreal, south in North America to MD, DE, OH, NE, NM, Mexico; also Patagonia. [= F, FNA, G, K; = *T. maritimum* – C, Z, orthographic variant]

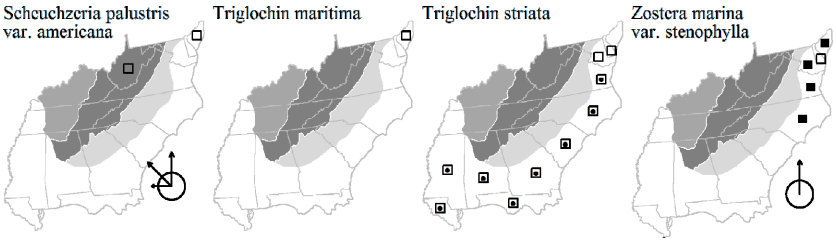
38. ZOSTERACEAE Dumortier 1829 (Eelgrass Family) [in ALISMATALES]

A family of 3 genera and about 18 species, nearly cosmopolitan in distribution. References: Haynes in FNA (2000); Kuo & McComb in Kubitzki (1998b).

Zostera Linnaeus 1753 (Eelgrass)

A genus of about 12 species, aquatic herbs, of nearly cosmopolitan distribution. References: Haynes in FNA (2000); Crow & Hellquist (2000)=Y; Kuo & McComb in Kubitzki (1998b); Green & Short (2003)=Z.

Zostera marina Linnaeus *var.* ***stenophylla*** Ascherson & Graebner, Eelgrass. Estuarine waters. February-March. The species occurs in Eurasia and North America. Var. *stenophylla* is North American, and ranges south along the Atlantic coast to NC and allegedly to FL (though reports from that state are apparently not substantiated and may be based on misidentification of other aquatics). [= F, G, Y; < *Z. marina* – RAB, C, FNA, K, S, Z]



39. POTAMOGETONACEAE Dumortier 1829 (Pondweed Family) [in ALISMATALES]

A family of 6-7 genera and about 100 species (if circumscribed, as here, to include Zannichelliaceae), aquatic herbs, nearly cosmopolitan. Here circumscribed following recent molecular studies to include *Zannichellia* (Lindqvist et al. 2006; Angiosperm Phylogeny Group 2003, 2009). References: Haynes & Hellquist in FNA (2000); Haynes (1978); Les & Haynes (1996); Haynes, Les, & Holm-Nielsen in Kubitzki (1998b); Wiegleb & Kaplan (1998)=Z; Lindqvist et al. (2006). [including *ZANNICHELLIACEAE]*

1 Leaves opposite lobes ..... ***Zannichellia***
1 Leaves alternate.
2 Stipules not adnate, or adnate to the blade < ½ the length of the stipule; peduncle stiff, the flowering spike elevated above the water's surface; submersed leaves translucent, flat, flexible; floating leaves present or absent ..... ***Potamogeton***
2 Stipules adnate to the blade for at least 2/3 the length of the stipule; peduncle flexible, the flowering spike submersed; submersed leaves opaque, channeled, stiff; floating leaves absent ..... ***Stuckenia***

Potamogeton Linnaeus 1753 (Pondweed)

A genus of about 80 species, aquatic herbs, nearly cosmopolitan. References: Haynes & Hellquist in FNA (2000); Haynes & Hellquist (1996); Wiegleb & Kaplan (1998). Treatment adapted from Haynes & Hellquist in FNA (2000). [also see *Stuckenia*]

1 Stipular sheaths of submersed leaves adnate with leaf blade base, the tip usually projecting as a ligule ..... **Key A**
1 Stipular sheaths of submersed leaves free from the leaf blade base, or with only a few adnate, the ligule not obvious.
2 Submersed leaves broadly linear-oblong to lanceolate to elliptic or nearly orbicular, 10-58 mm wide (occasional stranded forms lack submersed leaves) ..... **Key B**
2 Submersed leaves linear, thread-like or ribbon-like, 0.1-10 mm wide ..... **Key C**

Key A

1 Leaves stiffish, conspicuously 2-ranked, auriculate-lobed to rounded at the junction with the stipule, with 20-60 fine veins ..... ***P. robbinsii***
1 Leaves lax, not conspicuously 2-ranked, lacking basal lobes, with fewer than 20 veins.
2 Tips of submersed leaves obtuse to acute; floating leaves rounded at apex.
3 Tips of submersed leaves acute; fruit 1-2 mm wide, the lateral keel with acute tips, beak minute ..... ***P. diversifolius***
3 Tips of submersed leaves obtuse; fruit 1.3-2.4 mm wide, the lateral keel with blunt tips, beak lacking ..... ***P. spirillus***
2 Tips of submersed leaves acute to long-tapering; floating leaves acute at apex.
4 Submersed leaves 0.1-0.6 mm wide, without obvious lacunae; floating leaves 3-7 veined ..... ***P. bicupulatus***
4 Submersed leaves 0.2-1 (-2) mm wide, with abundant lacunae; floating leaves 9-23 veined ..... ***P. tennesseensis***

Key B

1 Leaf margins conspicuously serrate; stem flattened; fruit beak 2-3 mm long; turions commonly formed, hard ..... ***P. crispus***
1 Leaf margins entire; stem terete; fruit beak < 1 mm long; turions rarely formed.
2 Submersed leaves clasping the stem; floating leaves absent.
3 Leaves orbicular to ovate, often lanceolate in soft water, 1-6 cm long, with 3-25 delicate veins; stipules deteriorating and deciduous, absent on lower portions of stem ..... ***P. perfoliatus***
3 Leaves ovate-lanceolate to narrowly lanceolate, 1.6-13 cm long, with 3-35 coarse veins; stipules disintegrating to persistent fibers, even on lower portions of stem ..... ***P. richardsonii***
2 Submersed leaves petioled or sessile, not clasping the stem; floating leaves absent or present.
4 Submersed leaves 19-49 veined, distinctly arcuate ..... ***P. amplifolius***
4 Submersed leaves with fewer than 29 veins, not arcuate.
5 Stems conspicuously black-spotted; submersed leaves crisped along the margin; floating leaves 15-21 veined ..... ***P. pulcher***
5 Stems inconspicuously spotted or lacking spots; submersed leaves flat along the margin; floating leaves 7-29 veined.
6 Submersed leaves with petioles 1-13 cm long.
7 Larger submersed leaves acute at the apex with a sharp awl-like tip; fruit gray-green to olive-green, with well-developed lateral ridges ..... ***P. illinoensis***
7 Larger submersed leaves acute at the apex but lacking a sharp awl-like tip; fruit red to reddish-brown, with muricate lateral ridges ..... ***P. nodosus***
6 Submersed leaves sessile.
8 Fruit reddish-brown, with obsolete or rounded keel; submersed leaves with (3-) 5-9 veins ..... ***P. gramineus***

8 Fruit gray-green or olive-green, with well-developed keel; submersed leaves with 7-19 veins ..... ***P. illinoensis***

Key C

1 Fruit with a prominent keel 0.2-1.2 mm broad; floating leaves often present; lacunae prominent in submersed leaves.
2 Submersed leaves 3-13 veined; stipules of submersed leaves not adnate to the leaf base; floating leaves rounded at apex..... ***P. epihydrus***
2 Submersed leaves 1-3 (-7) veined; stipules of at least some submersed leaves adnate to the leaf base; floating leaves acute at apex..... ***P. tenneseensis***
1 Fruit with a keel < 0.2 mm broad; floating leaves absent or present; lacunae present in some species, but generally not prominent.
3 Floating leaves present, at least in some plants of the population.
4 Petiole junction with leaf distinctly pale in color; floating leaves ovate, oblong-ovate, cordate at base, rarely tapering..... ***P. natans***
4 Petiole junction with leaf lacking pale color; floating leaves elliptical, ovate-elliptical, or oblong-ellliptical.
5 Floating leaves 7-12 mm wide, tapering at both ends; fruit apparently not produced ..... ***P. floridanus***
5 Floating leaves 10-20 (-30) mm wide, obtuse, round or tapering at the base; fruit often produced ..... ***P. oakesianus***
3 Floating leaves absent from all plants in the population.
6 Rhizomes obvious; peduncle 5-25 cm long; leaves thread-like, 0.1-0.5 mm wide..... ***P. confervoides***
6 Rhizomes absent or not apparent; peduncle 0.3-7 cm long, often curved; leaves usually not thread-like, 0.1-5 mm wide.
7 Nodal glands absent.
8 Leaves 15-35 veined, > 2 mm wide; stem conspicuously flattened; peduncles terminal, usually straight ..... ***P. zosteriformis***
8 Leaves 3-5 veined, usually < 2 mm wide; stem terete; peduncles usually axillary, recurved.
9 Leaves acute, 3 (-5) veined, 0.3-1.5 (-2.3) mm wide; fruits 1-keeled, 1.4-2.3 (-2.7) mm long ..... ***P. foliosus*** *var.* ***foliosus***
9 Leaves usually bristle-tipped, occasionally apiculate to blunt, 3 veined, 1-2.2 (-4) mm wide; fruits 3-keeled, 2.3-4 mm long..... ***P. hillii***
7 Nodal glands present.
10 Stipules fibrous, often whitish ..... ***P. strictifolius***
10 Stipules not fibrous, usually delicate, green, brown, or white.
11 Leaf apex bristle-tipped (rarely apiculate); peduncles recurved, axillary or axillary and terminal, 0.5-6.6 cm long..... ***P. hillii***
11 Leaf apex blunt, acute, or apiculate, but not bristle-tipped; peduncles straight, terminal, 0.5-6.6 cm long.
12 Mature fruit obovate, sides concave, beak mostly forward; peduncle filiform to cylindrical, usually 1-3 per plant; inflorescence usually interrupted; leaves with up to 2 rows of lacunae along midrib, apex acute, rarely apiculate; stipules mostly connate ..... ***P. pusillus*** *var.* ***pusillus***
12 Mature fruit mostly widest at middle, or ovate, sides rounded, beak mostly central; peduncle cylindrical, usually > 3 per plant; inflorescence continuous; leaves with 1-5 rows of lacunae along midrib, apex acute to obtuse; stipules mostly convolute ..... ***P. pusillus*** *var.* ***tenuissimus***

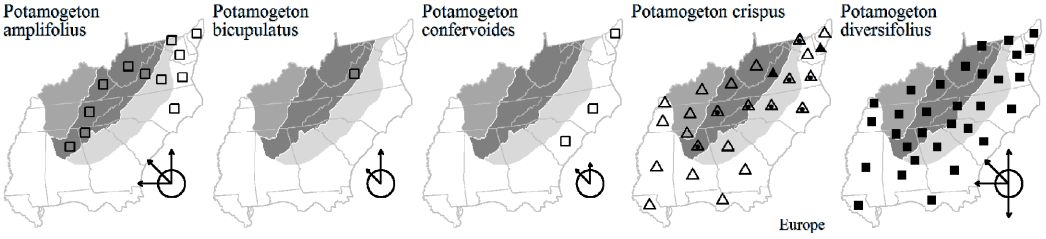
Potamogeton amplifolius Tuckerman, Bigleaf Pondweed, Muskie-weed. Ponds, lakes, sluggish streams. June-September. NL (Newfoundland) west to BC, south to e. NC, nw. GA (Jones & Coile 1988), n. AL, OK, and CA. [= RAB, C, F, FNA, G, K, S, W, WV, Z]

Potamogeton bicupulatus Fernald. Quiet waters. July-September. ME west to WI, south to VA (Augusta County) and se. TN. [= FNA, F, K, Z; = *P. diversifolius* Rafinesque var. *trichophyllus* Morong – C, GW]

Potamogeton confervoides Reichenbach, Alga Pondweed, Conferva Pondweed, Tuckerman's Pondweed. Acidic blackwater pools and streams. April-September. NL (Newfoundland) west to ON, south to NJ and PA; disjunct in sc. NC and nc. SC (fall-line sandhills). [= RAB, C, F, FNA, G, K, Z]

* ***Potamogeton crispus*** Linnaeus, Curled Pondweed, Curly Pondweed. Ponds; native of Europe. May-September. ME, MN, s. SK and s. BC, south to NC, Panhandle FL, TX, AZ, and CA. [= RAB, C, F, FNA, G, GW, K, W, WH, WV, Z]

Potamogeton diversifolius Rafinesque, Common Snailseed Pondweed. Pools, ponds, and lakes. June-September. MA and NY west to MN, MT, and OR, south to c. peninsular FL, TX, and CA. [= RAB, FNA, G, K, S, W, WH, WV, Z; = *P. diversifolius* var. *diversifolius* – C, GW; > *P. diversifolius* – F; > *P. capillaceus* Poiret var. *capillaceus* – F; > *P. capillaceus* Poiret var. *atripes* Fernald – F]



Potamogeton epihydrus Rafinesque, Ribbonleaf Pondweed. Ponds. June-September. NL (Newfoundland) west to AK, south to GA, w. Panhandle FL, s. MS (Sorrie & Leonard 1999), LA, CO, and CA. [= RAB, C, FNA, K, S, W, WH, WV; > *P. epihydrus* var. *epihydrus* – F, G; > *P. epihydrus* var. *nuttallii* (Chamisso & Schlechtendahl) Fernald – F, G; < *P. epihydrus* – Z (also see *P. tennesseensis*)]

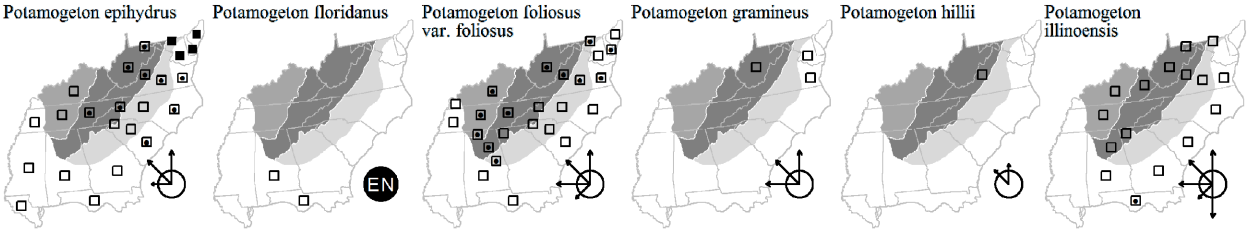
Potamogeton floridanus Small, Florida Pondweed. Blackwater rvers. Apparently endemic to blackwater rivers of the Panhandle of FL. Considering the under-collection of *Potamogeton*, it should be sought elsewhere. [= FNA, S, WH; < *P. natans* – Z]

Potamogeton foliosus Rafinesque *var.* ***foliosus***, Leafy Pondweed. Shallow ponds and streams. May-October. NL (Newfoundland) west to AK, south to SC, Panhandle FL, TX, and Mexico. [= C; < *P. foliosus* – RAB, G, GW, S, W, WH, Z; > *P. foliosus* var. *foliosus* – F, WV; > *P. foliosus* var. *macellus* Fernald – F, WV; = *P. foliosus* ssp. *foliosus* – FNA, K; > *P. curtissii* Morong – S; > *P. foliosus* – S]

Potamogeton gramineus Linnaeus, Variable Pondweed. Estuarine waters. Greenland and AK, south to sc. PA (Rhoads & Klein 1993), NJ, WV (Kartesz 1999), n. VA, MI, WI, CO, UT, and CA. Reported for VA (Fairfax County); specimen identification needing confirmation. [= C, FNA, G, K, WV, Z; > *P. gramineus* var. *maximus* Morong – F]

Potamogeton hillii Morong, Hill's Pondweed. Spring-fed oxbow pond. VT, MA, ON, and WI south to PA, VA, and OH. [= C, FNA, G, K, Z; > *P. hillii* – F; > *P. porteri* Fernald – F]

Potamogeton illinoensis Morong, Illinois Pondweed. Calcareous waters of streams, lakes, and ponds. May-September. QC west to NT and s. BC, south to s. FL, TX, Mexico, and CA. [= RAB, C, F, FNA, G, GW, K, W, WH, WV, Z; > *P. angustifolius* Berchtold & K. Presl – S; > *P. heterophyllus* Schreber – S; > *P. lucens* Linnaeus – S, misapplied]



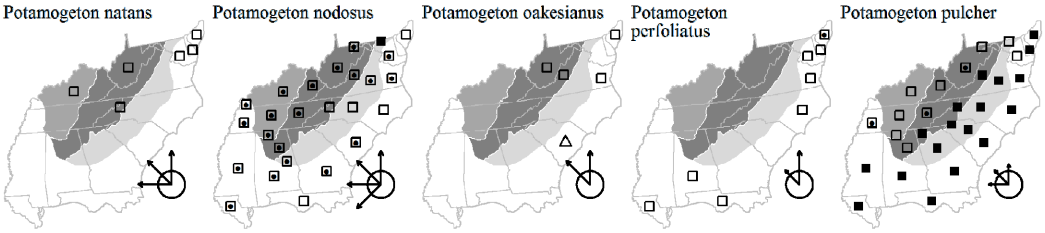
Potamogeton natans Linnaeus, Floating Pondweed. Lakes and slow streams. June-September. NL (Newfoundland) west to AK, south to e. WV, w. NC, KS, NM, AZ, and CA. [= RAB, C, F, FNA, G, K, S, W; < *P. natans* – Z (also see *P. floridanus*)]

Potamogeton nodosus Poiret, Longleaf Pondweed, American Pondweed. Ponds, streams. May-September. ME and QC west to BC, south to Panhandle FL, TX, Mexico, and CA. [= RAB, C, F, FNA, G, GW, K, W, WV, Z; *? P. fluitans* Roth – S; *P. oblongifolium* Forster, proposed for nomenclatural rejection (Reveal et al. 2003)]

Potamogeton oakesianus J.W. Robbins, Oakes PondweedLakes and streams. NL (Newfoundland) west to MN, south to VA, n. WV, and n. IL; apparently disjunct in MT, and BC, and possibly in s. AL (Sorrie, pers. comm.). [= C, F, FNA, G, K, W, Z]

Potamogeton perfoliatus Linnaeus, Perfoliate Pondweed, Redhead Grass. Ponds. June-October. NL (Newfoundland), NL (Labrador) west to MI, south to ne. NC, and n. OH; apparently disjunct in w. FL, c. peninsular FL, s. AL, and se. LA, and in SD. [= FNA, G, K, S, Z; > *P. perfoliatus* var. *bupleuroides* (Fernald) Farwell – RAB, F, GW, WH; > *P. bupleuroides* Fernald]

Potamogeton pulcher Tuckerman, Spotted Pondweed. Ponds, pools, ditches, streams. June-September. NS west to WI, south to n. peninsular FL and e. TX. [= RAB, C, F, FNA, G, GW, K, S, W, WH, WV, Z; = *P. rotundifolium* Forster, proposed for nomenclatural rejection (Reveal et al. 2003)]



Potamogeton pusillus Linnaeus *var.* ***pusillus***. Acid and alkaline waters. May-September. NS west to AK, south to FL and Mexico. [< *P. berchtoldii* Fieber – RAB; > *P. pusillus* var. *pusillus* – F; > *P. pusillus* var. *minor* (Bivona-Bernardi) Fernald & Schubert – F; = *P. pusillus* ssp. *pusillus* – FNA, K; < *P. pusillus* var. *pusillus* – C; < *P. pusillus* – G, GW, S, WH, Z; = *P. pusillus* – WV]

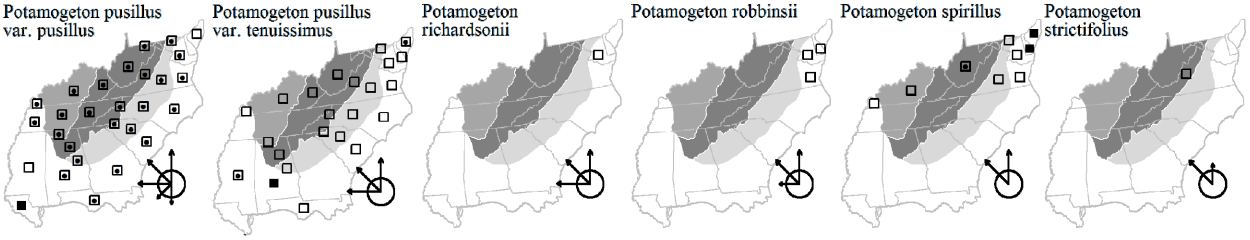
Potamogeton pusillus Linnaeus *var.* ***tenuissimus*** F.K. Mertens & W.D.J. Koch, Slender Pondweed. Millponds, other quiet waters. May-September. NL (Newfoundland) west to AK, south to Panhandle FL, TX, NM, and CA. Reported from SC by Gaddy & Rayner (1980). [= W; < *P. berchtoldii* Fieber – RAB; < *P. pusillus* var. *pusillus* – C; > *P. berchtoldii* var. *acuminatus* Fieber – F; > *P. berchtoldii* var. *berchtoldii* – F; > *P. berchtoldii* var. *lacunatus* (Hagström) Fernald – F; > *P. berchtoldii* var. *polyphyllus* (Morong) Fernald – F; > *P. berchtoldii* var. *tenuissimus* (Mertens & Koch) Fernald – F; < *P. pusillus* – G, GW, S, WH, Z; = *P. pusillus* ssp. *tenuissimus* (Mertens & Koch) R.R. Haynes & C.B. Hellquist – FNA, K; = *P. berchtoldi* – WV]

Potamogeton richardsonii (Bennett) Rydberg, Richardson Pondweed. Slow-moving, calcareous waters. NL (Labrador) west to AK, south to DE, MD, PA, n. OH, n. IN, n. IL, IA, NE, NM, AZ, and CA. [= C, F, FNA, G, K, Z]

Potamogeton robbinsii Oakes, Fern Pondweed. Muddy waters. August-September. NS and PE west to Keewatin and AK, south to n. VA, n. IL, s. MN, CO, UT, and CA; disjunct in s. AL. [= C, F, FNA, G, K, Z]

Potamogeton spirillus Tuckerman, Northern Snailseed Pondweed. Quiet waters. July-November. NL (Newfoundland) west to MB, south to e. VA, n. OH, n. IA, and se. NE. [= C, F, FNA, G, K, WV, Z]

Potamogeton strictifolius A. Bennett, Straightleaf Pondweed. Calcareous waters. July-September. NL (Newfoundland) west to YT, south to w. VA, n. IL, WY, and n. UT. [= C, FNA, G, K, W, Z; > *P. strictifolius* var. *strictifolius* – F; > *P. strictifolius* var. *rutiloides* Fernald – F; > *P. longiligulatus* Fernald – F]



Potamogeton tennesseensis Fernald, Tennessee Pondweed. Quiet or flowing water. Late May-September. PA and OH south to w. VA, and se. TN. [= F, FNA, K, W, WV; < *P. epihydrus* – Z]

Potamogeton zosteriformis Fernald, Flatstem Pondweed. Quiet waters. July-September. NL (Newfoundland) west to AK, south to n. VA, ne. WV, n. IL, KS, UT, and CA. [= C, F, FNA, G, K, WV, Z]

Stuckenia C. Börner 1912 (Sago-pondweed)

A genus of about 10 species, nearly cosmopolitan. This genus should be called *Stuckenia*, which has priority over *Coleogeton*. Lindqvist et al. (2006) provide molecular support for recognition of *Stuckenia* as a genus. References: Haynes & Hellquist in FNA (2000); Les & Haynes (1996)=Z; Haynes, Les, & Král (1998)=Y; Wiegleb & Kaplan (1998)=X; Lindqvist et al. (2006).

Stuckenia pectinata (Linnaeus) C. Börner, Sago-pondweed. Calcareous or brackish waters of ponds, lakes, estuaries, sounds. June-September. The species is irregularly cosmopolitan. [= FNA, K, Y; = *Potamogeton pectinatus* Linnaeus – RAB, C, F, G, GW, S, W, WH, WV, X; = *Coleogeton pectinatus* (Linnaeus) D.H. Les & R.R. Haynes – Z]

Zannichellia Linnaeus 1753 (Horned Pondweed)

A genus of about 5 species, aquatic herbs, nearly cosmopolitan. References: Haynes & Hellquist in FNA (2000); Haynes & Holm-Nielsen (1987)=Z.

Identification notes: *Zannichellia* is sometimes confused with other aquatics, such as *Ruppia* and narrow-leaved *Potamogeton*. *Potamogeton* has at least some leaves alternate; *Zannichellia* and *Ruppia* are opposite-leaved. *Zannichellia* lacks the abruptly broadened sheath of *Najas*. Also, the seeds are flattened in *Zannichellia*, and toothed down one side; *Najas* has a cylindric or elliptic fruit. *Zannichellia* has longer leaves (3-10 cm long) than *Najas* (< 4 cm long).

Zannichellia palustris Linnaeus, Horned Pondweed. Fresh or brackish water. February-October. The species occurs throughout much of the world. [= RAB, C, FNA, G, GW, K, S, W, WV, Z; > *Z. palustris* var. *major* (Hartman) W.D.J. Koch – F; > *Z. palustris* var. *palustris* – F]

41. RUPPIACEAE Horaninow ex Hutchinson 1934 (Wigeon-grass Family) [in ALISMATALES]

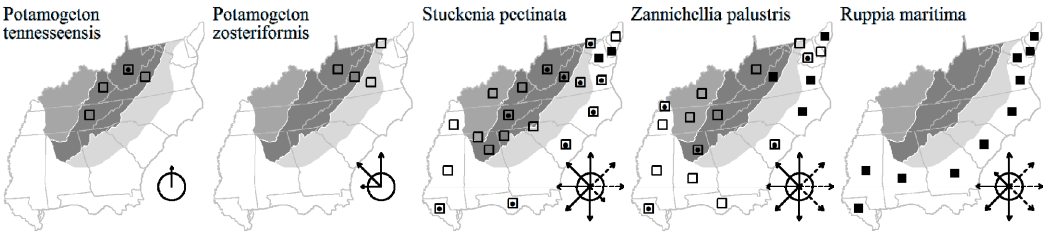
A family of a single genus and 1-10 species. References: Haynes (1978)=Z; Haynes in FNA (2000); Haynes, Holm-Nielsen, & Les in Kubitzki (1998b).

Ruppia Linnaeus (Wigeon-grass)

A genus of 1-10 species, nearly cosmopolitan. References: Haynes (1978)=Z; Haynes in FNA (2000); Haynes, Holm-Nielsen, & Les in Kubitzki (1998b).

Identification notes: Separable from superficially similar species of *Potamogeton* by the stipules adnate their entire length (vs. separate at least at the tip in *Potamogeton*).

Ruppia maritima Linnaeus, Wigeon-grass, Ditch-grass. Brackish estuaries, rivers, marsh pools. July-October. Nearly cosmopolitan. [= RAB, C, FNA, GW, K, S, Z; > *R. maritima* var. *maritima* – F, G; > *R. maritima* var. *longipes* Hagström – F; > *R. maritima* var. *rostrata* Agardh – F, G]



42. CYMODOCEACEAE N. Taylor 1909 (Manatee-grass Family) [in ALISMATALES]

A family of about 5 genera and 16 species, estuarine aquatics, of tropical and subtropical (rarely temperate) waters. References: Kuo & McComb in Kubitzki (1998b); Haynes in FNA (2000); Green & Short (2003).

1 Leaves flat above the sheath; leaf tips 3-toothed; female plants with flowers with 1 pistil.....***Halodule***
1 Leaves terete or subterete above the sheath; leaf tips acicular; female plants with flowers with 1-2 pistils.....***Syringodium***

Halodule Endlicher 1841 (Shoal-grass)

A genus of about 6 species, of tropical and subtropical regions of both hemispheres. References: Haynes in FNA (2000); McRoy & Helfferich (1977); Kuo & McComb in Kubitzki (1998b); Green & Short (2003)=Z.

Halodule wrightii Ascherson, Shoal-grass. Submerged in estuarine waters up to about 2 m deep, especially in Core and Pamlico sounds (North Carolina). E. NC (reported with unknown documentation from SC, not known from GA); FL west to TX, and south along shores of the Gulf of México and Caribbean; also on the Pacific coast of Panama and Nicaragua. Haynes in FNA (2000) concludes that *H. beaudettei* is not taxonomically distinct from *H. wrightii* (the older name). Seagrasses (an informal group including species such as *Halodule wrightii, Zostera marina*, and *Ruppia maritima* in our area) are very important components of estuarine ecosystems, providing a large proportion of the primary productivity in such systems and providing shelter and nursery grounds for fish, shrimp, and other invertebrates. An estimated 80,000 hectares of seagrass beds are found in Pamlico and Core sounds, NC, most of that area having *Halodule* as the co-dominant or dominant species (Ferguson, Rivera, & Wood 1989). There is concern about the destruction of seagrass beds by pollution, dredging of waterways, and mechanical disturbance by fishing boats (Koch & Orth 2003; Green & Short 2003). [= FNA, S, WH, Z; > *H. beaudettei* (den Hartog) den Hartog – RAB, GW, K]

Syringodium F.T. Kützing in R.F. Hohenacker 1860 (Manatee-grass)

A genus of 2 species, seagrasses, of the Caribbean and Indo-West Pacific. References: Haynes in FNA (2000); Kuo & McComb in Kubitzki (1998b); Green & Short (2003)=Z.

Syringodium filiforme F.T. Kützing in R.F. Hohenacker, Manatee-grass. Estuarine waters. Panhandle FL, peninsular FL, westward along the Gulf Coast, and in the West Indies. *Syringodium* is occasionally cast ashore in Georgia and the Carolinas following hurricanes, but there is no evidence that it grows in our area. [= FNA, WH, Z; = *Cymodocea filiformis* (F.T. Kützing in R.F. Hohenacker) Correll – GW, K; = *Cymodocea manatorum* Ascherson – S]

44. NARTHECIACEAE E.M. Fries 1846 (Bog-asphodel Family) [in DIOSCOREALES]

As circumscribed here (excluding Tofieldiaceae), a family of about 4 genera and 40 species, of e. Asia, e. North America, n. Europe, and the Guyana Shield of n. South America. Reveal & Zomlefer (1998) place the Nartheciaceae in the monotypic order Nartheciales. References: Zomlefer (1997b, 1999); Reveal & Zomlefer (1998); Tamura in Kubitzki (1998a).

Aletris Linnaeus 1753 (Colic-root, Stargrass)

As circumscribed here (including *Metanarthecium*), a genus of about 30 species, of e. North America and e. Asia. References: Weigant (2002)=X; Ward (1978)=Y; Zomlefer (1997b)=Z; Tamura in Kubitzki (1998a); Sullivan in FNA (2002a).

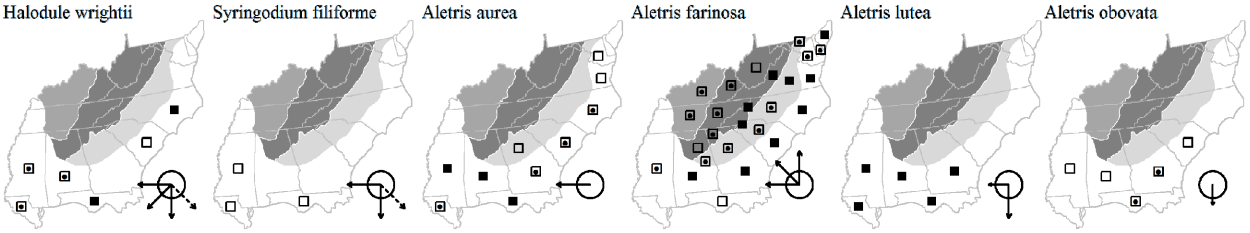
1 Perianth white to creamy-white (rarely pinkish).
  2 Perianth 6-10 mm long, cylindric at anthesis, 2-3× as long as broad, the perianth lobes narrowly deltoid (longer than broad); fruiting perianth markedly constricted above the middle ..... ***A. farinosa***
  2 Perianth 4-6 mm long, campanulate at anthesis, ca. 1× as long as broad, the perianth lobes broadly deltoid (about as long as broad); fruiting perianth somewhat narrowed above the base ..... ***A. obovata***
1 Perianth golden yellow (often faded in dried specimens).
  3 Perianth short-cylindric or campanulate at anthesis, 1-2× as long as broad, the perianth lobes not spreading; [flowering May-July] ..... ***A. aurea***
  3 Perianth long-cylindric at anthesis, 2.5-4× as long as broad, the perianth lobes spreading somewhat; [flowering March-May] ..... ***A. lutea***

Aletris aurea Walter, Golden Colic-root. Pine savannas, seepage bogs, pine flatwoods. Mid May-July; August. S. MD south to ne. FL, Panhandle FL, west to e. TX and se. OK. Flowering several weeks later than *A. farinosa* when growing together. [= RAB, C, F, FNA, G, GW, K, S, WH, X, Y, Z]

Aletris farinosa Linnaeus, Northern White Colic-root, Mealy Colic-root, Stargrass. Pine savannas, pine flatwoods, seepage bogs, upland woodlands, roadbanks. Late April-early June; July-August. S. ME, s. ON, and se. MN south to s. GA, FL (Wunderlin 1998), LA, and TX, the only species of the genus not restricted (or nearly so) to the Coastal Plain. [= RAB, C, F, FNA, G, GW, K, S, W, WH, X, Z]

Aletris lutea Small, Yellow Colic-root. Pine savannas. E. GA (in immediate proximity to the SC border) south to s. FL, and west to e. LA (Weigant 2002); disjunct in w. LA (Sorrie & LeBlond 2008). The report by F of *A. lutea* Small as far north as se. VA is in error. A specimen collected in se. NC has recently been annotated as *A. lutea*, but it appears to be *A. farinosa*. [= FNA, GW, K, S, WH, X, Y, Z]

Aletris obovata Nash ex Small, Southern White Colic-root. Pine savannas. May-early June; August. Se. SC south to c. peninsular FL, west to e. Panhandle FL. Reported for MS (Kartesz 1999), but the report rejected (likely based on a misidentified specimen). [= RAB, FNA, GW, K, S, WH, X, Y, Z]



Lophiola Ker-Gawler 1814 (Golden Crest)

A monotypic genus (as here interpreted to include *L. americana* and *L. septentrionalis*), of temperate e. North America. *Lophiola* is quite unlike any other genus, and its familial position has been problematic. Often treated in the Haemodoraceae (as in RAB, C, G, GW), *Lophiola* is better placed in the Nartheciaceae, as shown by studies of anatomy, pollen ultrastructure, and chemistry (Edwards, Churchill, & Weiss 1970; Simpson & Dickison 1981; Simpson 1983; Zavada 1983; Zavadu, Xu, & Edwards 1983; Ambrose 1985). References: Zomlefer (1997b)=Z; Tamura in Kubitzki (1998a); Robertson in FNA (2002a).

Lophiola aurea Ker-Gawler, Golden Crest. Wet savannas, bogs, marshes, ditches adjacent to these natural habitats. Late May-June; August-September. FL Panhandle and sw. GA west to e. LA; se. NC; n. DE (at least formerly) and s. NJ; disjunct in NS. Only a few populations remain in NC. [= C, FNA, K, S, Z; > *L. americana* (Pursh) Wood – RAB, F (the NJ-DE material), G, GW; > *L. septentrionalis* Fernald – F (the Nova Scotian material)]

Narthecium Hudson 1762 (Asphodel)

A genus of about 8 species, many narrow disjuncts, collectively with a very fragmented distribution in the temperate Northern Hemisphere. References: Small (1924)=Z; Zomlefer (1997b)=Y; Utech in FNA (2002a); Tamura in Kubitzki (1998a); Schumacher (1947)=X; Sorrie & Weakley (in prep.)=Q.

1 Tepals 4-6 mm long; capsule 10-14 mm long; pedicels stout, about as long as the subtending bracts; [Coastal Plain seeps and savannas]..... ***N. americanum***
1 Tepals 6-9 mm long; capsule 8-10 mm long; pedicels slender, distinctly longer than the subtending bracts; [Mountain bogs]..... ***N. montanum***

Narthecium americanum Ker-Gawler, Yellow Asphodel. Wet seepages or savannas. June-July; August-September. S. NJ and DE (where believed extirpated); disjunct in c. SC (where apparently extirpated, though still worth seeking in mucky seepages of the Sandhills of SC and NC). [= C, F, G, Q, X; < *Narthecium americanum* – RAB, FNA, GW, K, W, Y (also see *N. montanum*); = *Abama americana* (Ker-Gawler) Morong – S, Z]

Narthecium montanum (Small) C.H. Grey, Appalachian Yellow Asphodel. Bogs (apparently extinct). With the drainage of the bogs of East Flat Rock, Henderson County, this species was apparently extirpated. It is still possible that it will be relocated, in bogs in Henderson or Transylvania counties, NC. Small (1924, 1933) considered the NC mountain population a distinct species, based on its longer, more slender pedicels, larger sepals, petals, and stamens, and smaller capsules. Schumacher (1947), in the most thorough worldwide assessment of *Narthecium*, agreed, and Sorrie & Weakley (in prep.) concur, based on an herbarium analysis of the characters of all taxa in the genus. The morphological distinctions (and geographic disjunction) between *N. montanum* and *N. americanum* are as great or greater as those between most species recognized worldwide in the genus. [= F, Q, X; < *Narthecium americanum* – RAB, FNA, GW, K, W, Y; = *Abama montana* Small – S, Z]

45. BURMANNIACEAE Blume 1827 (Burmannia Family) [in DIOSCOREALES]

A family of about 13-15 genera and 130 species, pantropical and warm-temperate. References: Wood (1983a)=Z; Lewis in FNA (2002a); Maas-van de Kamer in Kubitzki (1998a).

1 Floral tube terete; ovary 1-locular ..... ***Apteria***
1 Floral tube 3-angled or 3-winged; ovary 3-locular ..... ***Burmannia***

Apteria Nuttall (Nodding Nixie)

A monotypic genus, the single species distributed from s. North America south to c. South America. References: Lewis in FNA (2002a); Maas-van de Kamer in Kubitzki (1998a).

Apteria aphylla (Nuttall) Barnhart ex Small, Nodding Nixie. Wet hammocks, bay swamps, other acid swamps, mesic forests. E. GA west to e. TX, south to c. South America, and in the West Indies. [= FNA, GW, K, S, WH]

Burmannia Linnaeus (Burmannia)

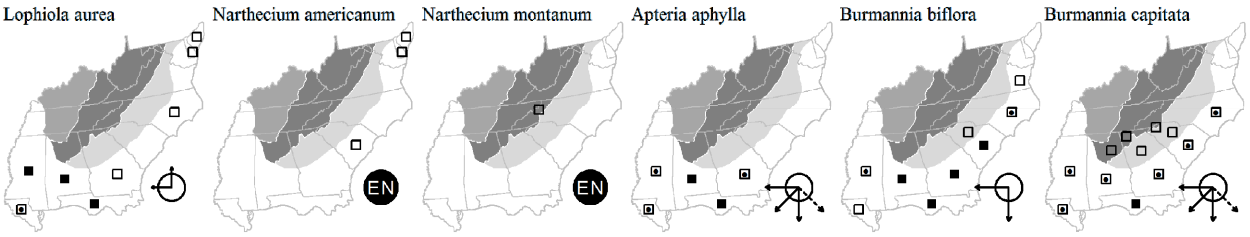
A genus of about 63 species, autotrophic or mycotrophic herbs, pantropical (to warm temperate). References: Lewis in FNA (2002a); Maas-van de Kamer in Kubitzki (1998a).

Identification notes: Both species of *Burmannia* are very small and easy to overlook; they occasionally occur together.

1 Floral tube 3-winged, violet; flowers in a spicate cyme (solitary in depauperate individuals)..... ***B. biflora***
1 Floral tube obtusely 3-angled, greenish to creamy white; flowers in a capitate cluster (solitary in depauperate individuals)..... ***B. capitata***

Burmannia biflora Linnaeus, Violet Burmannia. Savannas, bogs, shores of Coastal Plain depression ponds. August-November. Se. VA south to FL, west to e. TX. [= RAB, C, F, FNA, G, GW, K, S, WH]

Burmannia capitata (J.F. Gmelin) von Martius, White Burmannia. Savannas, bogs, shores of Coastal Plain depression ponds. July-November. E. NC south to s. FL, west to e. TX and se. OK; West Indies, Central America, and South America. [= RAB, FNA, GW, K, S, WH]



46. DIOSCOREACEAE R. Brown 1810 (Yam Family) [in DIOSCOREALES]

A family of about 3-20 genera and 600-880 species, of tropical and warm temperate regions. References: Raz in FNA (2002a); Huber in Kubitzki (1998a).

Dioscorea Linnaeus 1753 (Yam)

A genus of about 575-850 species, vines, of tropical and warm temperate regions of the Old World and New World. Huber in Kubitzki (1998a) advocates the division of the large and unwieldy *Dioscorea* into separate genera. *Dioscorea* (broadly defined) has a wide variety of economic uses, especially in the tropics, where it is most diverse. Various species are cultivated for their edible tubers (yams, not to be mistaken for sweet potatoes, *Ipomoea batatas*, often referred to colloquially as "yams" in the southern United States), especially in Africa. Oral contraceptives were developed from extracts of *Dioscorea*. Many other uses are described in Al-Shehbaz & Schubert (1989). References: Raz in FNA (2002a); Al-Shehbaz & Schubert (1989)=Y; Ward (1977c)=Z; Huber in Kubitzki (1998a).

1 Leaves cordate-ovate, the sides of the leaves continuously convex; aerial tubers never present; perennial from rhizomes < 1.5 cm in diameter; [native species, usually of forests and woodlands]; [section *Macropoda*].
  2 Staminate inflorescences usually of 1 large and 1-2 smaller secondary panicles in each axil (of upper stem leaves); filaments inwardly curved, ca. 0.4 mm long; anther lobes connate; tepals oblong; [of SC south]..... ***D. floridana***
  2 Staminate inflorescence a single panicle in each axil (of median or upper leaves); filaments straight, ca. 0.2 mm long; anther lobes separate; tepals ovate; [widespread in our area]..... ***D. villosa***
1 Leaves halberd-shaped or sagittate, the sides with a concave portion (*D. polystachya*) or continuously convex (*D. alata, D. bulbifera*); aerial tubers often present in the leaf axils; perennial from large, vertically-oriented tubers; [non-native species, usually in disturbed areas, especially in bottomlands]; [section *Enantiophyllum*].
  3 Stems with 2-4 wings or angles..... ***D. alata***
  3 Stems terete.
    4 Leaf margins sagittate, the sides continuously convex..... ***D. bulbifera***
    4 Leaf margins halberd-shaped, the sides with a concave portion..... ***D. polystachya***

* ***Dioscorea alata*** Linnaeus, White Yam, Great Yam. Disturbed areas, in moist soils; native of se. Asia. Reported for Lowndes County, GA (Carter, Baker, & Morris 2009). [= FNA, K, WH, Y, Z]

* ***Dioscorea bulbifera*** Linnaeus, Air Yam. Disturbed forests, thickets, and banks; native of Africa and Asia. Reported for Camden County, GA (Carter, Baker, & Morris 2009). [= FNA, K, WH] {add synonymy}

Dioscorea floridana Bartlett, Florida Wild Yam. Mesic to dry forests, swampy forests. June-July; August-November. SC south to n. FL, on the Coastal Plain. *D. floridana* is "the most distinctive of North American species" (Al-Shehbaz & Schubert 1989). [= FNA, K, S, WH, Y, Z; = *D. villosa* Linnaeus var. *floridana* (Bartlett) Ahles – RAB; = ***Merione sp. 1***]

* ***Dioscorea polystachya*** Turczaninow, Cinnamon Vine, Chinese Yam. Thickets, disturbed areas, bottomland forests; native of China. June-August. [= FNA; = *D. batatas* Decaisne – RAB, C, F, G, W, WH, Z; = *D. oppositifolia* Linnaeus – K, Y, misapplied]

Dioscorea villosa Linnaeus, Wild Yam. Moist forests and woodlands. April-June; September-November. NJ, NY, s. ON, WI, MN, and IA south to n. FL and LA. Various specific and infraspecific taxa are here combined. Ward (1977c) states that "a recent study at Duke University by Shu-fun Au, unfinished due to the death of its author, tentatively recognized *D. hirticaulis* and *D. floridana* but combined all other entities without distinction under *D. villosa*." Further study is needed. Al-Shehbaz & Schubert (1989) indicate that the lectotype of *D. villosa* has pubescent stems; nomenclatural changes are apparently needed, if varietal status of the 2 varieties of *D. villosa* proves warranted. [= FNA, K, WH; > *D. villosa* var. *villosa* – RAB, C; > *Dioscorea villosa*

Linnaeus var. *hirticaulis* (Bartlett) Ahles – RAB, C, Y; > *D. hirticaulis* Bartlett – F, G, S, Z ; > *D. villosa* – F, G, S, W, Z; = ***Merione sp. 2***; > *D. quaternata* – C, F, G, K, S, Y, Z; > *D. glauca* Muhlenberg ex Bartlett – S]

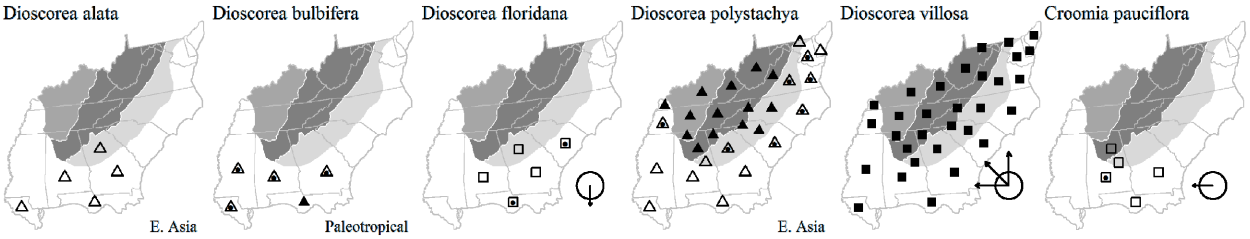
49. STEMONACEAE Engler 1887 (Stemona Family) [in PANDANALES]

A family of 3-4 genera and 30-35 species, herbs and shrubs, of Asia, Australia, and se. North America. References: Whetstone in FNA (2002a); Rogers (1982)=Z; Kubitzki in Kubitzki (1998a).

Croomia Torrey 1840 (Croomia)

A genus of 3 species, 2 in China and Japan and 1 in se. North America. Sometimes segregated into the Croomiaceae. References: Whetstone in FNA (2002a); Rogers (1982)=Z; Kubitzki in Kubitzki (1998a).

Croomia pauciflora (Nuttall) Torrey, Croomia. Moist bluff forests, often with beech and basswood. April-May. Wc. GA and n. AL south to Panhandle FL (Gadsden & Liberty counties; Wunderlin & Hansen 2008), and allegedly se. GA (Whetstone in FNA 2002, Jones & Coile 1988) and s. LA. [= FNA, K, S, WH, Z]



53a. TRILLIACEAE Lindley 1846 (Trillium Family) [in LILIALES]

A family of 5 genera and about 80 species, perennial herbs, of temperate Northern Hemisphere. References: Farmer & Schilling (2002).

Trillium Linnaeus 1753 (Trillium, Toadshade, Wake-robin)

A genus of about 50 species, of e. North America, w. North America, and e. Asia (especially se. North America). The genus *Trillium* in our area is difficult and complex. *Trillium* is now usually separated from the Liliaceae (along with Eurasian genera such as *Paris)* into the Trilliaceae (Zomlefer 1996, Kato et al. 1995, Kawano & Kato 1995, and others) or less drastically as part of the Melanthiaceae (Chase et al. 2000; Tamura et al. 2004). The traditonal division of the genus into two well-marked subgenera, subgenus *Trillium*, the pedicellate trilliums, and subgenus *Phyllantherum*, the sessile-flowered trilliums, has been partly supported by molecular and morphological phylogenetic studies (Kawano & Kato 1995, Kato et al. 1995). These studies support the monophyly of subgenus *Phyllantherum*, but suggest that subgenus *Trillium* consists of several groups which are only rather distantly related (Kawano & Kato 1995, Kazempour Osaloo et al. 1999; Farmer & Schilling 2002). Most species are slow-growing perennials; seedlings, juveniles, and depauperate or "tired" plants are one-leaved ("monilliums"), recognizable by the similar color, texture and venation of the single leaf to the three leaves of mature plants. In some species, such as *T. pusillum*, individual plants remain in the single-leaf stage for long periods of time, and populations may consist largely of juvenile plants. References: Patrick (1986)=Z; Patrick (2007)=V; Freeman (1975)=Y; Case & Case 1997=X; Patrick in Wofford (1989); Case in FNA (2002a); Mitchell (1990); Kato et al. (1995); Kawano & Kato (1995); Tamura in Kubitzki (1998a); Zomlefer (1996); Farmer & Schilling (2002). Key adapted from Patrick (1986, 2007), unpublished keys of J.D. Freeman and S. Farmer, and other sources.

Identification notes: Teratological forms are frequent in some species, as, for instance, leaves, sepals, and stamens in 2's or 4's, petals sepaloid, or sepals petaloid, and so forth. What are called “leaves” in *Trillium* are actually interpreted as bracts by some.

1 Leaves mottled with 2-3 different shades of green (very rarely the mottling not apparent); flower sessile; [subgenus *Phyllantherum*]..... **Key A**
1 Leaves solid green; flower on a pedicel (the pedicel sometimes very short or essentially absent in some varieties of *T. pusillum*); [subgenus *Trillium*].
  2 Petals relatively thick in texture, straight-margined, maroon or white, rarely yellow or green (if white, turning brown with age); stigmas thicker at base, tapering gradually toward tip, distinct; ovary purple-black, maroon, pink, or white, 6-angled; [*Erectum* group].....**Key B**
  2 Petals relatively delicate in texture, wavy-margined, white to deep pink (if white, generally fading to pink with age); stigmas thin, uniform in thickness from base to apex, somewhat fused at the base into a short style; ovary greenish-white to white, 3- or 6-angled or-lobed..... ..... **Key C**

Key A – trilliums with sessile flowers and mottled leaves (subgenus *Phyllantherum*)

1 Scape more-or-less decumbent in a gentle S-shape, the leaves lying on the ground, or nearly so; flower fragrance putrid; [*T. sessile* group].

2 Anther dehiscence extrorse (toward the outside of the flower); stamens about 0.25× as long as the petals; upper stem puberulent; petals 4-10 cm long; filaments 2-5 mm long ..... ***T. decumbens***
2 Anther dehiscence introrse (toward the inside of the flower); stamens about 0.5× as long as the petals; upper stem glabrous; petals 2.5-5.5 cm long; filaments 1-2 mm long ..... ***T. reliquum***
1 Scape erect, straight, the leaves borne well above the ground (the leaf tips sometimes nearly touching the ground); flower fragrance various.
3 Sepals abruptly deflexed between and below the leaves, distinctly descending below the approximately horizontal plane of the leaves; filaments about as long as incurved anthers; [*T. recurvatum* group].
4 Anther connectives slightly incurved; filaments short, < ½ the anther length; [endemic to Kershaw and Richland counties in the inner Coastal Plain of SC] ..... ***T. oostingii***
4 Anther connectives strongly incurved; filaments long, > ½ the anther length; [primarily west of the Blue Ridge and south into the Gulf Coastal Plain, very rarely disjunct to the Mountains or upper Piedmont].
5 Leaves sessile or subsessile, borne in a descending or drooping manner (similar to the sepals); petals usually 4-7× as long as wide, strongly clawed ..... ***T. lancifolium***
5 Leaves distinctly petiolate, borne in an ascending manner (strongly contrasting in position with the strongly deflexed sepals); petals usually ca. 2× as long as wide, attenuate to weakly clawed ..... ***T. recurvatum***
3 Sepals erect, ascending, or spreading, usually borne at or above the approximately horizontal plane of the leaves; filaments much shorter than the upright anthers.
6 Petals spreading to horizontal, with 1-2 spiral twists (looking something like an airplane propellor); anther dehiscence extrorse (toward the outside of the flower); [*T. sessile* group] ..... ***T. stamineum***
6 Petals erect to slightly spreading, not spirally twisted; anther dehiscence introrse (toward the inside of the flower), or latrorse (toward the side).
7 Petals broadly spatulate, clawed, broadly rounded (though sometimes with an apiculus) at the tip; petals pale lemon-yellow (the claws greenish or maroon); flower fragrance clove-like; [of the Savannah River drainage, from sw. NC southeastward along the GA-SC border]; [*T. sessile* group] ..... ***T. discolor***
7 Petals lanceolate, elliptic, obovate, or oblanceolate, but not broadly spatulate and distinctly clawed, generally acute at the tip; petals maroon-red, purplish-brown, yellow, or green; flower fragrance various; [collectively widespread in our area].
8 Stigmas > 1.5× as long as the ovary; stamens about 0.5× as long as the petals; anther connectives prominently prolonged into a beak 1.0-5.0 mm long (beyond the anther sacs); [*T. sessile* group] ..... ***T. sessile***
8 Stigmas as long as the ovary or shorter; stamens < 0.5× as long as the petals; anthers blunt, the connectives extended < 1.0 mm beyond the anther sacs.
9 Ovary ellipsoid; leaves acute, the margins of the outer 1/3 more or less straight; leaf blade mottled with 3 or more shades of green, the palest shade forming a very conspicuous pale silvery-green streak along the midvein; [of the Coastal Plain and fall-line area of GA, AL, and FL Panhandle]; [*T. sessile* group].
10 Stem 2.5-3× as long as the leaves; petals oblanceolate-obovate, usually 1.5-3× as long as wide; flower fragrance similar to overripe bananas ..... ***T. decipiens***
10 Stem 1-2× as long as the leaves (though sometimes elongating late in the season); petals narrowly elliptic to oblanceolate-obovate, usually 3-5× as long as wide; flower fragrance yeasty (reminiscent of stale beer) ..... ***T. underwoodii***
9 Ovary ovoid; leaves acute to acuminate, the margins of the outer 1/3 convex; leaf blade mottled with 2-3 shades of green, paler shades sometimes prominent along the midvein, but not as above; [collectively widespread in our area]; [*T. maculatum* group].
11 Petals < 4× as long as wide, elliptic-oblanceolate to oblanceolate; [of inland provinces, rarely in the Coastal Plain].
12 Flower fragrance fruity-spicy, like green apples or *Calycanthus* (rarely musky); petals maroon, bronze, green, yellow; portions of ovary and stamens purplish during anthesis ..... ***T. cuneatum***
12 Flower fragrance lemon-like; petals greenish-yellow darkening to yellow; ovary and stamens greenish-white during anthesis ..... ***T. luteum***
11 Petals > 4.5× as long as wide, narrowly oblanceolate-spatulate to linear-oblanceolate; [of the Coastal Plain, rarely further inland].
13 Ovary 3-angled at base of stigmas (rarely hexagonal); petals 7-17 mm wide, narrowly spatulate (appearing clawed); outer whorl of stamens broader, anther dehiscence introrse; flower fragrance faintly spicy-fragrant, banana-like; [of AL, n. FL, GA, and e. SC] ..... ***T. maculatum***
13 Ovary 6-angled; petals 3-8 mm wide, linear-oblanceolate, narrowly elliptic, to linear-lanceolate (weakly or not clawed); flower fragrance putrid, like rotting meat; [of MS and LA].
14 Petals 3-5 mm wide; anther dehiscence introrse; anther connective extending 1-1.5 mm beyond the anther sacs ..... ***T. foetidissimum***
14 Petals 4-8 mm wide; anther dehiscence latrorse; anther connective scarcely extending beyond the anther sacs ..... ***T. ludovicianum***

Key B – trilliums with unmottled leaves and pedicellate flowers, of the *Erectum* Group

1 Flowers held below the leaves (the pedicel declined below a horizontal plane).
2 Stamens far exceeding the pistil, filaments as long as the ovary or longer, at least partly maroon, the anther sacs yellow to maroon; ovary small, globose, 3-12 mm long, dark purplish black; flower fragrance pungent, rose-like; pedicel long, 3-13 cm long; petals strongly overlapping, usually maroon (rarely white or whitish) ..... ***T. vaseyi***
2 Stamens at most 1.5× longer than the pistil, filaments shorter than the ovary, white (less commonly purplish), the anther sacs lavender to vivid purple (or albino); ovary white to pink or dull red, large, ovoid, 10-17 mm long; flower fragrance various; pedicel short to long, 1.5-12 cm long; petals not strongly overlapping, usually white (rarely maroon).
3 Pedicels short, 1.5-3 cm long.
4 Anthers 7.5 mm long or less, about as long as the filaments or shorter; petals narrowly elliptic to obovate, often scarcely larger than the sepals, delicate, occasionally margined in pink or green; [of damp forests of n. VA and northwards] ..... ***T. cernuum***
4 Anthers 7.0 mm long or more, longer than the filaments; petals ovate to elliptic, much broader than the sepals; [of mesic forests of n. NC southwards] ..... ***T. rugelii***
3 Pedicels long, 4-12 cm long.

5 Stamens about as long as the ovary or slightly longer; filaments short, ca. 1/3 the length of the anthers or shorter; filaments ½ as long as the ovary or shorter; pollen creamy to pale yellow; filaments and anthers white, the anthers at least in part somewhat appressed against the ovary ..... ***T. flexipes***

5 Stamens far exceeding ovary height; filaments ca. ½ the length of the anthers; pollen creamy, yellow, or pale grayish purple; anthers and filaments also variable in color, mostly white, occasionally purplish; anthers mostly longer than the ovary and not appressed against it ..... ***T. species 2***

1 Flowers held at or above the level of the leaves (the pedicel nearly horizontal, inclined above the horizontal, or erect).

6 Ovary flask-shaped, broadest near the base, usually white to pinkish (sometimes darker); petals usually white to creamy white (maroon forma occasional)

7 Stamens about as long as the ovary or slightly longer; filaments short, ca. 1/3 the length of the anthers or shorter; filaments ½ as long as the ovary or shorter; pollen creamy to pale yellow; filaments and anthers white, the anthers at least in part somewhat appressed against the ovary ..... ***T. flexipes***

7 Stamens far exceeding ovary height; filaments ca. ½ the length of the anthers; pollen creamy, yellow, or pale grayish purple; anthers and filaments also variable in color, mostly white, occasionally purplish; anthers mostly longer than the ovary and not appressed against it ..... ***T. species 2***

6 Ovary globose, widest near the middle, black to purplish black; petals white, maroon, yellowish, or otherwise.

8 Petals lanceolate to narrowly ovate or elliptic, spreading from base in the same plane as the sepals, rarely > 2× as broad as the sepals; sepals 0.5-0.8× as long as the pedicel. weakly sulcate-tipped (keeled and upturned near apex); flower fragrance unpleasant, musty..... ***T. erectum***

8 Petals ovate, overlapping in some instances and forming a cup-shaped base, variably recurved apically, > 2× as broad as the sepals; sepals < 0.5 as long as the pedicel, sulcate-tipped; fragrance pleasant, sweet to fungal.

9 Sepals 0.4-0.7× as long as the pedicel; leaves broadly elliptic; stamens 1.2-1.8× pistil height; flowers generally large, petals much longer than the sepals; sepals green; petals usually white (rarely maroon); flower fragrance sweet, like green apples; [of sw. NC and nw. SC in our area] ..... ***T. simile***

9 Sepals 0.2-0.4× as long as the pedicel; leaves broadly obovate; stamens 0.9-1.6× pistil height; flowers relatively small, petals only slightly longer than the sepals; sepals suffused with purple; petals usually maroon (rarely white); flower fragrance fungal, like fresh mushrooms; [of sw. VA and nw. NC in our area]..... ***T. sulcatum***

Key C – trilliums with unmottled leaves and pedicellate flowers, of various affinities

1 Petals white with triangular red blaze (rarely entirely white or pinkish); anther sacs lavender to white, dehiscence extrorse; fruit a red berry; leaves long-acuminate; [of acidic sites in the Mountains, generally strongly associated with either *Pinus, Tsuga, Picea, Rhododendron*, or other heaths] ..... ***T. undulatum***

1 Petals white to deep pink, lacking a red blaze; anther sacs yellow, dehiscence introrse; fruit a white to greenish-white, fleshy, irregularly dehiscent capsule; leaves obtuse to acute (or somewhat acuminate in *T. grandiflorum*); [of less distinctly acidic sites, collectively widespread in our area].

2 Pedicel declined below the leaves (rarely erect); sepals arcuate-recurved; anthers irregularly twisted outward; pollen egg-yolk yellow..... ***T. catesbaei***

2 Pedicel inclined above leaves to strictly erect; sepals not arcuate-recurved; anthers erect, regular; pollen light yellow.

3 Sepals narrower than the petals, acute; anthers white to greenish-white between the anther sacs; leaves obtuse, acute, or acuminate; pedicel somewhat angled from the vertical.

4 Ovary obscurely 3-lobed; leaves < 5 cm long, blue-green, obtuse ..... ***T. nivale***

4 Ovary sharply 6-angled (-winged); leaves > 5 cm long, green, acute to acuminate.

5 Petals obovate, tightly rolled at base, abruptly flared near the apex; leaves broadly elliptic, acuminate; style minute, < 1.0 mm long ..... ***T. grandiflorum***

5 Petals elliptic, loose, gradually separating; leaves ovate, acute; style conspicuous, > 1.5 mm long..... ***T. persistens***

3 Sepals about as broad as the petals or broader, obtuse; leaves obtuse; anthers purplish-green between anther sacs; pedicel erect through fruiting; [*Trillium pusillum* complex].

6 Leaves with stomates on the upper surface, appearing farinose; [of n. GA] ..... ***T. pusillum*** *var.* ***2 "georgianum"***

6 Leaves without stomates on the upper surface, appearing glabrous.

7 Pedicels < 10 (-12) mm long.

8 Pedicels (0-) 0.5-1 mm long; leaves (1.5-) 2.0-2.4 (-2.9) × as long as broad; leaves (14-) 15-20 (-22.5) mm wide; filaments (4.5-) 4.6-5.8 (-8) mm long; [of upland woods of Mountains of w. VA and e. WV] ..... ***T. pusillum*** *var.* ***monticulum***

8 Pedicels (0.5-) 1-6.5 (-11) mm long; leaves (2.1-) 2.5-3.8 (-6) × as long as broad; leaves (6-) 10-17 (-25) mm wide; filaments (2.5-) 3-5 (6.5) mm long; [of wetland woods].

9 Anthers (3.2-) 4.5-6 (-7) mm long; stamens (5.7-) 8.4-10.9 (-12.5) mm long; stigmas (1-) 2.1-3 (-5) mm long; leaves elliptic; [of the outer Coastal Plain of e. MD, e. VA, and ne. NC]..... ***T. pusillum*** *var.* ***5 "palustris"***

9 Anthers (2.5-) 2.7-4.8 (-6.8) mm long; stamens (5.7-) 6-9.2 (-13.2) mm long; stigmas (1-) 1.2-2.5 (-4.7) mm long; leaves ovate; [of the upper Coastal Plain and Piedmont of ne. NC, se. VA, and Mountains of sw. VA].

10 Pedicels (0.5-) 1-2.1 (-7) mm long; stamens (6-) 7.5-9.2 (-11) mm long; stigmas (1-) 2-2.5 (-4.7) mm long; [of upper Coastal Plain of e.VA]..... ***T. pusillum*** *var.* ***virginianum***

10 Pedicels (1.2-) 1.8-6.6 (-11) mm long; stamens (5.7-) 6-7.6 (-13.2) mm long; stigmas (1-) 1.2-2 (-2.5) mm long; [of Piedmont to edge of upper Coastal Plain of ne. NC] ..... ***T. pusillum*** *var.* ***4 "carolinianum"***

7 Pedicels 10-56 mm long.

11 Leaves ascending; sepals ca. 1.4× as long as the petals; [of sphagnum bogs in the s. SC sandhills] ..... ***T. pusillum*** *var.* ***3 "telmacola"***

11 Leaves horizontal to declining; sepals 0.9-1.1× as long as the petals.

12 Leaves narrower, (1.9-) 3-4.1 (-5.6)× as long as wide; pedicels (23-) 25-33 (-56) mm long; [of calcareous savannas and swamps]..... ***T. pusillum*** *var.* ***pusillum***

12 Leaves broader, (2-) 2.7-3.4 (-5.5)× as long as wide; pedicels (7-) 13-30 (-45) mm long.

13 Leaves ovate, acute; sepals (14-) 22-30 (-41) long, (4-) 6-11 (-17) mm wide, (2-) 3-4.3 (-5.6)× as long as wide; [generally of upland rocky slopes] ..... ***T. pusillum*** *var.* ***ozarkanum***

13 Leaves elliptic, rounded; sepals (13-) 18-25 (-30) long, (4-) 6-8 (-12) mm wide, (1.8-) 2.7-3.1 (-4)× as long as wide; [generally of swamps and floodplains] ..... ***T. pusillum*** *var.* ***1 "alabamicum"***

Trillium catesbaei Elliott, Catesby's Trillium, Bashful Trillium, Rosy Wake-robin. Bottomland forests, mesic slopes, cove forests. Late March-early June; July-August. Nc. NC south to sw. GA and se. AL, north in the interior to n. AL and se. TN, centered in the Piedmont from NC to GA, but extending into the Mountains and Coastal Plain. This species is morphologically and genetically complex and may include several semi-crypti taxa. Petals white to pink. [= RAB, FNA, K, S, V, W, X, Z]

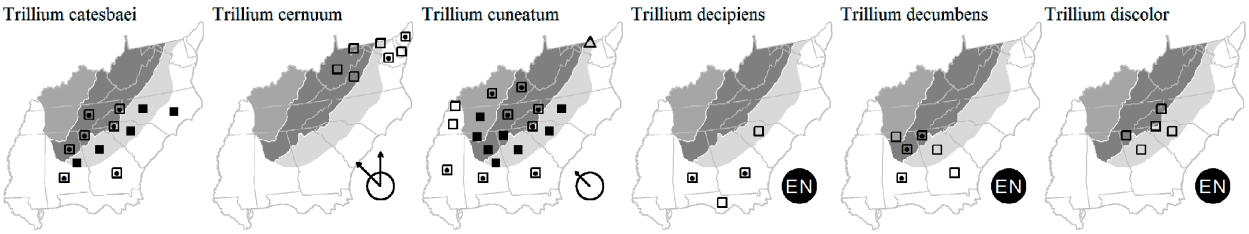
Trillium cernuum Linnaeus, Northern Nodding Trillium. Moist rich woods, seepage edges, damp forests with *Fraxinus nigra* and *Ulmus americana*. Late April-May. NL (Newfoundland), Hudson Bay area, and se. SK south to n. VA, ne. WV, n. IN, n. IL, n. IA, and SD. Petals white, pink, maroon, or green. [= FNA, K, W, WV, X, Z; < *T. cernuum* – RAB, F, S (apparently also including *T. rugelii*); > *T. cernuum* var. *cernuum* – C, G; >< *T. cernuum* var. *macranthum* A.J. Eames & Wiegand – C, G]

Trillium cuneatum Rafinesque, Sweet Betsy, Purple Toadshade, Large Toadshade, Wedge-petal Trillium, Bloody Butcher. In rich soils of cove forests, moist slopes, and bottomlands, usually over mafic or calcareous rocks, locally abundant. Mid March-April; late May-June. Centered in the Southern Appalachians (but is more abundant in adjacent physiographic provinces), extending north to the Highland Rim of KY, west to the Interior Low Plateau of TN, south to the Coastal Plain of MS and AL, and east to the Piedmont of GA, SC, and NC. Petals maroon, yellow, green, or various intermediate shades. [= C, FNA, K, V, W, X, Y, Z; = *T. cuneatum* var. *cuneatum* – RAB; > *T. cuneatum* – F; >< *T. viride* Beck – F, misapplied with respect to NC material; < *T. viride* var. *luteum* (Muhlenberg) Gleason – G, misapplied (also see *T. luteum*); > *T. hugeri* Small – S; >< *T. underwoodii* – S, misapplied]

Trillium decipiens J.D. Freeman, Chattahoochee Trillium, Deceptive Trillium. Moist forests. Late January-early April. FL Panhandle (Jackson and Walton counties) and sc. AL east to ec. GA, and in Abbeville Co. SC (L.L. Gaddy, pers. comm. 2009). It is similar to *T. underwoodii*. [= FNA, K, V, WH, X, Y, Z]

Trillium decumbens Harbison, Decumbent Trillium. Moist forests. Mid-March-April. Se. TN (Chester et al. 1993) south and west to nw. GA and nc. AL, and disjunct in Houston County, in central GA Coastal Plain; it should be sought in extreme sw. NC, an extremely "under-botanized" area. [= FNA, K, S, X, Y, Z]

Trillium discolor Wray ex Hooker, Pale Yellow Trillium, Pale Trillium, Small Yellow Toadshade. Rich cove and bluff forests, restricted to the Savannah River drainage; rare. Late March-early May; June-July. Endemic to the Savannah River drainage of nw. SC, ne. GA, and sw. NC, occurring in the Blue Ridge and Piedmont. In NC it is restricted to a few sites along the Whitewater and Thompson Rivers. Petals pale yellow, with maroon or greenish claws. [= RAB, FNA, K, S, V, W, X, Y, Z]



Trillium erectum Linnaeus, Red Trillium, Purple Trillium, Stinking Willie, Stinking Benjamin, Wake-robin. Wooded slopes, usually at middle to high elevations. April-early June; July-August. NB, QC, and MI south to w. NC, nw. SC, n. GA, e. TN, IN, and se. WI. Petals maroon, white, yellow, green, or various intermediate shades. [= C, K, V, W, X, Z; < *T. erectum* var. *erectum* – RAB, WV (also see *T. sulcatum*); < *T. erectum* – F, G, S (also see *T. sulcatum*); > *T. erectum* var. *erectum* – FNA; > *T. erectum* var. *album* (Michaux) Pursh – FNA]

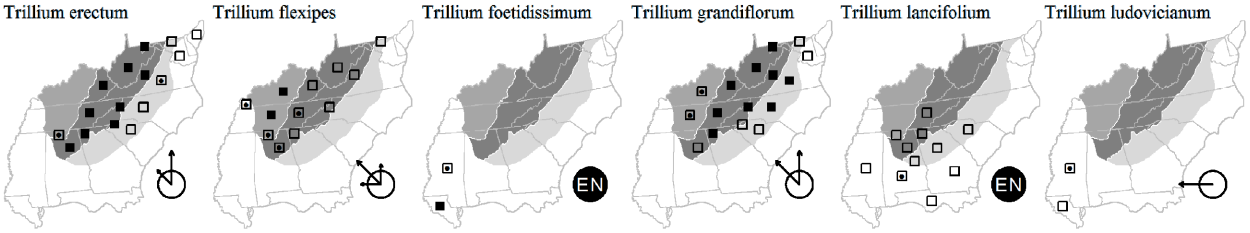
Trillium flexipes Rafinesque, Bent White Trillium. Moist coves over mafic or calcareous rocks. April. E. PA, s. ON and s. MN south to w. NC, nw. GA, n. AL, n. MS, mostly west of the Blue Ridge, but scattered in the Blue Ridge of NC, and disjunct east of the Blue Ridge in DE, PA, and MD. Petals white or maroon. [= C, F, FNA, K, V, W, X, Z; < *T. erectum* var. *vaseyi* – RAB; = *T. gleasoni* Fernald – G; = *T. declinatum* (A. Gray) Gleason – S, misapplied; = *T. erectum* var. *declinatum* – WV]

Trillium foetidissimum J.D. Freeman, Stinking Wake-robin. Bluffs, ravines, bottomlands. Late February-early April. MS west to LA. [= FNA, K, X, Y, Z; < *T. ludovicianum* Harbison – S]

Trillium grandiflorum (Michaux) Salisbury, Large-flowered Trillium, White Trillium, Great White Trillium. Rich coves and mesic slopes, also less typically on ridges over "rich" rock types. April-May; July-August. S. QC, s. ON, MI, and MN, south to NJ, c. NC, nw. SC, n. GA, n. AL, s. IL, and IA. Petals white to pink. [= RAB, C, F, FNA, G, K, S, V, W, WV, X, Z]

Trillium lancifolium Rafinesque, Lanceleaf Trillium, Narrowleaf Trillium. Rich forests over marble, limestone, and other calcareous substrates, floodplain forests. Late March-April. Se. TN south through w. GA and AL to Panhandle FL and se. AL. Petals purple, green, or greenish-purple. Material previously referred to this species from Kershaw County, SC represents the newly described *T. oostingii*. [= FNA, K, V, WH, Y, X, Z; = *T. lanceolatum* (S. Watson) Boykin ex Small – RAB, S]

Trillium ludovicianum Harbison, Louisiana Wake-robin. Floodplains, streambanks, ravine forests. Early March-April. MS west to LA. Reports of this species for AL are based on specimens of *Trillium species 3*. [= FNA, K, X, Y, Z; < *T. ludovicianum* – S]



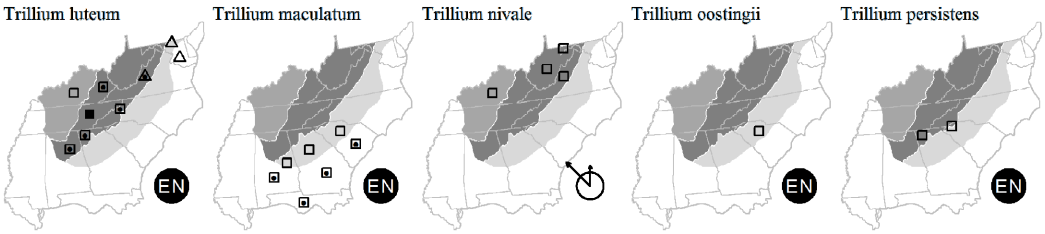
Trillium luteum (Muhlenberg) Harbison, Yellow Trillium, Yellow Toadshade, Wax Trillium, Lemon-scented Trillium. Moist coves over mafic or calcareous rocks, locally abundant in the vicinity of the Great Smokies. Mid March-April; late May-June. Nearly endemic to the Southern Appalachians: w. NC, e. TN, nw. GA, and se. KY, allegedly disjunct in c. AL (planted and naturalized in Frederick County, VA). Petals yellow. [= C, F, FNA, K, V, W, X, Y, Z; = *T. cuneatum* var. *luteum* (Muhlenberg) Ahles – RAB; < *T. viride* Beck var. *luteum* (Muhlenberg) Gleason – G (also see *T. cuneatum*); < *T. sessile* – S, misapplied]

Trillium maculatum Rafinesque, Mottled Trillium, Spotted Trillium. Rich forests and floodplains, over calcareous materials such as coquina limestone ("marl") or on shell middens. Early February-mid April. S. SC south to n. FL, west to sc. AL. Petals maroon or yellow. [= FNA, K, V, WH, X, Y, Z; < *T. viride* – RAB, misapplied; < *T. sessile* – S, misapplied]

Trillium nivale Riddell, Snow Trillium, Dwarf White Trillium. Rocky, calcareous forests. Early March-early April. MA, sw. PA, MI, WI, s. MN, and e. SD south to n. VA, KY, s. IN, s. IL, s. MO, and se. NE. Petals white to pink. [= C, F, FNA, G, K, WV, X, Z]

Trillium oostingii Gaddy, Wateree River Trillium. Rich bottomland forests. Somewhat similar to *T. lancifolium* and *T. recurvatum*. So far as is known, endemic to Kershaw and Richland counties, SC, along the Wateree River. With clawed, bicolored petals (the claw maroon and the blade green) and green sepals reflexed somewhat (in the same plane as the drooping leaves). See Gaddy (2008) for additional information. [previously misidentified as *T. lancifolium*]

Trillium persistens Duncan, Persistent Trillium. Acidic forests with hemlocks and heaths. April. Endemic to a short stretch of the Tallulah-Tugaloo river system in nw. SC and ne. GA. Petals white to pink. [= FNA, K, V, W, X, Z]

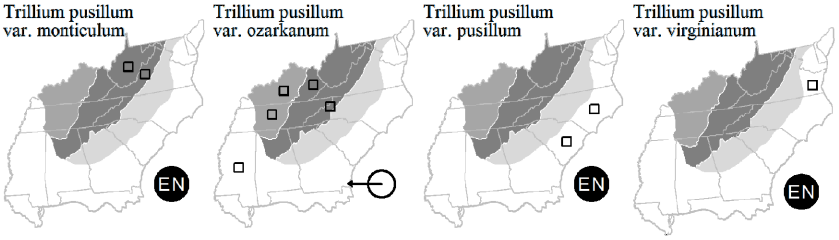


Trillium pusillum Michaux *var.* ***monticulum*** Bodkin & Reveal. Dry to dry-mesic forests and woodlands, moist forests along small mountain streams. Endemic to nw. VA, e. WV, and w. MD. NC. Var. *monticulum* Bodkin & Reveal has been controversial; see Cabe (1995) and Cabe & Werth (1995) for additional discussion of variation within *T. pusillum* in Virginia and elsewhere. Petals white to pink. [< *T. pusillum* – Z; < *T. pusillum* var. *virginianum* – C, K; < *T. pusillum* var. *pusillum* – FNA; = *T. pusillum* var. *monticola* Bodkin & Reveal – X, orthographic error; = *T. monticola* in prep.]

Trillium pusillum Michaux *var.* ***ozarkanum*** (Palmer & Steyermark) Steyermark. Dry to dry-mesic slopes, in NC under *Quercus coccinea* and *Kalmia latifolia*. Centered in the Ozarks of sw. MO, nw. AR, and e. OK; disjunct eastward at scattered localities in sc. KY, nc. TN, sw. NC, and s. MS. Petals white to pink. [= K, X; < *T. pusillum* – RAB, G, S, Z; < *T. pusillum* var. *pusillum* – FNA; = ***T. ozarkanum*** Palmer & Steyermark]

Trillium pusillum Michaux *var.* ***pusillum***, Carolina Least Trillium, Carolina Dwarf Trillium. Ecotones of calcareous savannas and swamp forests in the lower Coastal Plain. Late March-May; June-July. Endemic to the outer Coastal Plain of e. NC and e. SC. *T. pusillum* is somewhat reminiscent of a tiny *T. grandiflorum*. The *T. pusillum* complex has a wide but very fragmented range, involving most of the Southeastern states. In addition to the taxa treated here, the complex includes *T. texanum* Buckley (of e. TX). The *Trillium pusillum* complex is currently undergoing study by Susan Farmer (Univ. of Tennessee); preliminary analysis shows that the published varieties are "good" and that the recognition of additional taxa is warranted. Petals white to pink. [= X; < *T. pusillum* var. *pusillum* – C, F, FNA, K; < *T. pusillum* – RAB, G, S, Z; = ***T. pusillum*** (sensu stricto)]

Trillium pusillum Michaux *var.* ***virginianum*** Fernald, Virginia Least Trillium, Virginia Dwarf Trillium. Bottomland forests along small streams in the upper Coastal Plain, swamps and bottomland forests, also mesic beech islands in swamp forests. Late March-May; June-July. Var. *virginianum* occurs in the Coastal Plain of se. VA. Petals white to pink. [= F, FNA, X ; < *T. pusillum* – RAB, G, S, Z; < *T. pusillum* var. *virginianum* – C, K (also see var. *monticulum*); = ***T. virginianum*** (Fernald) C.F. Reed]



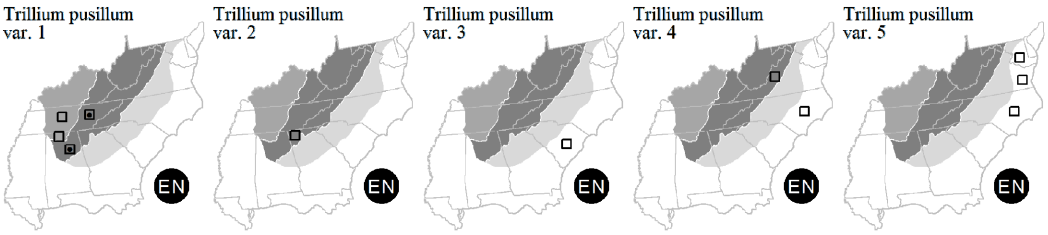
Trillium pusillum Michaux *var.* ***1***, Alabama Least Trillium. Swamps and floodplains. C. TN south to n. AL. Petals white to pink. Under study by Susan Farmer. [< *T. pusillum* var. *pusillum* – C, F, FNA, K; < *T. pusillum* – G, S, Z; = *T. pusillum* var. *alabamicum* – X (nomen nudum); = *T. alabamicum* in prep.]

Trillium pusillum Michaux *var.* ***2***, Georgia Least Trillium. Hardwood flatwoods. Endemic to n. GA. Apparently most closely related to *Trillium texanum*. Petals white to pink. Under study by Susan Farmer. [< *T. pusillum* – V; = *T. georgianum* in prep.]

Trillium pusillum Michaux *var.* ***3***, Aiken Least Trillium. Seepage bogs. Endemic to sc. SC. Petals white to pink. Under study by Susan Farmer. [< *T. pusillum*; = *T. telmacola* in prep.]

Trillium pusillum Michaux *var.* ***4***, Carolina Least Trillium. Swampy forests, bottomland forests along small streams in the upper Coastal Plain. E. NC (upper Coastal Plain and adjacent Piedmont) , moist mafic areas in Grayson Co. VA. The Grayson County site is within a kilometer of the Alleghany County, NC border, and the plant may be found to also occur in nw. NC. Petals white to pink. Under study by Susan Farmer. [< *T. pusillum*; = *T. carolinianum* in prep.]

Trillium pusillum Michaux *var.* ***5***, Dismal Swamp Least Trillium. Swampy forests. E. MD south to ne. NC. Petals white to pink. Under study by Susan Farmer. [< *T. pusillum*; = *T. palustris* in prep.]



Trillium recurvatum Beck, Prairie Trillium, Prairie Wake-robin. Rich soils of cove over calcareous rock. W. OH west to s. MI, s. WI, and e. IA, south to c. TN, c. AL, c. MS, n. LA, and e. TX; disjunct in the Cumberland Plateau of e. TN, e. KY, and the Blue Ridge and w. Piedmont of NC. The two known NC occurrences (Catawba and Madison counties) appear to be native. Petals maroon or yellow. [= C, F, FNA, G, K, S, X, Y, Z]

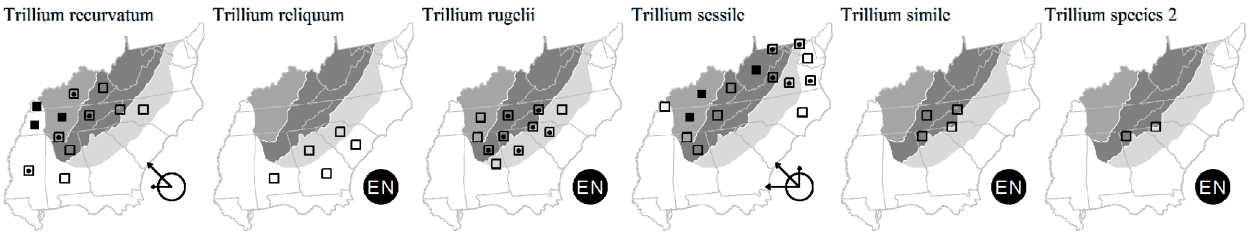
Trillium reliquum J.D. Freeman, Relict Trillium. Rich forests on bluffs and ravine slopes. Mid March-late April. Known from two disjunct areas, along the Savannah River in the vicinity of Augusta, on the border of SC (Aiken County) and GA (Richmond counties), and along the Chattahootchee River in sw. GA (Clay and Early counties). [= FNA, K, V, X, Y, Z]

Trillium rugelii Rendle, Southern Nodding Trillium. Rich woodlands and forests over mafic or calcareous rocks. April-early May. W. NC and e. TN south to c. GA, and c. AL. Petals white or maroon. [= FNA, K, V, W, X, Z; < *T. cernuum* – RAB, F, S; < *T. cernuum* var. *macranthum* A.J. Eames & Wiegand – C, G]

Trillium sessile Linnaeus, Sessile Trillium, Sessile Toadshade, Toad Trillium. Rich forests, in NC limited to very rich soils of natural levees and lower slopes along the Roanoke River. March-April. Primarily a species of the northern Midwest, *T. sessile* ranges from MD, w. PA, w. NY, s. MI, n. IL and n. MO, south to e. VA, ne. NC, c. TN, n. AL, and n. AR. The easternmost occurrences are disjunct populations east of the Blue Ridge, in MD, VA, and along the Roanoke River in ne. NC. Petals maroon or green. [= C, F, FNA, G, K, W, WV, X, Y, Z]

Trillium simile Gleason, Sweet White Trillium. Very rich soils of slopes and coves over mafic or calcareous rocks, often also in or near seepage. Late March-early May; June-July. A Southern Appalachian endemic: Blue Ridge of w. NC, nw. SC, e. TN, and n. GA. Petals white or very rarely maroon. [= FNA, K, S, V, W, X, Z; < *T. erectum* var. *vaseyi* – RAB]

Trillium species 2, Amicalola Trillium. Rich forests. Under study by Tom Patrick and Susan Farmer. Also recently found in SC. [= "Amicalola Trillium" – V]



Trillium species 3, Lookout Mountain Trillium. Rich forests. Endemic to the Lookout Mountain region of nw. GA, se. TN, and ne. AL. Resembles *T. ludovicianum*. Under study by Susan Farmer. [< *T. ludovicianum* – V; "*T. freemanii*"] {not yet keyed}

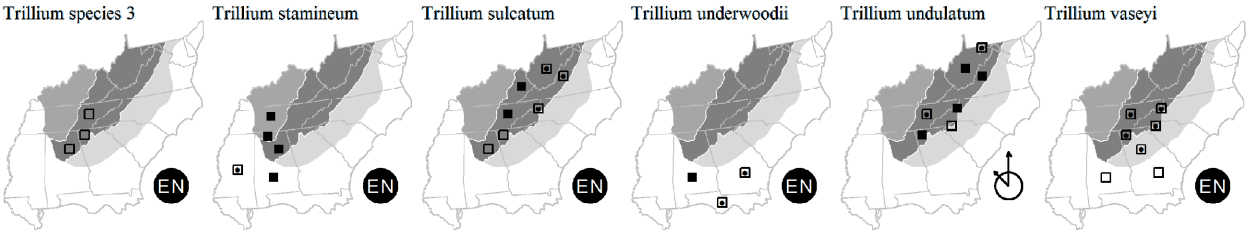
Trillium stamineum Harbison, Twisted Trillium. Floodplains, slopes, especially over limestone. Late March-mid May. C. TN (Chester et al. 1993) south to c. AL and e. MS. [= FNA, K, S, X, Y, Z]

Trillium sulcatum T. Patrick, Southern Red Trillium, Barksdale's Trillium. Coves and moist slopes. April-May. Primarily a species of the sedimentary rock Appalachians, *T. sulcatum* ranges from s. WV, sw. VA, and e. KY south to nw. NC (where it enters the Blue Ridge), w. TN, nw. GA, and ne. AL. This species seems quite distinctive for its small, generally maroon flowers (with strongly sulcate sepals purplish as well), borne on very long pedicels. Petals maroon or white. [= C, FNA, K, V, W, X, Z; < *T. erectum* var. *erectum* – RAB, WV; < *T. erectum* – F, G, S]

Trillium underwoodii Small, Underwood's Trillium. Moist forests. Late February-mid April. N. FL north to wc. GA and c. and s. AL. The only erect trillium with the stems typically < 2× as long as the leaves (though sometimes elongating later in the season). [= FNA, K, S, V, WH, X, Y, Z]

Trillium undulatum Willdenow, Painted Trillium, Striped Wake-robin. Acidic soils of ridges, slopes, and bog margins, mostly at high elevations and often associated with *Rhododendron, Tsuga, Pinus,* or *Picea*. Late April-May; late July-August. NB, e. QC, s. ON, and MI, south to w. NC, nw. SC, n. GA, e. TN, and ne. OH. Of all our species, this is the species best adapted to acidic soils. Petals white with a red blaze. [= RAB, C, F, FNA, G, K, S, V, W, WV, X, Z]

Trillium vaseyi Harbison, Sweet Trillium, Vasey's Trillium, Sweet Beth. Cove forests, other rich forests. Late April-early June. This species is a Southern Appalachian endemic: w. NC and e. TN south to nw. SC, n. GA, and ne. AL. Perhaps the largest trillium species, with the stems to 7 dm tall. Petals maroon or white. [= FNA, K, S, V, W, X, Z; < *T. erectum* var. *vaseyi* (Harbison) Ahles – RAB (also see *T. simile* and *T. flexipes*)]



53b. XEROPHYLLACEAE Takhtajan 1994 (Beargrass Family) [in LILIALES]

A family of a single genus and 2 species, perennial herbs, of e. and nw. North America. References: Dahlgren, Clifford, & Yeo (1985); Zomlefer (1997a)=Z; Zomlefer (1996, 2003); Tamura in Kubitzki (1998a); Zomlefer et al. (2001).

Xerophyllum Michaux 1803 (Turkeybeard, Beargrass)

A genus of 2 species, rather woody herbs of temperate North America. The other species in the genus is the western beargrass, *X. tenax* (Pursh) Nuttall, widely distributed in the western Cordillera. References: Zomlefer (1997)=Z; Utech in FNA (2002a); Tamura in Kubitzki (1998a).

Xerophyllum asphodeloides (Linnaeus) Nuttall, Turkeybeard, Beargrass, Mountain-asphodel. Dry ridges and slopes in the mountains, primarily in dry, strongly acidic sites which burn periodically, such as pine/heath woodlands and forests, heath balds, and xeric oak forests, most of the populations in the Blue Ridge Escarpment, often associated with *Pinus rigida* or *P. pungens*, disjunct to similar sites on quartzite monadnocks of the upper Piedmont, in the Coastal Plain in acidic pinelands. May-June; July-August. In two disjunct areas; the Coastal Plain of s. NJ and DE, and the Southern Appalachians from w. VA and e. WV south to e. TN, w. NC, nw. SC, and ne. GA. Sterile plants resemble tussocks of a bunchgrass, but the leaf bases are white and flattened and are obviously not those of a grass. The leaves remain green throughout the winter. [= RAB, C, F, FNA, G, K, W, WV, Z]

53c. HELONIADACEAE J. Agardh 1858 (Swamp-pink Family) [in LILIALES]

A family of 3 genera and 15 species, perennial herbs, of e. North America and e. Asia. References: Dahlgren, Clifford, & Yeo (1985); Zomlefer (1997a)=Z; Zomlefer (1996, 2003); Tamura in Kubitzki (1998a); Zomlefer et al. (2001).

1 Flowers white to cream; plants dioecious (individual flowers either male or female) ..... ***Chamaelirium***
1 Flowers pink; plants hermaphroditic (individual flowers perfect) ..... ***Helonias***

Chamaelirium Willdenow 1808 (Devil's-bit)

A monotypic genus, an herb of temperate e. North America. Perhaps better placed in the segregate family Chionographidaceae. References: Zomlefer (1997a)=Z; Tamura in Kubitzki (1998a); Utech in FNA (2002a).

Chamaelirium luteum (Linnaeus) A. Gray, Devil's-bit. Moist slopes, bottomlands, wet savannas. March-May; September-November. MA west to ON, OH, s. IN, and AR, south to FL and LA. The ecological amplitude and morphologic variability of this species is surprising; it needs additional, more careful, study. *C. obovale* Small (or other previously unnamed entities) may warrant recognition at some level. [= RAB, C, F, FNA, G, GW, K, W, WH, Z; > *C. luteum* – S; > *C. obovale* Small – S]

Helonias Linnaeus 1753 (Swamp Pink)

A monotypic genus, an herb of temperate e. North America. Although *Helonias* has traditionally been considered a monotypic genus, Takahashi & Kawano (1989) have suggested that the closely related *Heloniopsis* and *Ypsilandra* (both of e. Asia) may be congeneric. Perhaps better to be placed in the segregate family Heloniadaceae. References: Zomlefer (1997a)=Z; Utech in FNA (2002a); Tamura in Kubitzki (1998a).

Helonias bullata Linnaeus, Swamp Pink. Bogs, usually under dense shrubs in peaty soils, in the VA Coastal Plain in acidic sandy seepage swamps. April-May; June-July. S. NY and NJ to e. VA on the Coastal Plain, and from w. VA through w. NC to nw. SC and ne. GA (Jones & Coile 1988) in the Blue Ridge Mountains. The flowering scape elongates markedly in fruit, reaching 1 m in height. [= RAB, C, F, FNA, GW, G, K, S, W, Z]

53d. MELANTHIACEAE Batsch 1802 (Bunchflower Family) [in LILIALES]

A family of about 8 genera and 80 species, mostly temperate and northern hemisphere, but extending into South America (Peru). References: Dahlgren, Clifford, & Yeo (1985); Zomlefer (1997a)=Z; Zomlefer (1996, 2003); Tamura in Kubitzki (1998a); Tamura et al. (2004); Zomlefer et al. (2001).

1 Leaves 3, whorled at the summit of the stem; flowers 1 per plant, solitary and terminal ..... **[see *TRILLIACEAE*]**
1 Leaves many, not whorled at the summit of the stem; flowers many per plant, in spikes, racemes, or panicles.
  2 Leaves 1-2 mm wide, linear, stiff, sclerified ..... **[see *XEROPHYLLACEAE*]**
  2 Leaves 3-150 mm wide, linear, obovate, or oblanceolate, not notably stiff.
    3 Main (basal) leaves obovate or oblanceolate, the main secondary veins diverging individually (at angles of < 10°) from the midvein in the lower half of the expanded blade and rejoining at the apex; flowers pink, white or cream ..... **[see *HELONIADACEAE*]**
    3 Main (basal) leaves linear, elliptic, or obovate, the main veins parallel, all diverging at the base of the leaf and rejoining at the apex; flowers white, cream, yellowish, greenish, or brownish.
      4 Inflorescence a spike or raceme.
        5 Inflorescence a spike ..... ***Schoenocaulon***
        5 Inflorescence a raceme.
          6 Basal leaves many, 4-23 mm wide; capsule 5-7 mm long, 5-7 mm wide; bulb broadly ovoid ..... ***Amianthium***
          6 Basal leaves 1-3, 2-7 mm wide; capsule 7-9 mm long, 3-4 mm wide; bulb cylindrical ..... ***Stenanthium densum***
      4 Inflorescence a panicle.
        7 Inflorescence axes scurfy-pubescent; seeds winged; leaves **either** linear **or** broader, < 14 cm wide ..... ***Veratrum***
        7 Inflorescence axes glabrous; seeds not winged (though sometimes angled); leaves linear, < 2 cm wide.
          8 Leaves strongly keeled, (5-) 10-20 mm wide; plant colonial, from thick, hard, horizontal, short-creeping rhizomes covered with fibrous old leaf bases; inner tepals (petals) 7-17 mm long, distinctly clawed, acute-acuminate at the tip, bearing 2 glands well above the base ..... ***Zigadenus***
          8 Leaves slightly or not at all keeled, 2-12 mm wide; plant solitary, from a bulbous or semibulbous base; inner tepals (petals) 3-6 or 7-12 mm long, clawed or not, bearing either a single (sometimes obscure to essentially invisible) gland near the base or a bilobed gland well above the base.
            9 Inner tepals (petals) 7-12 mm long, clawed, with a single bilobed gland borne well above the base; [of calcareous habitats in the Mountains] ..... ***Anticlea***
            9 Inner tepals 3-10 mm long, not clawed, with a single, unlobed gland borne near the base (this often difficult or impossible to see, consisting only of a greenish line at the very base of the tepal); [of acid habitats of the Mountains, Piedmont, and Coastal Plain] ..... ***Stenanthium***

Amianthium A. Gray 1837 (Fly-poison)

A monotypic genus, an herb of temperate e. North America. Zomlefer et al. (2001) confirm that *Amianthium* should be treated as a monotypic genus. *Amianthium* has a chromosome number of 2n=32 (Zomlefer & Smith 2002). Like *Zigadenus*, containing very toxic alkaloids. References: Zomlefer (1997a)=Z; Zomlefer & Judd (2002)=Y; Utech in FNA (2002a); Tamura in Kubitzki (1998a).

Amianthium muscitoxicum (Walter) A. Gray, Fly-poison. Mesic forests, pine savannas, meadows. May-July; July-September. S. NY, PA, MO, and OK, south to Panhandle FL, MS, and AR. [= FNA, K, Y; = *A. muscaetoxicum* – RAB, C, F, G, GW, W, WH, orthographic variant; = *Chrosperma muscaetoxicum* (Walter) Kuntze – S; = *Zigadenus muscitoxicus* (Walter) Regel – Z]

Anticlea Kunth 1843 (Death-camas)

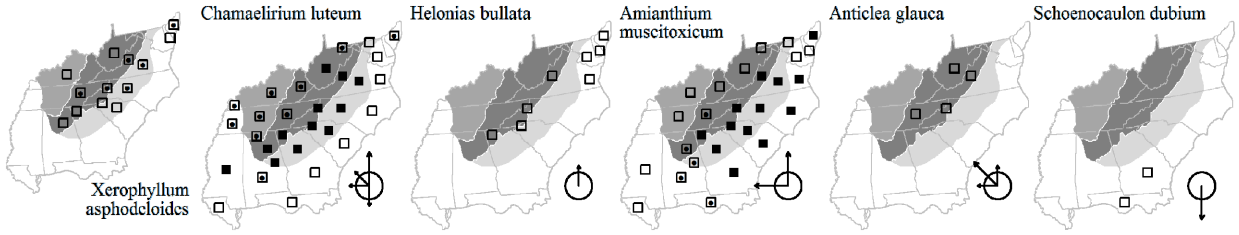
A genus of about 15 species, of North America south to Guatemala, and e. Asia. *Anticlea* has a chromosome number of 2n=32 (Zomlefer & Smith 2002). References: Zomlefer (1997a)=Z; Zomlefer & Judd (2002)=Y; Zomlefer et al. (2001); Schwartz in FNA (2002a).

Anticlea glauca Kunth, White Death-camas. Limestone and dolostone woodlands, glades, cliffs, and outcrops. July-August; September-October. *A. glauca* is the more eastern component of a complex variously treated as two species or a single variable species, with or without recognized varieties or subspecies. *A. elegans* (in the broadest sense) ranges from QC and NY west to AK, south to n. OH, n. IN, n. IL, MO, IA, NM, AZ, and n. Mexico; disjunct in the mountains of w. VA, e. WV, and w. NC. Two taxa have often been recognized, at the specific, subspecific, or varietal level. The more eastern taxon (epithet "*glauca*" – see synonymy below) ranges from NB west to ND, south to w. NC, TN, and MO, and is distinguished by glaucous foliage, paniculate inflorescence, and tepals often purplish or brownish basally. The more western taxon (epithet "*elegans*"), occurring east to the MN and MO, has the foliage greener, the inflorescence often only racemose, and the tepals yellow. [< *Anticlea elegans* (Pursh) Rydberg – Y; = *Zigadenus elegans* Pursh ssp. *glaucus* (Nuttall) Hultén – K; = *Zigadenus glaucus* Nuttall – RAB, F, W, Z; = *Zigadenus elegans* var. *glaucus* (Nuttall) Preece – C; < *Zigadenus elegans* – FNA; = *Zygadenus glaucus* – G; < *Anticlea chlorantha* (Richardson) Rydberg – S, misapplied; = *A. elegans* ssp. *glauca* (Nuttall) A. Haines; = *A. elegans* var. *glauca* (Nuttall) Zomlefer & Judd]

Schoenocaulon A. Gray 1837 (Feathershank)

A genus of about 24 species of s. North America, Central America, and n. South America. *Schoenocaulon* has a chromosome number of 2n=16 (Zomlefer & Smith 2002). References: Zomlefer et al. (2006)=Z; Zomlefer (1997a); Tamura in Kubitzki (1998a); Frame in FNA (2002a).

Schoenocaulon dubium (Michaux) Small, Florida Feathershank. Dry pine savannas, sandhills, scrub. S. GA and n. peninsular FL south to s. peninsular FL. [= FNA, K, S, WH, Z]



Stenanthium (A. Gray) Kunth 1843 (Featherbells, Featherfleece)

A genus of about 4 species, herbs of e. North America. *Stenanthium*, as redefined by Zomlefer & Judd (2002), has a chromosome number of 2n=20, excludes a w. North American and an e. Asian species previously included, and includes some taxa formerly placed in *Zigadenus* (Zomlefer & Smith 2002). References: Zomlefer & Judd (2002)=Y; Zomlefer (1997a)=Z; Wofford (2006); Utech in FNA (2002a); Schwartz in FNA (2002a); Tamura in Kubitzki (1998a). Key adapted in part from F, the taxa and key needing further evaluation and (probably) alteration.

1 Tepals obovate, the tip rounded-obtuse.
  2 Inflorescence a raceme; flowers all bisexual; plants 3-10 dm tall; flowering April-early June; [of the Coastal Plain (in our area)] ..... ***S. densum***
  2 Inflorescence a panicle of racemes; lower flowers of the inflorescence branches bisexual and fertile, the upper staminate or superficially perfect but the pistils nonfunctional (not producing fruits); plants 4-20 dm tall; flowering July-August; [of the Mountains of NC and VA and Coastal Plain of GA westward to LA] ..... ***S. leimanthoides***
1 Tepals lanceolate, the tip acute-acuminate.
  3 Inflorescence a diffuse panicle up to 3 dm wide, the terminal racemose portion reduced or absent; flowers on mid-portion of lateral branches with pedicels 1.6-4 mm long, spaced 8-15 mm apart; uppermost non-bracteal stem leaf 4-14 cm above ground level; flowering mid September-mid October; [of sandstone rockhouses of the Cumberland Plateau] ..... ***S. diffusum***
  3 Inflorescence branched but not diffuse, typically up to 1.5 dm wide, the terminal racemose portion present and up to 3 dm long; flowers on mid-portion of lateral branches with pedicels 0.3-1.1 mm long, generally spaced 3-7 mm apart; uppermost non-bracteal stem leaf 22-66 cm above ground level; flowering May-late August; [of various wet to dry habitats, widespread in our area].
    4 Larger leaves to 30 mm wide, thin and membranous-translucent, not strongly ribbed; panicle dense, the branches stiffly ascending, the flowers crowded; perianth 5-10 mm long, greenish; capsules oblong or subcylindric, 9-10 mm long, erect; seeds 5-8 mm long; leaves distributed all along the stem, nearly as dense just below the panicle as at the base; plant to 2.2 m tall and the stem to 2 cm in diameter near its base; [of bogs and wet meadows] ..... ***S. gramineum*** *var.* ***robustum***
    4 Larger leaves to 15 mm wide, firm to coriaceous, strongly ribbed; panicle diffuse, the branches ascending, spreading, or drooping, the flowers scattered; perianth 3-8 (-10) mm long, whitish; capsules ovoid to urceolate, 6-9 mm long, deflexed; seeds 5-5.5 mm long; leaves mainly near the base, rapidly reduced upwards; plant to 1.9 m tall and the stem to 1 cm in diameter near its base; [of dry to moist upland forests].
      5 Perianth 5-10 mm long; plant to 1.9 m tall, the stem 4-10 mm in diameter near the base ..... ***S. gramineum*** *var.* ***gramineum***
      5 Perianth 3-4.5 (-5.0) mm long; plant to 1.0 m tall, the stem 1.5-5 mm in diameter near the base ..... ***S. gramineum*** *var.* ***micranthum***

Stenanthium densum (Desrousseaux) Zomlefer & Judd, Crow-poison. Pine savannas, pine flatwoods. April-early June; late May-July. Se. VA south to c. peninsular FL and west to se. TX, on the Coastal Plain. See *Z. leimanthoides* for discussion of the taxonomy of the 2 species. *Z. densus* is superficially very similar to *Amianthium muscitoxicum*; *Z. densus* has a conical capsule, 2× or more as long as broad (vs. about 1× as long as broad), a bladeless purple sheath, 3-8 cm long, enclosing the leaves at the base (vs. sheath absent, all leaves with blades), and basal leaves usually 1-3 in number, 3-6 (-10) mm wide (vs. mostly 4 or more in number, mostly 7-10 mm wide). [= Y; = *Zigadenus densus* (Desrousseaux) Fernald – RAB, C, GW, K, Z; < *Zigadenus densus* (Desrousseaux) Fernald – FNA, WH (also including *S. leimanthoides*); = *Zygadenus densus* – G (an orthographic variant); = *Tracyanthus angustifolius* (Michaux) Small – S]

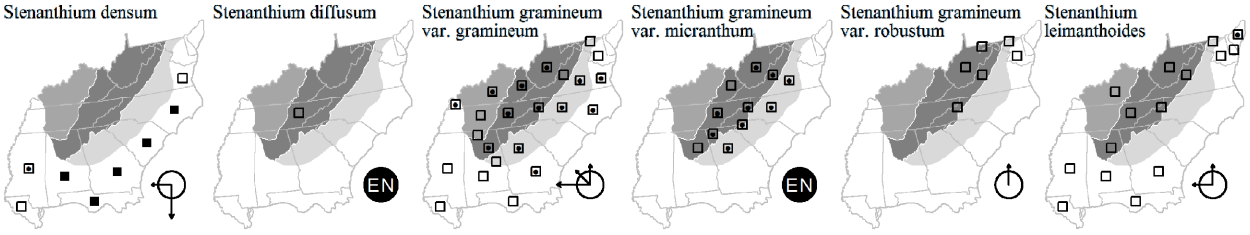
Stenanthium diffusum Wofford, Rockhouse Featherbells. Sandstone rockhouses. Mid-September-mid-October. Endemic to the Cumberland Plateau of ne. TN (known from Fentress, Morgan, Pickett, Scott counties). See Wofford (2006).

Stenanthium gramineum (Ker-Gawler) Morong *var.* ***gramineum***, Common Featherbells. Moist forests, grassy balds, to 1700m in elevation. July-early September; August-October. PA west to IL and MO, south to ne. NC, Panhandle FL, and TX. [= F, K; < *S. gramineum* – RAB, C, FNA, G, S, W, WH, Z; < *S. gramineum* var. *gramineum* – WV]

Stenanthium gramineum (Ker-Gawler) Morong *var.* ***micranthum*** Fernald, Small Featherbells. Dry upland forests and woodlands. July-early September; August-October. W. VA and TN south to n. AL. [= F, K; < *S. gramineum* – RAB, C, FNA, G, S, W, Z; < *S. gramineum* var. *gramineum* – WV]

Stenanthium gramineum (Ker-Gawler) Morong *var.* ***robustum*** (S. Watson) Fernald, Giant Featherbells, Bog Featherbells. Wet meadows, bogs. July-early September; August-October. PA south to w. NC. [= F, K, WV; = *S. robustum* S. Watson – S; < *S. gramineum* – RAB, C, FNA, G, W, Z]

Stenanthium leimanthoides (A. Gray) Zomlefer & Judd, Pinebarrens Death-camas. High elevation rock outcrops, shrub balds, seepage areas at high elevations, in the Coastal Plain in sandhill bogs and wet pine savannas. July-August; September-October. As currently interpreted, with a peculiar and disjunct range, occurring on the Coastal Plain of se. NY (Long Island), NJ, and DE, in the mountains from WV and VA south through w. NC to (allegedly) AL, and on the Gulf Coastal Plain, from s. GA to LA. Unpublished studies involving (primarily) Gulf Coast populations of *S. leimanthoides* have questioned its distinctness from *S. densum*. Our plants seem very distinct in many ways. Perhaps inflorescence characters do not reliably distinguish the two taxa and so-called *S. leimanthoides* of the Gulf Coast is a paniculate form of *Z. densus* (the real distinguishing characters not at present clear). *S. leimanthoides* in the east follows much the same phytogeographic patterns as *Kalmia buxifolia* and *Xerophyllum asphodeloides*; the 3 species occurring together in the Pine Barrens of the s. NJ Coastal Plain and at 1900 m elevation on the summit of Grandfather Mountain, Avery County, NC! [= Y; = *Zigadenus leimanthoides* A. Gray – RAB, C, F, GW, K, W, WV, Z; < *Zigadenus densus* (Desrousseaux) Fernald – FNA, WH; = *Zygadenus leimanthoides* – G (an orthographic variant); = *Oceanoros leimanthoides* (A. Gray) Small – S]



Veratrum Linnaeus 1753 (White-hellebore)

A genus of about 30-55 species, herbs of temperate Northern Hemisphere. *Veratrum* is here interpreted broadly, including *Melanthium*, following the molecular phylogeny work of Zomlefer et al. (2003). A proposal to conserve the name *Veratrum* against *Melanthium* has been made but not yet ruled on (Zomlefer, Judd, & Gandhi 2010). References: Zomlefer (1997)=Z; McNeal & Shaw in FNA (2002a); Bodkin & Utech in FNA (2002a); Tamura in Kubitzki (1998a); Zomlefer et al. (2003).

1 Leaves all linear, 1-2 (-3) cm wide; tepals greenish white to creamy white (sometimes fading brownish); [section *Fuscoveratrum*]..... ***V. virginicum***

1 Leaves (at least the basal) oblanceolate to obovate or elliptic, 3-15 cm wide (the upper leaves sometimes linear); tepals yellowish green, green, or maroon.

2 Leaves strongly plicate, 6-15 cm wide; tepals pubescent, 8-13 mm long, 3-5 mm wide, with a conspicuous pair of glands near the base of the tepal blade (these sometimes more or less fused); filament free from the tepals; [section *Veratrum*]..... ***V. viride***

2 Leaves not at all to slightly plicate, 3-14 cm wide; tepals glabrous, 4-9 mm long, 1-3 mm wide (3-5 mm wide in *V. latifolium*), with either conspicuous (*V. latifolium*) or diffuse (*V. parviflorum* and *V. woodii*) glands; filament fused to the basal claw of the tepal; [section *Fuscoveratrum*].

3 Tepals 3-5 mm wide, the blade of the tepal abruptly narrowed to a claw, the blade nearly as wide as long, with undulate margins, and 2 conspicuous succulent glands; leaves 1-7 cm wide..... ***V. species 1***

3 Tepals 1-3 mm wide, the blade gradually narrowed to the base, the blade much longer than wide, with entire margins, and with diffuse glandular areas; leaves 3-12.5 cm wide.

4 Tepals pale to olive green, 4-7 mm long; ovaries glabrous; leaves 4.5-14 cm wide; [common, of the Mountains in our area]..... ***V. parviflorum***

4 Tepals dark maroon, 6-9 mm long; ovaries densely pubescent; leaves 3-10 cm wide; [rare disjunct in our area]..... ***V. woodii***

Veratrum species 1, Crisped Bunchflower. Moist to dry forests. July-August; September-October. An Appalachian endemic: CT south to NC, SC, and n. GA. The basionym with priority is apparently *Melanthium hybridum*; the combination in *Veratrum* has not yet been made (Ward 2010; Weakley, in prep.). [= *Veratrum latifolium* (Desrousseaux) Zomlefer – Z; = *Melanthium hybridum* Walter – RAB, C, F, G, W, WV; = *Melanthium latifolium* Desrousseaux – FNA, K, S]

Veratrum parviflorum Michaux, Mountain Bunchflower. Moist to rather dry forests, up to at least 1700 meters. July-early September; August-October. A Southern Appalachian endemic: e. and sc. WV and KY south to VA, NC, n. GA, and TN. [= RAB, C, G, W, S, Z; = *Melanthium parviflorum* (Michaux) S. Watson – F, FNA, K, WV]

Veratrum virginicum (Linnaeus) Aiton, Bog Bunchflower, Virginia Bunchflower. Savannas, bogs, seepage bogs, wet forests. June-August; August-October. S. NY, PA, OH, IN, IL, and IA south to c. peninsular FL and e. TX. This species is superficially quite similar to *Zigadenus glaberrimus*, which, in addition to characters given in the family key, has the stem glabrous (vs. pubescent in *M. virginicum*). [= WH, Z; = *Melanthium virginicum* Linnaeus – RAB, C, F, FNA, G, GW, K, W, WV; > *Melanthium dispersum* Small – S; > *Melanthium virginicum* – S]

Veratrum viride Aiton, White-hellebore, Indian Poke, Green Hellebore, Cornhusk Lily. Seeps, streambanks, wet boulderfields. June-August; July-September. QC and ON south in the mountains to NC, TN, and ne. GA. The closely related *V. eschscholtzii* A. Gray, sometimes treated as *V. viride* ssp. *eschscholtzii* (A. Gray) A. & D. Löve or *V. viride* var. *eschscholtzii* (A. Gray) Breitung, is western, ranging from AK to OR. This plant is strongly poisonous; an insecticide was formerly manufactured from the roots. [= RAB, C, F, G, GW, S, W, WV, Z; < *V. viride* – K; = *V. viride* var. *viride* – FNA; = *V. viride* ssp. *viride*]

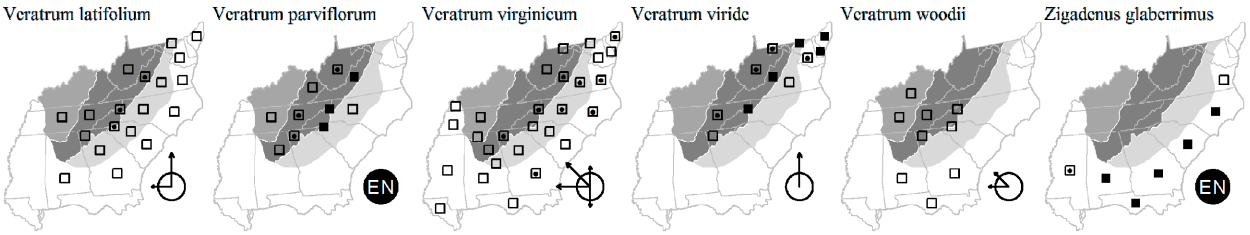
Veratrum woodii J.W. Robbins ex Wood, Ozark Bunchflower, Wood's False-hellebore. Circumneutral soil of woodlands over mafic rocks (such as amphibolite) or other calcareous substrates, hammocks. July; September. Primarily Ozarkian, but

extending in scattered populations eastwards as far as FL Panhandle (Gadsden and Liberty counties), sw. GA, nw. GA, sc. TN, nw. SC (Pickens County), and sw. NC (Polk County). [= C, F, G, Z; = *Melanthium woodii* (J.W. Robbins ex Wood) Bodkin – FNA, K; > *V. intermedium* Chapman – S]

Zigadenus Michaux 1803 (Death-camas)

As redefined, a monotypic genus of se. North America. A molecular systematics study by Zomlefer et al. (2001) gives strong support to a treatment recognizing *Zigadenus* as monotypic (*Zigadenus glaberrimus*), *Anticlea* (including for our area the former *Zigadenus elegans* ssp. *glaucus*), *Stenanthium* (including for our area *Stenanthium* spp. and the former *Zigadenus densus* and *Z. leimanthoides*). *Zigadenus* (as redefined) has a tentatively reported chromosome number of 2n=52 (Zomlefer & Smith 2002). References: Zomlefer (1997)=Z; Tamura in Kubitzki (1998a); Zomlefer et al. (2001); Schwartz in FNA (2002a). [also see *Anticlea, Stenanthium*]

Zigadenus glaberrimus Michaux, Large Death-camas, Snakeroot. Sandhill seepage bogs, pine savannas, pocosin edges. Late June-early September; August-November. Se. VA south to Panhandle FL, west to se. TX, on the Coastal Plain. [= RAB, C, F, FNA, GW, K, WH, Z; = *Zygadenus glaberrimus* – G, S (orthographic variant)]



55. ALSTROEMERIACEAE Dumortier 1829 (Peruvian-lily Family) [in LILIALES]

A family of 5 genera and about 170 species, perennial herbs, of Central and South America. References: Holmes in FNA (2002a).

Alstroemeria (Peruvian-lily, Alstroemeria)

A genus of about 60 species, perennials, of South America. References: Holmes in FNA (2002a).

* ***Alstroemeria pulchella*** Linnaeus f., Peruvian-lily. Disturbed areas, roadsides near plantings; native of Brazil. Naturalized in GA, FL, AL, MS, LA, and TX (Holmes in FNA 2002; Singhurst, Keith, & Holmes 2005). [= FNA, WH]

56. COLCHICACEAE A.P. de Candolle 1805 (Meadow Saffron Family) [in LILIALES]

As here circumscribed, a family of about 15 genera and about 250 species, nearly cosmopolitan. References: Vinnersten & Manning (2007); Dahlgren, Clifford, & Yeo (1985); Nordenstam in Kubitzki (1998a).

1 Plant acaulescent, from a tunicated bulb; [tribe *Colchiceae*] ..... ***Colchicum***
1 Plant with leafy stem, from a rhizome or tuber.
  2 Tepals red or orange, reflexed; leaves attenuate into a tendril-like tip; [alien]; [tribe *Colchiceae*] ..... ***Gloriosa***
  2 Tepals yellow, not reflexed; leaves acute to obtuse; [native]; [tribe *Uvularieae*] ..... ***Uvularia***

Colchicum Linnaeus 1753 (Meadow Saffron)

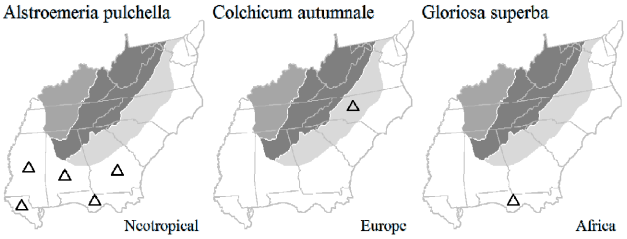
A genus of about 100 species, of s. Europe, n. Africa, and w. and c. Asia, here circumscribed to include *Androcymbium*, following Vinnersten & Manning (2007). References: Vinnersten & Manning (2007); Nordenstam in Kubitzki (1998a).

* ***Colchicum autumnale*** Linnaeus, Meadow Saffron, Autumn-crocus. Planted as an ornamental, at least long-persistent; native of s. Europe. September-October. [= C, F, G, K]

Gloriosa Linnaeus 1753 (Flamelily)

A genus of about 5 species, perennials, native of Africa and Asia.

* ***Gloriosa superba*** Linnaeus, Flamelily, Glory-lily. Disturbed areas; native of tropical Africa. [= FNA, K, WH]



Uvularia Linnaeus 1753 (Bellwort, Merrybells)

A genus of about 5 species, of temperate eastern North America. References: Wilbur (1963b)=Z; Uttal (1991)=Y; Utech & Kawano in FNA (2002a); Nordenstam in Kubitzki (1998a).

1 Leaves perfoliate, the margins scarious but smooth; upper stems terete in cross-section, hollow; [section *Uvularia*].
2 Tepals glabrous within; leaves puberulent beneath (or rarely glabrate); leaves below the fork (0-) 1 (-2) ..... ***U. grandiflora***
2 Tepals conspicuously granular-papillose within; leaves glabrous and often glaucous beneath; leaves below the fork 2-4..... ***U. perfoliata***
1 Leaves sessile, the margins scarious and minutely papillose-denticulate; upper stems angled in cross-section, solid; [section *Oakesiella*].
3 Undivided portion of the style 0.5-1× as long as the style branches; upper stem and lower leaf surfaces puberulent to glabrous, light green; rhizome very short, with clustered, thickened roots..... ***U. puberula***
3 Undivided portion of the style 3-5× as long as the style branches; upper stem and lower leaf surfaces glabrous, usually also glaucous; rhizome elongate, with scattered, fibrous roots.
4 Pedicel bearing a sessile, leaf-like bract 5-17 mm below the flower; capsule sessile at base, conspicuously beaked at apex ... ***U. floridana***
4 Pedicel bractless; capsule on a stalk 2-4 (-6) mm long, not beaked..... ***U. sessilifolia***

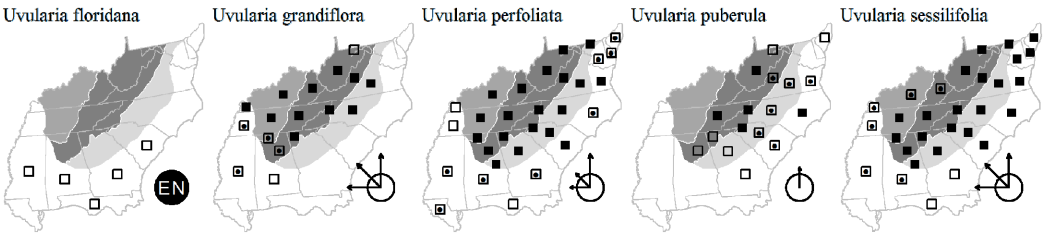
Uvularia floridana Chapman, Florida Bellwort. Alluvial forests, moist ravines. Mid March-early April. C. SC south to ne. FL, and Panhandle FL, west to c. MS, rare and local throughout its range. [= RAB, FNA, GW, K, WH, Z; = *Oakesiella floridana* (Chapman) Small – S]

Uvularia grandiflora J.E. Smith, Large-flowered Bellwort. Cove forests and other moist, rich, forested sites. Mid April-mid May; July-August. S. QC west to ND, south to w. NC, w. SC, n. GA, c. AL, MS, c. AR, and e. OK. [= RAB, C, F, FNA, G, K, S, W, WV, Z]

Uvularia perfoliata Linnaeus, Perfoliate Bellwort. Moist to fairly dry hardwood forests. April-early May; June-August. S. NH, s. ON, and c. OH, south to Panhandle FL and LA. [= RAB, C, F, FNA, G, K, S, W, WH, WV, Z]

Uvularia puberula Michaux, Carolina Bellwort, Appalachian Bellwort, Coastal Bellwort. Dry to moist upland, acidic forests, up to at least 1500m. Early April-Early May; August-October. Sometimes interpreted as having two varieties, the montane and Piedmont plants as var. *puberula* (leaves broader, rounded to slightly clasping at the base, firm in texture, obviously reticulate on the lower surface, the stem puberulent in lines on the ridges) and var. *nitida* (Britton) Fernald (leaves narrower, more cuneate, thin in texture, the reticulation of cross veins less evident, the stems glabrous); see Wilbur (1963b) and Uttal (1991). S. PA to GA in the Mountains and (more rarely) Piedmont, and from Long Island NY south to GA in the Coastal Plain and Sandhills. While Wilbur (1963b) chose not to recognize varieties, Uttal (1991) supports varietal recognition. The differences seem minor and variable, and poorly correlated with geography. [= FNA, K, W, Z; > *Uvularia puberula* Michaux var. *puberula* –C, Y; > *Uvularia puberula* Michaux var. *nitida* (Britton) Fernald – C, Y; = *U. pudica* (Walter) Fernald – RAB, WV, nomen dubium; > *U. pudica* var. *pudica* – F, G; > *U. pudica* var. *nitida* (Britton) Fernald – F, G; = *Oakesiella puberula* (Michaux) Small – S; = *Uvularia caroliniana* (J.F. Gmelin) Wilbur]

Uvularia sessilifolia Linnaeus, Straw-lily, Wild-oats. Moist hardwood forests, on slopes and mainly in bottomlands. Late March-early May; August-October. NS west to ND, south to Panhandle FL and n. LA. [= RAB, C, F, FNA, K, W, WH, WV, Z; = *Oakesiella sessilifolia* (Linnaeus) S. Watson – S]



59. SMILACACEAE Ventenat 1799 (Greenbrier Family) [in LILIALES]

A family of 3-12 genera and about 375 species, widespread in tropical, subtropical, and temperate regions. References: Holmes in FNA (2002a); Judd (1998); Conran in Kubitzki (1998a).

Smilax Linnaeus 1753 (Greenbrier, Carrionflower, Smilax)

A genus of about 300 species, woody vines and herbs, subcosmopolitan in temperate and tropical regions. Our deciduous species are a monophyletic group within *Smilax*, with a classic eastern North American - east Asian disjunction, and are treated as section Nemexia or subgenus Luiste (Wilbur 2004, Fu et al. 2005). *Smilax* berries and shoots provide important food sources for many

wildlife species, including black bears (*Ursus americanus*). References: Mangaly (1968)=Z; Judd (1998)=Y; Holmes in FNA (2002a); Wilbur (2004); Fu et al. (2005); Duncan (1967); Godfrey (1988). Key for the woody species based in part on Godfrey (1988).

1 Stem herbaceous, lacking prickles; ovules 2 per carpel; peduncles usually > 4 cm long; [section *Nemexia*].
2 Plants erect, 0.2-1.0 m tall, even when well-developed with < 20 leaves [note that immature or depauperate individuals (nonflowering) of *S. pseudochina, S. herbacea, S. lasioneura*, and *S. pulverulenta* often have this aspect]; tendrils absent or rudimentary; peduncles usually few (usually 1-4), the lowest often from bract axils.
3 Leaves glabrous and glaucous beneath, thick in texture, base cordate, tip acute or acuminate; lowest peduncle from a leaf axil (very rarely from bract axils), upper peduncles from leaf axils; leaves 5-7, clustered together near the summit of the stem .....***S. biltmoreana***
3 Leaves pubescent and green (or glaucous) beneath, usually thin in texture, base cordate, truncate, or rounded, tip acuminate, acute, or obtuse; lowest peduncles from axils of bracts below the lowest leaves, upper peduncles also often from bracts (the uppermost often from leaf axils); leaves either clustered together near the summit of the stem or well distributed.
4 Leaves relatively many, (7-) 10-13 (-20), often well distributed in the upper half of the stem, notably reduced in size from lower to upper, mostly with the base cordate and the tip acuminate; berry 3-5 seeded .....***S. ecirrata***
4 Leaves few, usually 4-8, usually clustered together near the summit of the stem (rarely well distributed), about the same size, mostly with the base ovate (to subcordate), the tip acute to obtuse; berry 2-3 seeded.....***S. hugeri***
2 Plants vine-like, climbing or sprawling, to 3 m tall, when well-developed with > 30 leaves; tendrils present and numerous; peduncles usually many, from leaf axils.
5 Leaf bases hastate, the leaf margins straight or concave in outline; longest fruiting pedicels < 2× as long as the fruit; anthers equaling or longer than the filaments; perianth 1.5-2.5 mm long; leaves glabrous and glaucous beneath.....***S. pseudochina***
5 Leaf bases cordate, the leaf margins convex in outline; longest fruiting pedicels 2× or more as long as the fruit; anthers shorter than the filaments; perianth 3.5-6 mm long; leaves either puberulent beneath (at least along the veins), or glabrous and glaucous beneath.
6 Leaves glabrous and glaucous on the lower surface; fruit dark blue and glaucous; peduncles 5-8× as long as the subtending petioles... .....***S. herbacea***
6 Leaves puberulent on the lower surface, at least on the veins; fruit dark blue and glaucous or black and not glaucous; peduncles 1-10× as long as the subtending petioles.
7 Leaves bright green and shiny beneath; fruit black, not glaucous; peduncles 1-2 (-3)× as long as the subtending petioles ....***S. pulverulenta***
7 Leaves pale green and dull below; fruit dark blue, glaucous; peduncles (3-) 5-10× as long as the subtending petioles ....***S. lasioneura***
1 Stem woody, usually with prickles; ovules 1 per carpel; peduncles usually < 3 cm long; [section *China*].
8 Stems and petioles tomentose, lacking prickles; leaves densely tomentose beneath; berries red; plant trailing or ascending, rarely > 0.5 m tall (with determinate growth) .....***S. pumila***
8 Stems and petioles stellate-scurfy or glabrous, generally with prickles; leaves glabrous or papillate beneath; berries red, black, or dark blue; plant climbing, ascending, or trailing, mature plants generally well over 0.5 m tall (with indeterminate growth).
9 Lower surfaces of leaves strongly glaucous .....***S. glauca***
9 Lower surfaces of leaves green (rarely very slightly glaucous).
10 Prickles of the stem abundant, thin and needle-like, shiny brown or black.....***S. hispida***
10 Prickles of the stem fewer, broad-based and awl-like or catclaw-like, green, brown, or black.
11 Midvein (as seen on the lower surface) much more pronounced than the principal lateral veins, which are scarcely raised; leaves evergreen, thick, coriaceous.....***S. laurifolia***
11 Midvein (as seen on the lower surface) little if any more pronounced than the principal lateral veins; leaves evergreen or deciduous, thin, subcoriaceous.
12 Leaves mostly lanceolate, the base cuneate, the tip acute to acuminate; berries dull red .....***S. smallii***
12 Leaves mostly ovate, oblong, pandurate, or hastate, the base cordate, truncate, rounded, or cuneate, the tip rounded to acute; berries various in color.
13 Margin of the leaf blade prominently thickened with a marginal vein (this appearing as a thickening, a visible vein, or an apparent revolute margin); berries with 1-3 seeds.
14 Inflorescence peduncle (stalk of the umbel) as long as or shorter than the subtending leaf petiole; stems and prickles glabrous; leaves evergreen; berries usually with 2-3 seeds; [generally of xeric or less commonly mesic sands]..... .....***S. auriculata***
14 Inflorescence peduncle (stalk of the umbel) > 1.5×as long as the subtending leaf petiole; stems (especially the lower) and prickles brownish stellate-scurfy; leaves semi-evergreen to evergreen; berries usually with 1 seed; [of a wide variety of habitats].....***S. bona-nox***
13 Margin of the leaf blade thin, sometimes revolute; berries with (1-) 2-4 seeds.
15 Berries blue-black; perianth green; leaves semi-evergreen to evergreen, margins of mature leaves generally not revolute, the margins of the leaves and the petioles often with minute, flattish, tooth-like projections; berries with (1-) 2-3 seeds; [a wide variety of upland and wetland habitats] .....***S. rotundifolia***
15 Berries bright red; perianth brownish-yellow; leaves deciduous, margins of mature leaves usually revolute, the margins of the leaves and the petioles lacking minute, flattish, toothlike projections; berries with 2-4 seeds; [swamp forests, bogs, often where submersed for at least part of the year] .....***S. walteri***

Smilax auriculata Walter, Dune Greenbrier. Dunes on barrier islands, dry sandy openings in maritime forests or sandhills (northwards, as in the Carolinas, limited to sites near the near the coast). May-July; October-November (and persisting). E. NC (Dare County) south to s. FL and west to LA; Bahama Islands. [= RAB, FNA, GW, K, S, WH, Y]

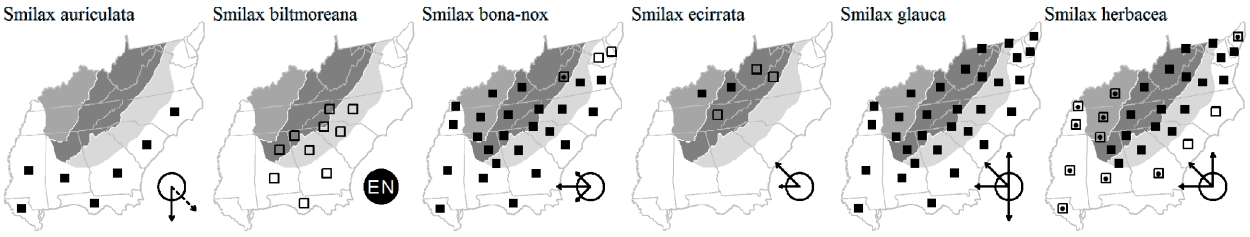
Smilax biltmoreana (Small) J.B.S. Norton ex Pennell, Biltmore Carrionflower. Dry forests (such as dry pine ridges and chestnut oak forests) and moist forests. April-May; August-October. The species is apparently limited to to NC, SC, and GA, primarily in the Blue Ridge Escarpment region, with disjunct occurrences in Panhandle FL, s. AL, and sc. KY. [= FNA, K, W, Y, Z; = *Smilax ecirrata* (Engelmann ex Kunth) S. Watson var. *biltmoreana* (Small) Ahles – RAB; < *S. ecirrhata* – G, WH; = *Nemexia biltmoreana* Small – S]

Smilax bona-nox Linnaeus, Catbrier, Tramp's-trouble. In a wide variety of upland and wetland habitats. Late April-May; September-November. MD and MO south to s. FL and TX, and also in Mexico. [= RAB, C, FNA, G, GW, K, S, W, WH, Y; > *S. bona-nox* var. *hastata* (Willdenow) Alphonse de Candolle – F; > *S. bona-nox* var. *exauriculata* Fernald – F; > *S. bona-nox* var. *hederifolia* (Beyrich) Fernald – F; > *S. bona-nox* var. *bona-nox* – F]

Smilax ecirrata (Engelmann ex Kunth) S. Watson. Forests. Mid May-early June; August-September. N. OH MI, WI, and s. MN south to w. VA, TN, s. IL, MO, and e. OK. [= K, Y, Z; = *S. ecirrhata* – C, F, FNA, WV, orthographic variant; < *S. ecirrhata* – G; = *Nemexia ecirrhata* (Engelmann ex Kunth) Small – S]

Smilax glauca Walter, Whiteleaf Greenbrier, Wild Sarsaparilla. In a wide variety of upland and wetland habitats. Late April-early June; September-November (and persisting). NJ, c. PA, OH, IN, MO, and KA, south to c. peninsular FL and TX, and also in Mexico. [= RAB, C, FNA, GW, S, W, Y; > *S. glauca* var. *glauca* – F, G, K, WV; > *S. glauca* var. *leurophylla* Blake – F, G, K, WV]

Smilax herbacea Linnaeus, Common Carrionflower. Moist deciduous forests. May-June; August-October. Centered in the Appalachian Mountains, from QC and ME west to OH, south to AL, GA, and TN. Young, non-flowering plants closely resemble *S. biltmoreana*. [= F, FNA, K, W, WV, Y, Z; = *S. herbacea* var. *herbacea* – RAB, C, G; = *Nemexia herbacea* (Linnaeus) Small – S]



Smilax hispida Rafinesque, Bristly Greenbrier, Hellfetter. Moist to wet forests. CT, NY, MN, and NE south to s. FL and TX. Wilbur (2003) discusses the complicated nomenclatural problems involving this plant and concludes that *S. hispida* Raf. is the correct name. [= RAB, C, G, S, WV; = *S. tamnoides* Linnaeus – FNA, GW, K, W, WH, Y, misapplied; > *S. tamnoides* var. *hispida* (Muhlenberg) Fernald – F; > *S. tamnoides* var. *tamnoides* – F; > *S. hispida* var. *australis* Small – S; > *S. hispida* var. *hispida* – S]

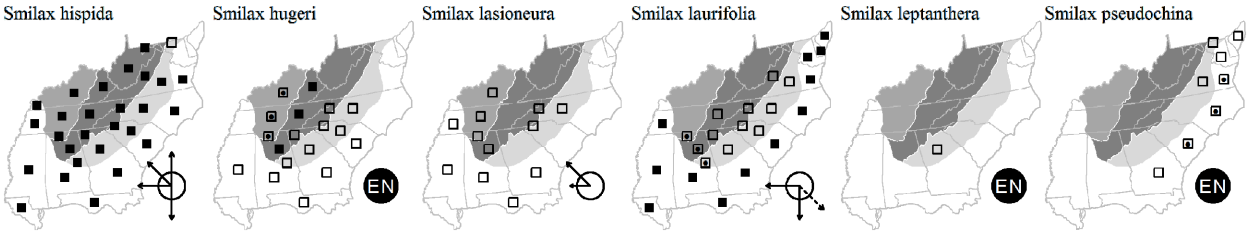
Smilax hugeri (Small) J.B.S. Norton ex Pennell, Huger's Carrionflower. Moist deciduous forests. March-April; August-October. S. NC and e. TN south through SC, GA, and AL to Panhandle FL. [= FNA, K, W, Y, Z; = *S. ecirrata* (Engelmann ex Kunth) S. Watson var. *hugeri* (Small) Ahles – RAB; = *Nemexia hugeri* Small – S; < *S. ecirrhata* – WH]

Smilax lasioneura Hooker, Midwestern Carrionflower. Moist deciduous forests, hammocks, bluff forests, pine-oak hickory submesic forests, perhaps only or primarily over mafic rocks. April-May; August-September. ON and MT south to w. VA (?), w. NC, Panhandle FL, OK, and CO. Material from VA is ambiguous. [= F, FNA, K; = *S. herbacea* var. *lasioneura* (Hooker) Alphonse de Candolle – C, G; = *Nemexia lasioneuron* (Hooker) Rydberg – S; = *S. lasioneuron* – WH, Y, orthographic variant]

Smilax laurifolia Linnaeus, Blaspheme-vine, Bamboo-vine. Pocosins, swamp forests, mountain bogs in sw. NC. July-August; September-October of the second year (and persisting). Primarily a Southeastern Coastal Plain species: NJ south to s. FL, west to w. TN, AR, and e. TX, and also in the Bahama Islands and Cuba. [= RAB, C, F, FNA, G, GW, K, S, W, WH, Y]

Smilax leptanthera Pennell. Moist forests. See Pennell (1916) for additional information. Treated as valid and rare by GAHP. [= *Nemexia leptanthera* (Pennell) Small – S; < *S. pseudochina*] {investigate}

Smilax pseudochina Linnaeus, Coastal Carrionflower. Pocosins, swamp forests, edges of pine savannas. May; August-October. An Atlantic Coastal Plain endemic: NJ, se. PA, and DE south to e. GA. [= C, FNA, K, Y; = *S. tamnifolia* Michaux – RAB, G; = *S. pseudo-china* – F, W, Z, orthographic variant; > *Nemexia tamnifolia* (Michaux) Small – S; > *Nemexia leptanthera* (Pennell) Small – S]



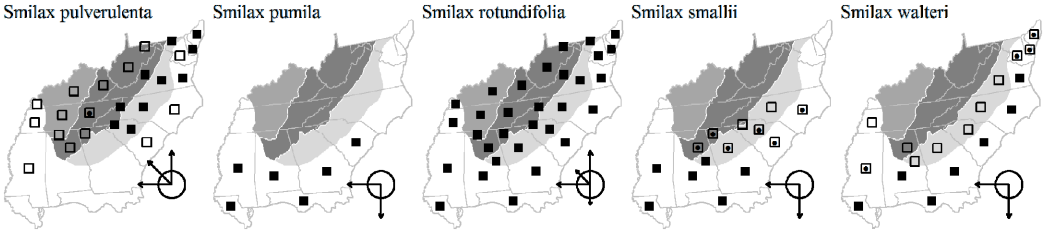
Smilax pulverulenta Michaux. Moist deciduous forests. May-June; August-October. Se. NY, se. and sc. PA, IN, MO, and e. KS south to NC, TN, and AR. [= F, FNA, K, W, WV, Y, Z; = *S. herbacea* var. *pulverulenta* (Michaux) A. Gray – RAB, C, G; = *Nemexia pulverulenta* (Michaux) Small – S]

Smilax pumila Walter, Sarsaparilla-vine, Dwarf Smilax. Mesic to dryish hammocks and bluffs, northward primarily in maritime-influenced mainland forest, with *Magnolia grandiflora* and *Tilia americana* var. *caroliniana*. October-November; January-April (and persisting). Ne. SC (within a few hundred meters of Brunswick County, NC) to c. peninsular FL and west to TX. It occurs on Colkins Neck, along the NC-SC border, in maritime-influenced forests with southern affinities, now largely destroyed by golf-course development. This unusual *Smilax* is sometimes cultivated as an ornamental ground-cover. [= RAB, FNA, K, S, WH, Y]

Smilax rotundifolia Linnaeus, Common Greenbrier, Bullbrier, Horsebrier. In a wide variety of upland and wetland habitats. April-May; September-November (and persisting). NS and s. ON south to n. FL and e. TX. [= RAB, C, F, FNA, G, GW, K, S, W, WH, WV, Y; > *S. rotundifolia* var. *quadrangularis* (Muhlenberg ex Willdenow) Wood]

Smilax smallii Morong, Jackson-brier. Bottomland forests. June-July; April-June of the next year. Ne. NC (se. VA?) to c. peninsular FL, west to s. AR and e. TX, primarily on the Coastal Plain. Unless the name *S. smallii* is conserved, it must be replaced by the older *S. maritima* Alph. Wood. [= RAB, FNA, G, GW, K, W, WH, Y; = *S. lanceolata* Linnaeus – S, misapplied; = ***S. maritima*** Alph. Wood]

Smilax walteri Pursh, Coral Greenbrier, Red-berried Swamp Smilax. Swamp forests, bogs, often where submersed for at least part of the year. Late April-May; September-November (and persisting). NJ south to c. peninsular FL and west to TN, AR, and TX. In its relatively narrow leaves, *S. walteri* can resemble *S. smallii*; *S. walteri* has a thicker-textured leaf, and is almost always rounded at the base rather than cuneate. [= RAB, C, F, FNA, G, GW, K, S, W, WH, Y]



61. LILIACEAE A.L. de Jussieu 1789 (Lily Family) [in LILIALES]

As here interpreted narrowly, the Liliaceae constitutes about 11 genera and 550 species, of the Northern Hemisphere. There has been much recent investigation and re-interpretation of evidence regarding the upper-level taxonomy of the Liliales, with strong suggestions that the broad Liliaceae recognized by Cronquist (1981) is artificial and polyphyletic. Cronquist (1993) himself concurs, at least to a degree: "we still await a comprehensive reorganization of the lilies into several families more comparable to other recognized families of angiosperms." Dahlgren & Clifford (1982) and Dahlgren, Clifford, & Yeo (1985) synthesized an early phase in the modern revolution of monocot taxonomy. Since then, additional research, especially molecular (Duvall et al. 1993, Chase et al. 1993, Bogler & Simpson 1995, and many others), has strongly validated the general lines (and many details) of Dahlgren's arrangement. The most recent synthesis (Kubitzki 1998a) is followed as the basis for familial and generic taxonomy of the lilies and their relatives (see summary below). References: Angiosperm Phylogeny Group (1998, 2003, 2009); Tamura in Kubitzki (1998a). [also see *AGAVACEAE*, *ALLIACEAE, ALSTROEMERIACEAE, AMARYLLIDACEAE, ASPARAGACEAE, COLCHICACEAE, HEMEROCALLIDACEAE, HOSTACEAE, HYACINTHACEAE, HYPOXIDACEAE, MELANTHIACEAE, NARTHECIACEAE, RUSCACEAE, SMILACACEAE, THEMIDACEAE, TOFIELDIACEAE, TRILLIACEAE*]

Our "liliaceous" genera (members of orders placed in the Lilianae) are therefore divided as shown below, largely following Kubitzki (1998a) and some more recent molecular analyses.

ALISMATALES
TOFIELDIACEAE: *Harperocallis, Pleea, Tofieldia, Triantha.*
LILIALES
ALSTROEMERIACEAE: *Alstroemeria.*
COLCHICACEAE: *Colchicum, Uvularia.*
HELONIADACEAE: *Chamaelirium, Helonias*. (or to be included in MELANTHIACEAE)
LILIACEAE: *Clintonia, Erythronium, Lilium, Medeola, Prosartes, Streptopus, Tulipa.*
MELANTHIACEAE: *Amianthium, Anticlea, Schoenocaulon, Stenanthium, Veratrum, Toxicoscordion, Zigadenus.*
SMILACACEAE: *Smilax.*
TRILLIACEAE: *Trillium.* (or to be included in MELANTHIACEAE)
XEROPHYLLACEAE: *Xerophyllum*. (or to be included in MELANTHIACEAE)
ASPARAGALES
AGAVACEAE: *Camassia, Manfreda, Schoenolirion, Yucca.* (or to be included in ASPARAGACEAE)
AMARYLLIDACEAE: *Allium, Crinum, Galanthus, Habranthus, Hymenocallis, Leucojum, Lycoris, Narcissus, Nothoscordum, Sternbergia, Tristagma, Zephyranthes*. [including ALLIACEAE]
ASPARAGACEAE: *Asparagus.*
HOSTACEAE: *Hosta.* (or to be included in ASPARAGACEAE)
HYACINTHACEAE: *Hyacinthoides, Hyacinthus, Muscari, Ornithogalum.* (or to be included in ASPARAGACEAE)
HYPOXIDACEAE: *Hypoxis.*
IRIDACEAE: *Alophia, Calydorea, Crocus, Crocosmia, Gladiolus, Herbertia, Iris, Nemastylis, Sisyrinchium.*
ORCHIDACEAE: *Aplectrum, Arethusa, Bletilla, Calopogon, Cleistesiopsis, Coeloglossum, Corallorhiza, Cypripedium, Epidendrum, Epipactis, Galearis, Goodyera, Habenaria, Hexalectris, Isotria, Liparis, Listera, Malaxis, Platanthera, Pogonia, Ponthieva, Platythelys, Pteroglossaspis, Sacoila, Spiranthes, Tipularia, Triphora, Zeuxine.*
RUSCACEAE: *Convallaria, Liriope, Maianthemum, Nolina, Polygonatum.* (or to be included in ASPARAGACEAE)
THEMIDACEAE: *Dichelostemma*. (or to be included in ASPARAGACEAE)
XANTHORRHOEACEAE: *Hemerocallis.* (or to be split, and then in HEMEROCALLIDACEAE)
DIOSCOREALES
BURMANNIACEAE: *Apteria, Burmannia.*
DIOSCOREACEAE: *Dioscorea.*
NARTHECIACEAE: *Aletris, Lophiola, Narthecium.*
PANDANALES
STEMONACEAE: *Croomia*.

1 Leaves basal; flowers on a leafless scape; tepals yellow or white.
2 Flowers in an umbel at the summit of a leafless scape; fruit a berry; [subfamily *Medeoloideae*] ..... ***Clintonia***
2 Flowers solitary and scapose; tepals yellow or white; fruit a capsule; [subfamily *Lilioideae*] ..... ***Erythronium***
1 Leaves on a stem; flowers not scapose; tepals orange, red, rose, yellow, or white.
3 Leaves whorled at 1 node or more.

4 Leaves occurring at several nodes, these variously whorled and/or alternate; flowers orange, red, or yellow; [subfamily *Lilioideae*] ..... ***Lilium***
4 Leaves occurring in a single whorl, with fertile plants with a second whorl of leaflike bracts subtending the flowers; flowers yellow; [subfamily *Medeoloideae*] ..... ***Medeola***
3 Leaves alternate at all nodes.
5 Leafy stem branched; fruit a berry; [subfamily *Streptopoideae*].
6 Stems brownish, wiry; inflorescence terminal ..... ***Prosartes***
6 Stems green, rather succulent; inflorescence axillary ..... ***Streptopus***
5 Leafy stem unbranched; fruit a capsule; [subfamily *Lilioideae*].
7 Leaves at 7 or more nodes; flowers with tepals recurved; flowers orange, red, or yellow (rarely white) ..... ***Lilium***
7 Leaves at 1-6 nodes; flowers cup-shaped, the tepals incurved-erect; flowers of various colors..... ***Tulipa***

Clintonia Rafinesque 1819

A genus of 5 species, of temperate to subarctic e. Asia and North America. References: Utech in FNA (2002a); Tamura in Kubitzki (1998a).

1 Flowers yellow; berry blue (rarely to whitish-blue); leaf margins glabrous or slightly ciliate; [mostly of high elevations]..... ***C. borealis***
1 Flowers white (often marked with purple); berry black; leaf margins copiously retrorsely ciliate, the cilia 2-4 mm long; [plants of middle elevations] ..... ***C. umbellulata***

Clintonia borealis (Aiton) Rafinesque, Bluebead-lily. Spruce-fir forests, northern hardwood forests, less commonly in red oak forests. Late May-June; July-September. NL (Labrador) west to MB, south to NJ, PA, and n. IN, and in the mountains to w. NC, e. TN, and n. GA (Jones & Coile 1988). [= RAB, C, F, FNA, G, K, S, W]

Clintonia umbellulata (Michaux) Morong, Speckled Wood-lily. Red oak and other oak forests, mesic to dry ridges and slopes, less commonly in northern hardwood forests, generally at lower elevations than *C. borealis*, though the two species can co-occur. Mid May-June; August-October. An Appalachian endemic: c. NY west to s. OH, south to n. GA (Jones & Coile 1988). *Clintonia alleghaniensis* Harned, differing from *C. umbellulata* in its ultramarine blue berry (vs. black) is known from a number of sites in VA, MD, and WV. It has been variously interpreted as a species, a hybrid of *C. borealis* and *C. umbellulata*, or merely an odd form of *C. umbellulata*; it needs further study. [= RAB, C, F, FNA, G, K, W; = *Xeniatrum umbellulatum* (Michaux) Small – S; > *C. alleghaniensis* Harned]

Erythronium Linnaeus 1753 (Trout Lily)

A genus of about 25 species, north temperate and subarctic, of North America and Eurasia (especially diverse in w. North America). References: Parks & Hardin (1963)=Z; Mathew (1992)=Y; Allen & Robertson in FNA (2002a); Tamura in Kubitzki (1998a).

Identification notes: Stolons are white shoots produced from the bulb. Most run horizontally, either underground or along the ground surface but beneath leaf litter. Flowering individuals often produce no stolons. The stolon characters in the key below are those of non-flowering individuals and refer to horizontal stolons only.

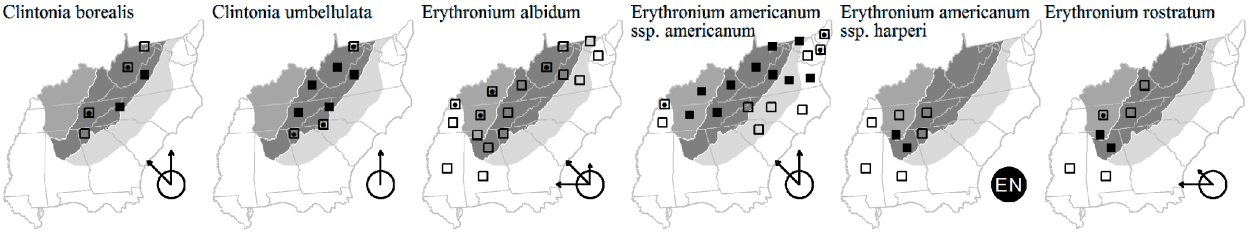
1 Perianth white (sometimes pinkish or bluish)..... ***E. albidum***
1 Perianth yellow.
2 Petals lacking auricles at base; capsule and ovary distinctly indented (umbilicate) at apex (or rarely truncate in *E. umbilicatum* ssp. *monostolum*, or the ovary when young not yet displaying the apical indentation); mature capsules usually reclining on ground, with the apex downward; stolons 0-1 per bulb; anthers usually lavender, brown, cinnamon, or purple (sometimes yellow).
3 Horizontal stolons 1 per bulb; flecking on perianth segments slight to strong; perianth margins slightly irregular (though not auricled); stigma lobes long; pale spot on adaxial side of perianth segments always present, small to large, usually pale yellow; [at high elevations in the Southern Appalachians] ..... ***E. umbilicatum*** *ssp.* ***monostolum***
3 Horizontal stolons 0 per bulb; flecking on perianth segments absent to slight; perianth margins entire, smooth; stigma lobes short; pale spot on adaxial side of perianth segments usually present, small to medium, usually white; [of lower to mid elevations, widespread in our area]..... ***E. umbilicatum*** *ssp.* ***umbilicatum***
2 Petals with auricles at base; capsule and ovary truncate, rounded, apiculate, or beaked at apex; mature capsules usually held well off ground, the apex oriented horizontally or ascending; stolons usually (1-) 2-5 per bulb; anthers usually yellow (rarely brown or lavender).
4 Capsule distinctly beaked at the apex; petals with well-developed auricles at the base, these encircling a filament ..... ***E. rostratum***
4 Capsule truncate, rounded, or apiculate at the apex; petals with small auricles at the base, which do not encircle a filament.
5 Capsule apiculus absent or poorly developed ..... ***E. americanum*** *ssp.* ***americanum***
5 Capsule apiculus well developed..... ***E. americanum*** *ssp.* ***harperi***

Erythronium albidum Nuttall, White Trout Lily, Blonde Lilian. Rich, mesic forests, in very nutrient-rich alluvial soils. March-May. S. ON west to MN, south to n. VA, nw. GA, KY, sc. TN, MO, and OK. [= C, K, S, W, WV, Y; = *E. albidum* var. *albidum* – F, G]

Erythronium americanum Ker-Gawler *ssp.* ***americanum***, American Trout Lily. Moist bottomland or slope forests, especially over mafic rocks. February-April; April-May. NB west to ON and MN, south to sc. NC, c. TN, AR, and OK. It is much rarer than *E. umbilicatum* in NC. *E. americanum* is a tetraploid (2n = 48); Parks & Hardin suggest the possibility that it is an allotetraploid involving *E. rostratum* and *E. umbilicatum* as parents. *E. americanum* is larger-flowered, more graceful, and later-blooming (by 1-2 weeks) than *E. umbilicatum* ssp. *umbilicatum*, where they co-occur. [= FNA, GW, K, Y, Z; < *E. americanum* – RAB, F, G, S (also see *E. umbilicatum*); < *E. americanum* – C, W, WV]

Erythronium americanum Ker-Gawler *ssp.* ***harperi*** (W. Wolf) Parks & Hardin, Harper's Trout Lily. Moist forests. Ne. TN and nc. TN south to extreme se. TN, nw. GA, and nc. AL. [= FNA, GW, K, Y, Z; < *E. americanum* – S]

Erythronium rostratum W. Wolf, Beaked Trout Lily. Moist bottomland or slope forests. C. TN, MO, and se. KS, south to c. AL, wc. LA, and se. OK. [= FNA, GW, K, Y, Z; < *E. americanum* – S]



Erythronium umbilicatum Parks & Hardin *ssp.* ***monostolum*** Parks & Hardin, Southern Appalachian Trout Lily. High elevation coves, slopes, and grassy balds, moist forests. March-May; April-June. Ssp. *monostolum* is endemic to the high mountains of NC and TN. It approaches the VA border and should be sought, especially in the Grayson Highlands area. *E. umbilicatum* ssp. *monostolum* is a diploid (2n = 24). [= FNA, GW, K, Y, Z; < *E. americanum* – RAB, F, G, S; < *E. umbilicatum* – C, W]

Erythronium umbilicatum Parks & Hardin *ssp.* ***umbilicatum***, Dimpled Trout Lily. Moist bottomland or slope forests, or in rather dry upland habitats. February-April (May?); April-June. VA and e. WV south through NC, SC, and e. TN to c. GA, e. AL, and Panhandle FL. *E. umbilicatum* ssp. *umbilicatum* is a diploid (2n = 24). Mathew (1992) suggests the possibility that an earlier name, *E. nuttallianum* Roemer & Schultes, may apply to this taxon; the two locations mentioned on the type, Pennsylvania and Albany, NY, are outside the known range of the species, however. [= FNA, GW, K, Y, Z; < *E. americanum* – RAB, F, G, S; < *E. umbilicatum* – C, W, WH, WV]

Lilium Linnaeus 1753 (Lily)

A genus of about 110 species, of temperate northern hemisphere (especially e. Asia). Many taxonomic problems remain in this genus of showy ornamentals. References: Adams & Dress (1982)=Z; Skinner & Sorrie (2002)=X; Wherry (1946)=Y; Skinner in FNA (2002a); Henry (1946); Tamura in Kubitzki (1998a).

1 Dark bulblets produced in many leaf axils; [exotic] ..... ***L. lancifolium***
1 Dark bulblets never produced; [native (except *L. longiflorum* and *L. philippinense*), though some species also cultivated].
  2 Flowers white; leaves narrowly linear or lanceolate; [exotic].
    3 Leaves lanceolate; plants < 1 m tall; perianth parts 13-18 cm long, glabrous at the base (internally) ..... ***L. longiflorum***
    3 Leaves linear; plants 1-3 m tall; perianth parts 18-25 cm long, papillose at the base (internally) ..... ***L. philippinense***
  2 Flowers orange or yellow; leaves lanceolate, oblanceolate, or obovate; [native].
    4 Flowers erect, facing upwards; tepals clawed.
      5 Leaves all alternate; [of the Coastal Plain] ..... ***L. catesbaei***
      5 Leaves (at least some of them) whorled or verticillate; [of the Mountains] ..... ***L. philadelphicum*** *var.* ***philadelphicum***
    4 Flowers nodding or declined, facing downwards or to the side; tepals narrowed to the base, but not clawed.
      6 Leaves oblanceolate to obovate, alternate and whorled, in many plants 50% or more of nodes bearing a single leaf; flowers 1-4 (rarely more), nodding to pendant, fragrant ..... ***L. michauxii***
      6 Leaves lanceolate or narrowly elliptic, not broader distally, alternate and whorled, in most plants 10-30% of nodes bearing a single leaf; flowers 1-30+, oriented variously, not fragrant.
        7 Flowers at maturity campanulate (tepals with somewhat recurved tips); style and stamens included or barely exserted.
          8 Flowers 3-4 cm in diameter; pistil 3-4 cm long; tepals 3-5.5 cm long, deep red, mucronate by extension of the midrib, reflexed < 45 degrees from the flower axis, the terminal third of the tepals generally gently incurved; anthers 4-6 mm long, completely included within the perianth when viewed from the side; [high elevations in the Blue Ridge of w. NC, ne. TN, and sw. VA] ..... ***L. grayi***
          8 Flowers 4.5-9 cm in diameter; pistil 4-6 cm long; tepals 6-8 cm long, yellow, orange to brick-red, acuminate, reflexed 60-120 degrees from the flower axis; anthers 5-10 mm long, exserted to fully included within the perianth when viewed from the side; [low to moderate elevations, more widespread].
            9 Perianth yellow (rarely orange to red); mid-stem leaves 5-10× as long as wide ..... ***L. canadense*** *var.* ***canadense***
            9 Perianth orange to red; mid-stem leaves 2-5× as long as wide ..... ***L. canadense*** *var.* ***editorum***
        7 Tepals at maturity recurved fully to form a circular shape; flowers pendant to nodding; style and stamens long-exserted.
          10 Style reddish, more-or-less the same color as the tepals; [west of the Blue Ridge] ..... ***L. michiganense***
          10 Style pale green, strongly contrasting with tepals; [Blue Ridge and eastward and southward].
            11 Leaves 7-26 cm long, oriented horizontally, with the tips downward-arching; leaf whorls 6-24; plants 1.2-2.8 m tall; inflorescences (1-) 5-22 flowered, tepals orange to reddish; [Mountains, Piedmont, and Coastal Plain] ..... ***L.superbum***
            11 Leaves 2-16 cm long, ascending or more or less horizontal, but with the tips not downward-arching; leaf whorls 1-12; plants 0.6-2.0 m tall; inflorescences 1-4 (-7) flowered, tepals yellow to orange (to dusky red); [Coastal Plain].
              12 Leaf whorls 1-5; petals yellow to yellow-orange; [East Gulf Coastal Plain pitcher-plant bogs and relatively open blackwater baygalls and streamheads in nw. FL and sw. AL] ..... ***L. iridollae***
              12 Leaf whorls 1-12; petals orange to dusky red; [seepage bogs and margins of tree-shrub streamheads in se. VA, c. NC, and c. SC] ..... ***L. pyrophilum***

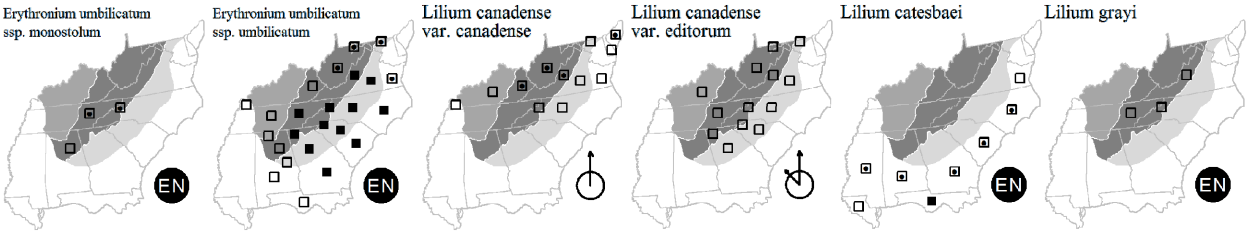
Lilium canadense Linnaeus *var.* ***canadense***, Yellow Canada Lily. Wet meadows. June-July; late July-September. Apparently ranging from NB to NC, mostly east of or in the Appalachians; the range is obscured by different interpretations of var. *canadense* and var. *editorum*, by spread from cultivation, and by collections of cultivated plants not clearly so indicated.

Some of our plants are definitely var. *canadense*. [= F, WV; < *L. canadense* – RAB, C, FNA, G, GW, S; = *L. canadense* ssp. *canadense* – K, W, Z; = *L. canadense* ssp. *typicum* – Y]

Lilium canadense Linnaeus *var.* ***editorum*** Fernald, Red Canada Lily. Wet meadows, forest openings. June-July; late July-September. According to Adams & Dress (1982), who emphasize tepal color in distinguishing the infraspecific taxa, ranging from NB west to s. ON, south (mostly in and west of the Appalachians) to n. GA and n. AL. Wherry (1946) and Fernald (1950) emphasize leaf shape, and secondarily flower color, restricting var. *editorum* to a range from PA west to s. IN, south to AL. There has been considerable confusion between *L. canadense* var. *editorum* and *L. grayi*, and populations in sw. VA appear to show some intergradation between the two. [= F, WV; < *L. canadense* – RAB, C, FNA, G, GW, S; = *L. canadense* ssp. *editorum* (Fernald) Wherry – K, W, Y, Z]

Lilium catesbaei Walter, Pine Lily, Catesby's Lily, Leopard Lily. Pine savannas, sandhill seeps. Mid June-mid September; September-November. Se. NC south to FL and west to LA, on the Coastal Plain. [= GW, S, WH; > *L. catesbaei* var. *catesbaei* – RAB; > *L. catesbaei* var. *longii* Fernald – RAB, C, F, G; > *L. catesbaei* ssp. *catesbaei* – K; > *L. catesbaei* ssp. *asperellum* Wherry – K, misspelling; > *L. catesbaei* ssp. *asprellum* – Y; > *L. catesbaei* ssp. *longii* (Fernald) Wherry – Y; > *L. catesbaei* ssp. *typicum* – Y]

Lilium grayi S. Watson, Gray's Lily, Roan Lily. Bogs, seepages, grassy balds, moist forests, and wet meadows, at medium to high elevations. June-July; August-September. A Southern Appalachian endemic: sw. VA, nw. NC, and ne. TN. Clearly related to *L. canadense* (especially through the somewhat intermediate *L. canadense* var. *editorum*), *L. grayi* appears to be adapted for pollination by Ruby-throated Hummingbirds (Adams & Dress 1982). See *L. canadense* var. *editorum* for additional comments. The two most important strongholds for this rare lily (each with thousands of individuals) are the Roan Mountain massif (Avery and Mitchell counties, NC and Carter County, TN), where it was first found, and Long Hope Valley (Watauga and Ashe counties, NC). Otherwise, it tends to occur in very small, isolated populations in bogs, wet pastures, and seeps. In addition to the characters in the key, *L. grayi* can be distinguished in sterile condition from the 2 more common species of the Mountains by leaves, which are widest near the midpoint, typically 4-6× as long as wide (vs. distinctly wider towards the apex in *L. michauxii*, and widest near the midpoint but typically 10× or more as long as wide in *L. superbum*). Certainly one of our most beautiful wild plants! [= RAB, C, F, G, K, S, W, Y, Z]



Lilium iridollae M.G. Henry, Panhandle Lily, Pot-o'-gold Lily. Bogs. Panhandle FL west to s. AL. [= FNA, GW, WH; < *L. iridollae* – K (also see *L. pyrophilum*)]

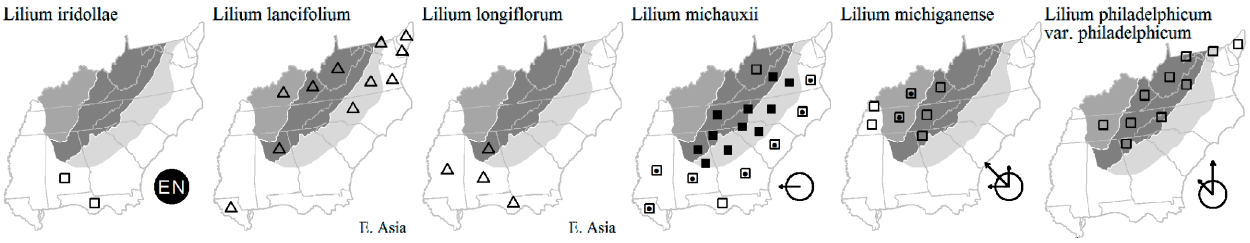
* ***Lilium lancifolium*** Thunberg, Tiger Lily. Disturbed areas, trash heaps; native of Asia. The more familiar name, *L. tigrinum*, must be rejected in favor of the older *L. lancifolium* (Ingram 1968). [= C, FNA, K; = *L. tigrinum* Ker-Gawler – F, G, WV]

* ***Lilium longiflorum*** Thunberg, Easter Lily. Disturbed areas, persistent from cultivation. [= FNA, K]

Lilium michauxii Poiret, Carolina Lily. Dry upland forests, ridges, slopes, and ridges. July-August; September-October. S. VA, e. TN, n. AL, c. MS, and e. LA south to s. SC, Panhandle FL, s. AL, s. MS, and s. LA. [= C, F, FNA, G, GW, K, W, WH, WV, X, Y, Z; < *L. michauxii* – RAB (also see *L. pyrophilum*); = *L. carolinianum* Michaux – S]

Lilium michiganense Farwell, Michigan Lily. Wet prairies and calcareous hardwood flatwoods. ON and MN south to e. TN, KY, nw. GA, AL, AR, and e. OK. [= C, F, FNA, K; < *L. superbum* – G; = *L. canadense* Linnaeus ssp. *michiganense* (Farwell) Boivin & Cody]

Lilium philadelphicum Linnaeus *var.* ***philadelphicum***, Wood Lily. Grassy balds, moist to wet meadows (especially in thin soils over rock), open woodlands. June-July; August-October. The species ranges from ME west to BC, south to NC, nw. GA (Jones & Coile 1988), KY, IL, IA, NE, and NM. Var. *philadelphicum*, distinguished by the leaves whorled at 3-6 nodes, 10-15 (-25) mm wide, the capsule 2.5-3.5 (-5) cm long, is eastern and mainly Appalachian, ranging from ME and s. ON south to NC, GA, and KY. Var. *andinum* (Nuttall) Ker-Gawler, distinguished by the leaves whorled at 1-2 nodes, 3-10 mm wide, the capsule 4-8 cm long, is western, ranging from OH, MN, and BC south to NM. [= C, F, G, K; < *L. philadelphicum* – RAB, FNA, S, W, WV; = *L. philadelphicum* ssp. *philadelphicum* – Y]



* ***Lilium philippinense*** Baker, Philippine Lily. Escaped from cultivation; native of the Philippines. July-August. This species is introduced at various locations in the Southeast, including FL and LA (Kartesz 1999), and has been documented from Richmond Co. NC (B.A. Sorrie, pers. comm.). In North America there has been confusion between this species and *L. formosanum* A. Wallace. [= FNA, K, WH]

Lilium pyrophilum M.W. Skinner & Sorrie, Sandhills Bog Lily. Peaty seepage bogs in the Sandhills and peaty swamp margins in the upper Coastal Plain. Late July-mid August. See Skinner & Sorrie (2002) for detailed information on this species.

Superficially, this plant is somewhat similar to *L. michauxii*, in its one to several, nodding flowers with recurved tepals, relatively few whorls of leaves, and relatively few leaves per whorl. In addition to the character used in the key, this plant differs from *L. michauxii* in the following ways: flowers not fragrant or only slightly so (vs. flowers strongly fragrant), leaves generally widest near the middle (vs. widest towards the tip), leaves only slightly paler below and lacking a pronounced waxy sheen (vs. leaves strongly bicolored, the lower surface much paler and with a waxy sheen), and habitat in sphagnous, peaty bogs (vs. in xeric to mesic, sandy to loamy soils). [= FNA, X; < *L. michauxii* – RAB (misapplied to these plants); < *L. iridollae* M.G. Henry – K, misapplied]

Lilium superbum Linnaeus, Turk's-cap Lily, Lily-royal. Cove forests and moist forests, moist ravines, blackwater stream swamps, Coastal plain bogs. July-August; September-October. MA and s. NY south to ne. NC, Panhandle FL, and c. MS, southwards primarily in the Appalachians, but extending across the Piedmont to the Coastal Plain of VA and ne. NC, and with a similarly odd extension south of the southern terminus of the Appalachians into the Coastal Plain of GA, w. FL, AL, and MS. The plants of blackwater swamps of se. VA and ne. NC are very narrow-leaved and yellow-tepaled; this form, atypical in habitat, range, and morphology has been referred to speculatively as "*Lilium* species 1." Further study is needed to determine whether it is a distinct taxon (species, or variety of *L. superbum*) or only a form. [= C, F, FNA, GW, K, RAB, S, W, WH, WV, X, Y, Z; < *L. superbum* – G (also see *L. michiganense*)]

Medeola Linnaeus 1753 (Indian Cucumber-root)

A monotypic genus, an herb of eastern North America. References: Utech in FNA (2002a); Tamura in Kubitzki (1998a).

Identification notes: *Medeola* is sometimes mistaken (when sterile) for *Isotria*; *Medeola* has a wiry stem, floccose-pubescent, *Isotria* a fleshy, glabrous stem.

Medeola virginiana Linnaeus, Indian Cucumber-root. Moist forests, usually with acidic soils. Mid April-mid June; September-October. QC and ON west to MN, south to GA, Panhandle FL and LA. The tuber is white, crisp, tasting cucumber-like, usually about 5 cm long and 5 mm in diameter. Bell (1974) describes patterns of vegetative growth. Flowering plants have a second, smaller whorl of leaves; the flowers are borne on recurved pedicels beneath the top whorl of leaves. In fruit, however, the pedicels are ascending or erect, bringing the fruits above the top whorl. When the berries are ripe, the leaves of the upper whorl become scarlet at the base, presumably acting as an attractant to animals. [= C, F, FNA, G, GW, K, RAB, S, W, WH, WV]

Prosartes D. Don 1839 (Fairybells, Mandarin)

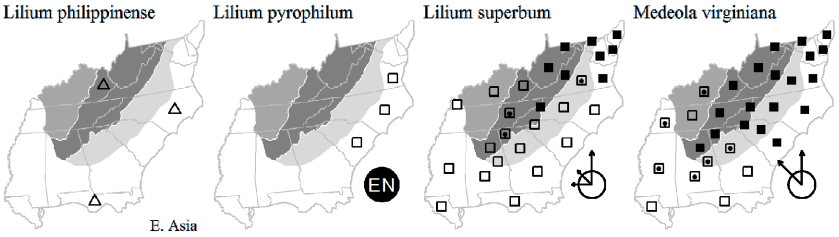
A genus of 6 species, of temperate e. North America, w. North America, and e. Asia. Dahlgren, Clifford, & Yeo (1985) suggest that American species of *Disporum* are generically distinct from Asiatic species and should be segregated in the genus *Prosartes*, a distinction made as long ago as 1839. Asian *Disporum* species lack the distinctly reticulate venation of our plants, have strictly glabrous foliage (vs. pubescent), have spurred tepals (vs. unspurred), blue or black berries (vs. red or straw-colored), tripartite stigma (vs. not), and other differences (Jones 1951). Further study of generic limits by Shinwari et al. (1994) shows that the separation into *Prosartes* of the American species often assigned to *Disporum* is clearly warranted, based on morphological and karyological grounds. *Prosartes* is much more closely related to *Streptopus* than to (Asian) *Disporum*; (Asian) *Disporum* is more closely related to *Uvularia*. References: Johnson (1968)=Z; Shinwari et al. (1994)=Y; Jones (1951); Tamura, Utech, & Kawano (1992); Utech in FNA (2002a); Tamura in Kubitzki (1998a).

1 Fruit glabrous, ellipsoid, weakly triangular in cross-section, the surface smooth and shiny, red when ripe; tepals greenish, unspotted; leaves relatively many and small; leaf glabrous on the surface above (except for sparsely pubescent on the midrib and main veins), densely pubescent on the midrib below, sparsely pubescent on the surface below; leaf pubescence weak, often twisted or curled apically (as seen at 10-20× magnification), the leaf therefore very soft to the touch ..... ***P. lanuginosa***

1 Fruit pubescent, strongly 3-lobed (or 1- or 2-lobed by abortion), the surface textured and dull, whitish-tan when ripe; tepals whitish, spotted with purple; leaves relatively few and large; leaf sparsely pubescent on the surface and veins above and below; leaf pubescence stiff, generally straight and perpendicular to the surface (as seen at 10-20× magnification), the leaf therefore slightly rough to the touch ..... ***P. maculata***

Prosartes lanuginosa (Michaux) D. Don, Yellow Mandarin, Yellow Fairybells. Deciduous forests, especially coves. April-May; August-September. Primarily an Appalachian species: NY and s. ON south to n. GA (Jones & Coile 1988) and AL. [= FNA, K, Y; = *Disporum lanuginosum* (Michaux) Nicholson – RAB, C, F, G, S, W, WV, Z]

Prosartes maculata (Buckley) A. Gray, Spotted Mandarin, Nodding Mandarin. Nutrient-rich deciduous forests, especially cove forests. April-May; July-August. AL, n. GA, KY, MI, w. NC, OH, TN, w. VA, and s. WV; its distribution is rather fragmented, and the species is considered rare or uncommon in every state in its range. The fruits are more reminiscent of *Uvularia* than of *Prosartes lanuginosa*. [= FNA, K, Y; = *Disporum maculatum* (Buckley) Britton – RAB, C, F, G, S, W, WV, Z]



Streptopus Michaux 1803 (Twisted-stalk)

A genus of about 7 species, temperate to subarctic in Europe, e. Asia, and North America. References: Utech in FNA (2002a); Fassett (1935)=Z; Tamura in Kubitzki (1998a).

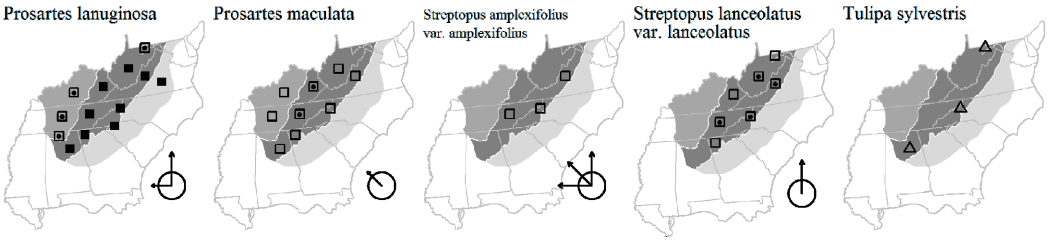
1 Leaf margins and nodes not coarsely ciliate; leaves strongly cordate-clasping; fruit ellipsoid ..... ***S. amplexifolius*** *var.* ***amplexifolius***
1 Leaf margins and nodes coarsely ciliate; leaves sessile to somewhat cordate-clasping (especially the lower leaves of robust individuals); fruit globose ..... ***S. lanceolatus*** *var.* ***lanceolatus***

Streptopus amplexifolius (Linnaeus) A.P. de Candolle *var.* ***amplexifolius***, White Mandarin, Pagoda-bells. Moist forests and seepages at high elevations. Late April-early June; late July-September. The species is circumboreal, the range fragmented. Fassett recognized seven varieties, the plants in our area being var. *americanus*. The species ranges from Greenland and NL (Labrador) to MN, south (in the mountains and disjunctly) to NC, and in the west from AK (and Kamchatka) south to NM and AZ, in Japan, and in the Alps in Europe. [= K; < *S. amplexifolius* – RAB, FNA, W; > *S. amplexifolius* var. *americanus* J.A. & J.H. Schultes – C, F, G, Z; < *Tortipes amplexifolius* (Linnaeus) Small – S]

Streptopus lanceolatus (Aiton) Reveal var. ***lanceolatus***, Eastern Rose Mandarin, Eastern Twisted-stalk. Moist forests at high elevations. Late April-early June; late July-September. Fassett (1935) recognized four varieties in *S. roseus*. Reveal (1993c) determined that the correct name for the species widely known as *S. roseus* is *S. lanceolatus* (Aiton) Reveal, and he transferred Fassett's varieties. Fassett (and Reveal) considered *S. lanceolatus* var. *lanceolatus* [*S. roseus* var. *perspectus* Fassett] to range from s. NL (Labrador) west to MI, south to NJ and PA, and in the mountains to w. NC, e. TN, and ne. GA (Jones & Coile 1988). *S. lanceolatus* var. *longipes* (Fernald) Reveal [*S. roseus* var. *longipes* (Fernald) Fassett] is midwestern, from s. ON and nw. PA west to MI, WI, MN, and s. MB. Var. *curvipes* (Vail) Fassett is western, ranging from AK to se. BC and nw. OR. Var. *roseus* was considered to be a Southern Appalachian endemic, differing from var. *perspectus* only in having the pedicel-peduncles entirely glabrous (vs. ciliate with few to many multicellular hairs). The number of hairs on the peduncles varies constantly, and recognition of two varieties in e. North America does not appear warranted; all of our material is then *S. lanceolatus* var. *lanceolatus* [*S. roseus* var. *roseus* (in a broader sense)], which does differ significantly from the more western varieties. [< *S. roseus* – RAB, S, W, WV; > *S. roseus* var. *roseus* – C, F, G, Z; > *S. roseus* var. *perspectus* Fassett – C, F, G, Z; < *S. lanceolatus* – FNA; > *S. lanceolatus* var. *lanceolatus* – K; > *S. lanceolatus* var. *roseus* (Michaux) Reveal – K]

Tulipa Linnaeus 1753 (Tulip)

A genus of about 150 species, of temperate Eurasia (especially w. and c. Asia). References: Tamura in Kubitzki (1998a); Straley & Utech in FNA (2002a).



* ***Tulipa sylvestris*** Linnaeus, Tulip, Dutch-lily. Very commonly cultivated; native of w. Asia. "Occasionally naturalized in moist meadows, fields and roadsides" in se. PA (Rhoads & Klein 1993) and MD (Kartesz 1999). [= FNA, K]

62. ORCHIDACEAE A.L. de Jussieu 1789 (Orchid Family) [in ASPARAGALES]

A family of about 800 genera and 19,000 species, perennial (rarely annual), mycotrophic herbs and vines. Only a small minority of orchid species worldwide are terrestrial rather than epiphytic; only *Epidendrum magnoliae* in our flora shows the common epiphytic habit. References: Luer (1972) and Luer (1975)=L; Correll (1950)=X; Romero-González, Fernández-Concha, Dressler, Magrath, & Argus in FNA (Williams & Williams (1983); Brown (2003); Homoya (1993); Correll (1937); Pridgeon et al. (1999a, 1999b, 1999c).

Identification notes: Flowering plants are necessary for use of the key to genera.

1 Plant epiphytic, growing on the branches or trunks of trees in swamps ..... ***Epidendrum***
1 Plant terrestrial, growing on soil.
2 Leaves absent at flowering, or with a solitary leaf with a purplish undersurface withering at about the time of flowering.
3 Flowers with a spur ..... ***Tipularia***
3 Flowers without a spur.
4 Flowers white, the lip, sepals, and petals all predominantly white ..... ***Spiranthes***
4 Flowers pink, greenish, yellowish, or purplish, the lip sometimes white or marked with white, the sepals and petals colored.
5 Flower solitary; lip strongly bearded ..... ***Arethusa***
5 Flowers in spikes or racemes; lip not bearded.
6 Lip with 2 fleshy ridges near the base; pollinia 4; plants mycoparasitic and never with leaves ..... ***Corallorhiza***
6 Lip with 3-7 ridges near the base or extending most of the length of the lip; pollinia 4 or 8; plants either mycoparasitic and never with leaves, or with a plicate winter leaf withering shortly before flowering.
7 Plants with a plicate winter leaf withering shortly before flowering (the withered remnant usually detectable); pollinia 4; veins of the petals and sepals not strikingly different in color than the intervein areas; lip with 3 ridges ..... ***Aplectrum***
7 Plants never with leaves and saprophytic; pollinia 8; veins of the petals and sepals strikingly different in color than the intervein areas; lip with 5-7 ridges ..... ***Hexalectris***
2 Leaves present at flowering (*Cleistesiopsis* with a foliaceous bract at the summit of the stem).
8 Leaf solitary.
9 Leaf basal.
10 Flower with a spur ..... ***Platanthera***
10 Flower without a spur.
11 Flower solitary; leaf plicate ..... ***Arethusa***
11 Flowers in a raceme or spike.
12 Flowers relatively large, purple, pink, to rarely white, the lip oriented upwards ..... ***Calopogon***
12 Flowers relatively small, whitish, the lip oriented downwards ..... ***Spiranthes***
9 Leaf cauline.
13 Flower solitary (-4), pink (rarely nearly white); [subfamily *Vanilloideae*; tribe *Pogonieae*].
14 Sepals brown to purple, linear or narrowly oblanceolate, 3-6.5 cm long, about 5 mm wide; leaf coriaceous ..... ***Cleistesiopsis***
14 Sepals pink (rarely white), elliptic or oblanceolate, 1.3-2.7 cm long, 3-11 mm wide; leaf herbaceous ..... ***Pogonia***
13 Flowers in spikes or racemes, 5-many, reddish, yellowish, or greenish.
15 Flower without a spur; petals, sepals, and lip 1-3 mm long ..... ***Malaxis***
15 Flower with a spur; petals, sepals, and lip 3-25 mm long ..... ***Platanthera***
8 Leaves 2-many.
16 Lip inflated, pouch-like or slipper-like, 2-6 cm long ..... ***Cypripedium***
16 Lip not inflated, or if so, then 0.3-1.1 cm long.
17 Leaves basal (sometimes with bladeless sheaths upwards on the stem).
18 Leaves plicate.
19 Lip oriented upwards; flowers pink to white ..... ***Calopogon***
19 Lip oriented downwards; flowers greenish, purplish-brown, or yellowish.
20 Leaves ovate to elliptic, 2-5× as long as wide; plant 1-3 dm tall ..... ***Liparis***
20 Leaves linear-lanceolate, > 10× as long as wide; plant 3-14 dm tall ..... ***Pteroglossaspis***
18 Leaves smooth, often creased at the midrib, but not plicate.
21 Lip with a spur.
22 Flowers bicolored, the lip white, the sepals and petals pink; leaves 2 ..... ***Galearis***
22 Flowers not bicolored, the lip, petals, and sepals similarly colored; leaves 2-5.
23 Lip deeply divided into 3 linear segments; leaves 3-5 ..... ***Habenaria***
23 Lip entire; leaves 2 ..... ***Platanthera***
21 Lip without a spur.
24 Leaf blades more-or-less horizontally oriented, flat against the ground or 1-2 cm above it.
25 Lip oriented upwards ..... ***Ponthieva***
25 Lip oriented downwards.
26 Leaves variegated with white; lip saccate ..... ***Goodyera***
26 Leaves green, not variegated; lip not saccate ..... ***Spiranthes***
24 Leaf blades ascending.
27 Leaves linear to lanceolate, 2-4 ..... ***Spiranthes***
27 Leaves elliptic to ovate, 2.
28 Lip broadest near its apex ..... ***Liparis***
28 Lip broadest near its base, tapering to the apex ..... ***Malaxis***
17 Leaves cauline.
29 Leaves plicate; lip saccate ..... ***Epipactis***
29 Leaves smooth, often creased at the midrib, but not plicate; lip not saccate.
30 Leaves whorled, terminating the stem ..... ***Isotria***
30 Leaves alternate or opposite, not terminating the stem.
31 Leaves 2, opposite, near the middle of the stem ..... ***Listera***
31 Leaves (2-) 3-many, alternate, variously distributed on the stem.
32 Lip without a spur; leaves 0.8-8.0 cm long.
33 Leaves ovate, 0.8-2.0 cm long ..... ***Triphora***
33 Leaves linear or narrowly lanceolate, 1-8 cm long ..... ***Zeuxine***
32 Lip with a spur; leaves linear, lanceolate, or narrowly elliptic, 5-40 cm long (at least the larger > 5 cm long, except in *Platythelys*, with lanceolate to ovate leaves 1.5-6.5 cm long).
34 Leaves 1.5-6.5 cm long, with inflated tubular sheaths; plants from creeping rhizomes ..... ***Platythelys***
34 Leaves 5-40 cm long, sessile; plants from fleshy or fusiform roots.
35 Lip divided into 3 linear divisions, the divisions not further divided, fringed, or eroded ..... ***Habenaria***

35 Lip not divided into 3 divisions, or divided into 3 divisions but the divisions not linear.
36 Spur saccate, 2-3 mm long, the orifice minute ..... ***Coeloglossum***
36 Spur elongate and slender, 4-50 mm long, the orifice larger..... ***Platanthera***

Aplectrum Torrey 1818 (Puttyroot, Adam-and-Eve)

A genus of 2 species, 1 in e. North America and 1 in Japan (Sheviak & Catling in FNA (2002a). References: Sheviak & Catling in FNA (2002a); Correll (1950)=X.

Identification notes: Like *Tipularia*, *Aplectrum* has a single, overwintering leaf, purplish on the underside, and withering prior to the appearance of the flowering stalk; they are readily separable by leaf shape, texture, and veining (see *Tipularia*).

Aplectrum hyemale (Muhlenberg ex Willdenow) Torrey, Puttyroot, Adam-and-Eve. Rich, mesic forests. May-June. QC and MN, south to SC, GA, AL, and OK. [= RAB, C, F, FNA, G, GW, K, L, S, W, X]

Arethusa Linnaeus 1753 (Dragon's-mouth, Bog-rose, Arethusa)

A monotypic genus (Sheviak & Catling in FNA 2002). References: Sheviak & Catling in FNA (2002a); Correll (1950)=X.

Identification notes: The combination of the following characters serves to separate *Arethusa* from other, vaguely similar, genera: flowers magenta, solitary and scapose, the lip descending, the other 2 petals and 3 sepals erect or ascending. *Calopogon* has a leafy stem, the inflorescence a raceme, the lip crested but oriented upwards. *Pogonia* has solitary, pale pink flowers, with a descending, bearded lip, but the stem has a well-developed, flat leaf, 1-2.5 cm wide, the flower is subtended by a well-developed, leaf-like, floral bract, and the 2 lower sepals are spreading-descending. *Cleistesiopsis* has 3 brown to purplish brown sepals.

Arethusa bulbosa Linnaeus, Dragon's-mouth, Bog-rose, Arethusa. Bogs. May-June. NL (Newfoundland) and NL (Labrador) west to SK, south to NJ, DE, IN, and MN, and to NC and SC in the mountains, rare south of ME, MI, and MN. The lanceolate, plicate leaf (15-30 cm long, 2-4 mm wide) develops after flowering, the flowering plant thus consisting (aboveground) of the solitary scape only. The lip is crested with fimbriate ridges, marked with yellow and purple. [= RAB, C, F, FNA, G, GW, K, L, S, W, X]

Bletilla Reichenbach f.

A genus of 9 species, of temperate e. Asia. References: Correll (1950)=X.

* ***Bletilla striata*** (Thunberg) Reichenbach f., Urn Orchid. Lawns, roadsides; native of China. Known only from Escambia County, FL. [= FNA, K, WH] {add to genus key; add X to synonymy}

Calopogon R. Brown 1813 (Grass-pink)

A genus of 5 species (one with two varieties), endemic to e. North America. The only taxon not treated here is *C. tuberosus* var. *simpsonii* (Chapman) Magrath of s. FL. References: Goldman, Magrath, & Catling in FNA (2002a); Trapnell, Hamrick, & Giannasi (2004)=Z; Goldman, van den Berg, & Griffith (2004)=Y; Correll (1950)=X. Key adapted from Goldman, Magrath, & Catling in FNA (2002a).

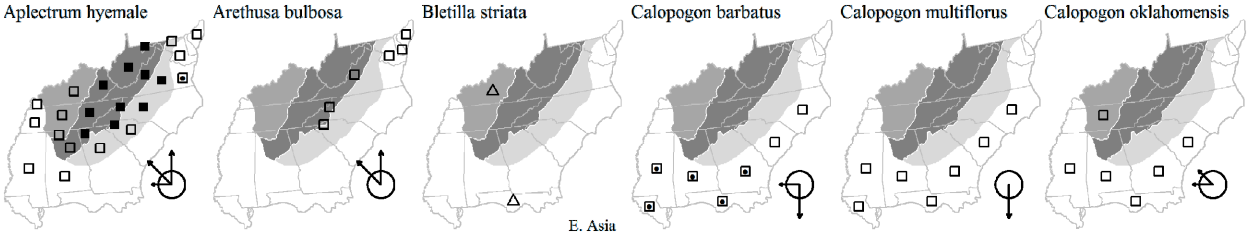
Identification notes: The lip is oriented upwards.

1 Petals wider towards the tip than towards the base; lip usually as wide as or wider than long; flowers strongly fragrant..... ***C. multiflorus***
1 Petals equal or narrower towards the tip than towards the base; lip usually narrower than long; flowers scentless or mildly fragrant.
2 Leaf appressed to the inflorescence during flowering; flowers < 1 cm apart; flowers not fragrant; flowers on same plant opening simultaneously ..... ***C. barbatus***
2 Leaf not appressed to the inflorescence during flowering; flowers > 1 cm apart; flowers faintly to distinctly fragrant; flowers on same plant opening nearly simultaneously to sequentially.
3 Lateral sepals 10-15 mm long, falcate, widely spreading ..... ***C. pallidus***
3 Lateral sepals 15-28 mm long, weakly falcate to straight.
4 Flowers of each plant opening nearly simultaneously; dilated distal portion of middle lip lobe usually much narrower than long, triangular to broadly rounded; stigma typically flat against column surface; corms elongate, forked ..... ***C. oklahomensis***
4 Flowers of each plant opening sequentially; dilated distal portion of middle lip lobe usually much wider than long, typically anvil-shaped; stigma at angle to column surface; corms globose to elongate, not forked..... ***C. tuberosus*** *var.* ***tuberosus***

Calopogon barbatus (Walter) Ames, Bearded Grass-pink. Savannas, sandhill seeps. April-early May. A Southeastern Coastal Plain endemic: se. NC south to s. FL and west to e. LA. [= RAB, FNA, GW, K, L, WH, X, Y, Z; = *Limodorum parviflorum* (Lindley) Nash – S]

Calopogon multiflorus Lindley, Many-flowered Grass-pink. Pine savannas, pine flatwoods, pitcher plant bogs. March-early May. A Southeastern Coastal Plain endemic: E. NC south to s. FL, west to e. LA. [= FNA, GW, K, L, WH, X, Y, Z; = *Limodorum multiflorum* (Lindley) C. Mohr – S]

Calopogon oklahomensis D.H. Goldman, Oklahoma Grass-pink. Pine savannas, prairies. E. SC south to s. GA, west to e. TX, north in the eastern Great Plains to MN. [= FNA, Y, Z]



Calopogon pallidus Chapman, Pale Grass-pink. Savannas, sandhill seeps. May-July. A Southeastern Coastal Plain endemic: se. VA south to s. FL and west to LA. [= RAB, C, F, FNA, G, GW, K, L, WH, X, Y, Z; = *Limodorum pallidum* (Chapman) C. Mohr – S]

Calopogon tuberosus (Linnaeus) Britton, Sterns, & Poggenburg *var.* ***tuberosus***, Common Grass-pink. Savannas, sandhill seeps, floating peat mats, in the Piedmont and Mountains in bogs. April-July. Var. *tuberosus* occurs from NL west to MT, south to s. FL and e. TX, also in Cuba and the West Indies. Var. *simpsonii* (Chapman) Magrath occurs in peninsular FL, Cuba, and the West Indies. [= FNA, K, L, WH, Y, Z; = *C. pulchellus* R. Brown – F, G, RAB, X; < *C. tuberosus* – C, GW, W; = *Limodorum tuberosum* Linnaeus – S]

Cleistesiopsis Pansarin & F. Barros 2008 (Spreading Pogonia, Rosebud Orchid)

A genus of 3 species, endemic to e. North America. As traditionally circumscribed, *Cleistes* was a genus of about 55 species, primarily of tropical America. The circumscription of this genus has been uncertain (Cameron & Chase 1999; Cameron et al. 1999; Pridgeon et al. 1999c). North American "*Cleistes*" is not closely related to South American *Cleistes* (which includes the type of the genus), and two alternative treatments are possible: the North American species can be housed in a separate genus, or alternatively, *Pogonia*, *Isotria*, and N. American "*Cleistes*" could be combined into *Pogonia* (a generic disposition popular many decades ago). Pansarin & de Barros (2008) favor the former idea, and have named the new genus *Cleistesiopsis*. References: Pansarin & de Barros (2008)=Y; Catling & Gregg (1992)=Z; Brown & Pansarin (2009)=V; Gregg & Catling in FNA (2002a); Gregg (1991); Correll (1950)=X.

1 Column 21-29 mm long; lip (26-) 34-56 mm long, the basal 3/4 of the central keel of the lip with 1-3 parallel, continuous low ridges; sepals (31-) 40-56 (-65) mm long; petals 27-53 mm long; distance between median leaf and floral bract 9-20 cm; fresh flower with daffodil-like odor ..... ***C. divaricata***

1 Column 13-19 mm long; lip 21-33 (-38.5) mm long, the basal 3/4 of the central keel of the lip with 5-7 discontinuous and irregular ridges; sepals (24-) 30-40 (-55) mm long; petals 21-36 mm long; distance between median leaf and floral bract 3-16 cm; fresh flowers with strong vanilla scent (in *C. oricamporum*, of the Coastal Plain) or odorless (in *C. bifaria*, of the Mountain and upper Piedmont).

2 Fresh flowers odorless; [of the Mountains and Piedmont] ..... ***C. bifaria***

2 Fresh flowers with strong vanilla scent; [of the Coastal Plain] ..... ***C. oricamporum***

Cleistesiopsis bifaria (Fernald) Pansarin & F. Barros, Appalachian Small Spreading Pogonia. Moist to fairly dry meadows, dry ridgetops under pines (where seasonally moist). May-July. WV south through w. VA, e. KY, w. NC, and e. TN to w. SC, n. GA and n. AL. Catling & Gregg (1992) make a convincing case for the recognition of *Cleistesiopsis bifaria* and *C. divaricata* as specifically distinct (as *Cleistes*), based on differences in morphology, range, phenology (in the sympatric portions of their ranges), and floral fragrance. [= V; < *Cleistesiopsis bifaria* – Y; < *Cleistes bifaria* (Fernald) Catling & Gregg – FNA, K, Z; < *Cleistes divaricata* – RAB, C, G, GW, L, S, W, X; < *Cleistes divaricata* var. *bifaria* Fernald – F; < *Cleistes divaricata* var. *bifara* – WV, misspelling; < *Pogonia bifaria* (Fernald) P.M. Brown & Wunderlin – WH]

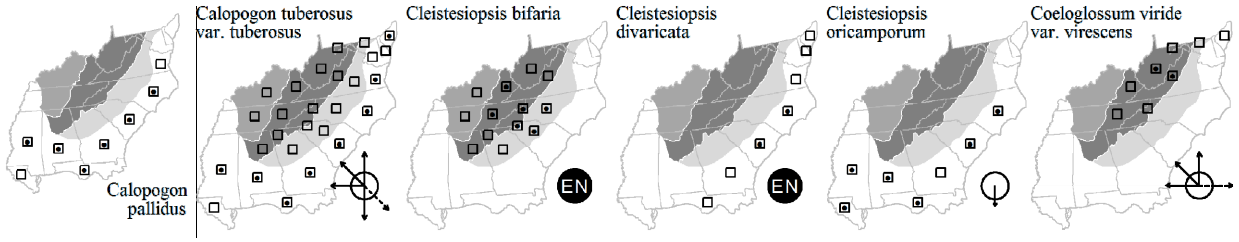
Cleistesiopsis divaricata (Linnaeus) Pansarin & F. Barros, Large Spreading Pogonia. Pine savannas. May-mid June. S. NJ to sw. GA and ne. FL, in the Coastal Plain; reports from more inland (non Coastal Plain) areas are based on a taxonomic concept of *C. divaricata* including *C. bifaria*, and reports from the East Gulf Coastal Plain (west of ne. FL) are based on *C. oricamporum*. [= V, Y; = *Cleistes divaricata* (Linnaeus) Ames – FNA, K, Z; < *Cleistes divaricata* – RAB, C, G, GW, K, L, S, W, X (also see *Cleistes bifaria*); = *Cleistes divaricata* var. *divaricata* – F; = *Pogonia divaricata* (Linnaeus) R. Brown – WH]

Cleistesiopsis oricamporum P.M. Brown, Small Coastal Plain Spreading Pogonia. Savannas, sandhill seeps. May-July. Se. NC to c. peninsular FL and west to e. LA. Catling & Gregg (1992) make a convincing case for the recognition of *Cleistesiopsis bifaria* (including *C. oricamporum*) and *C. divaricata* as specifically distinct (as *Cleistes*), based on differences in morphology, range, phenology (in the sympatric portions of their ranges), and floral fragrance. The co-occurrence of *C. divaricata* and *C. oricamporum* at such sites as the Green Swamp, Brunswick County, NC, where phenologically separated, supports their taxonomic status. Where co-occurring, *C. oricamporum* flowers on average about 10 days before *C. divaricata*. Recent studies (Smith et al. 2004) suggest the probability that montane and Coastal Plain populations of "*C. bifaria*" represent 2 different species, a suggestion formalized by Brown & Pansarin (2009). [= V; < *Cleistesiopsis bifaria* – Y; < *Cleistes bifaria* (Fernald) Catling & Gregg – FNA, K, Z; < *Cleistes divaricata* – RAB, C, G, GW, L, S, W, X; < *Cleistes divaricata* var. *bifaria* Fernald – F, WV; < *Pogonia bifaria* (Fernald) P.M. Brown & Wunderlin – WH]

Coeloglossum Hartman 1820 (Frog Orchid, Long-bracted Orchid)

Usually regarded as a monotypic genus, of north temperate regions of the Old and New World. However, *Coeloglossum* is probably not distinct from *Dactylorhiza* Necker ex Nevski; *Coeloglossum* is the older name, but *Dactylorhiza* has been accepted for nomenclatural conservation. The taxonomic and nomenclatural outcome is uncertain. References: Sheviak & Catling in FNA (2002a); Bateman, Pridgeon, & Chase (1997)=Z; Pridgeon et al. (1997, 1999b); Correll (1950)=X.

Coeloglossum viride (Linnaeus) Hartman *var.* ***virescens*** (Muhlenberg ex Willdenow) Luer, Long-bracted Frog Orchid. Moist woods. April-June. The species is circumboreal; var. *virescens* is e. Asian and North American, in e. North America south in the Appalachians to NC. It is generally more "southern" than the typic var. *viride*, which is more completely circumboreal, widespread in n. Eurasia and far northern North America. [= K, L, W; = *Habenaria viridis* (Linnaeus) R. Brown var. *bracteata* (Muhlenberg ex Willdenow) Reichenbach ex A. Gray – RAB, C, F, G, X; < *Coeloglossum viride* (Linnaeus) Hartman – FNA; = *Coeloglossum bracteatum* (Muhlenberg ex Willdenow) Parlatore – S; < ***Dactylorhiza viridis*** (Linnaeus) R.M. Bateman, Pridgeon, & M.W. Chase – Z]



Corallorhiza Gagnebin 1755 (Coralroot)

A genus of about 15 species, distributed in north temperate regions of the Old and New World. The closest relative of *Corallorhiza* in our flora is *Aplectrum* (Freudenstein 1992). The mycotrophic nature of *Corallorhiza* is well established, but the exact means of the transfer of nutrients from the fungal hyphae to the orchid is not yet understood. References: Freudenstein (1992, 1997, 1999)=Z; Magrath & Freudenstein in FNA (2002a); Correll (1950)=X.

1 Lip with two lateral teeth or lobes; lateral sepals spreading to down-curved.
  2 Sepals 1-veined ..... ***C. trifida***
  2 Sepals 3-veined.
    3 Middle lobe of lip expanded slightly or not at all distally, the ratio of the width of the dilated part to the base of the mid-lobe < 1.5; floral bracts averaging 0.5-1.0 mm long ..... ***C. maculata*** *var.* ***maculata***
    3 Middle lobe of the lip distinctly expanded, the ratio of the width of the dilated part to the base of the midlobe greater than 1.5; floral bracts averaging 1.0-2.8 (-4.5) mm long ..... ***C. maculata*** *var.* ***occidentalis***
1 Lip without lateral teeth or lobes (though sometimes erose or minutely toothed near its apex); lateral sepals arching, upcurved, or forward-directed.
  4 Sepals and petals 5-7.5 mm long; dorsal sepal > 4.5 mm long, 3-nerved; flowering April-July.
    5 Lip with prominent, thickened, involute margins; flowering mid to late July ..... ***C. bentleyi***
    5 Lip planar; flowering April-May ..... ***C. wisteriana***
  4 Sepals and petals 3-4.5 mm long; dorsal sepal < 4.5 mm long, 1-nerved; flowering August-October.
    6 Perianth closed or nearly so (cleistogamous); lip 1.7-2.2 mm wide, straight; column lacking or with only poorly developed basal ventral auricles; stigma 0.2-0.5 mm wide ..... ***C. odontorhiza*** *[cleistogamous form]*
    6 Perianth open (chasmogamous); lip 2.1-3.7 mm wide, bent downwards at a nearly right angle; column with 2 prominent auricles at the base on the ventral surface; stigma 0.7-1.0 mm wide ..... ***C. odontorhiza*** *[chasmogamous form]*

Corallorhiza bentleyi Freudenstein. Dry-mesic to mesic forests, especially near roadsides. The species was recently named and was known (at the time of publication) from only a single population (Freudenstein 1999). This species is now known from about 15 populations in e. WV (Monroe and Pocahontas counties) and w. VA (Giles, Alleghany, and Bath counties). It is most closely related to *C. involuta* Greenman of Mexico, a component of the *C. striata* Lindley complex of w. and n. North America. [= FNA, Z]

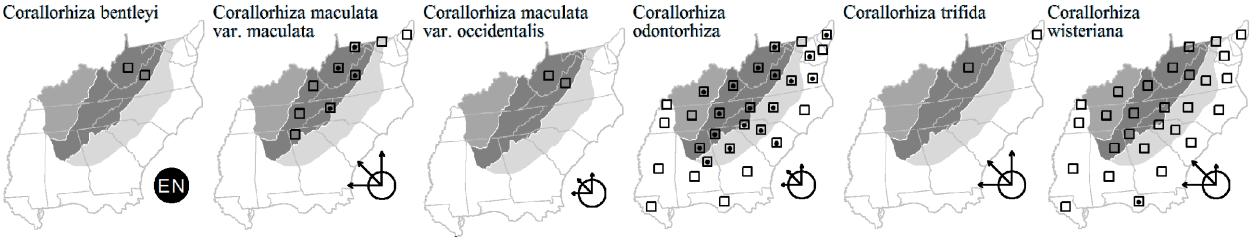
Corallorhiza maculata (Rafinesque) Rafinesque *var.* ***maculata***, Eastern Spotted Coralroot. Moist forests, northern hardwood forests. July-August. Var. *maculata* is irregularly distributed in much of North America, primarily northern, from NL (Newfoundland) QC, and MN south to PA, OH, and IN, and south in the Appalachians to ne. GA, in the west from BC south to s. CA, s. AZ, and s. NM. Var. *mexicana* (Lindley) Freudenstein *ined*. is restricted to Mexico. [= FNA, Z; < *C. maculata* – RAB, C, F, G, K, L, W, WV, X; < *Corallorrhiza maculata* – S, orthographic variant]

Corallorhiza maculata (Rafinesque) Rafinesque *var.* ***occidentalis*** (Lindley) Ames, Western Spotted Coralroot. Forests. May-July. Var. *occidentalis* (Lindley) Ames has a distribution similar to var. *maculata*, except that in the east it ranges south only to PA, s. ON, and WI, with disjunct populations in e. WV (Pocahontas County; Morton et al. 2004) and VA. [= FNA, Z; < *C. maculata* – RAB, C, F, G, K, L, W, WV, X; < *Corallorrhiza maculata* – S, orthographic variant]

Corallorhiza odontorhiza (Willdenow) Poiret, Autumn Coralroot. Forests. August-October. The cleistogamous form is the more common, and is widespread in e. North America, from ME, NY, s. ON, MI, and MN south to SC, c. GA, ne. FL, c. AL, n. MS, c. AR, and e. OK. The chasmogamous form is less common, and is scattered in ne. United States and adjacent Canada, in ON, CT, PA, MI, IA, IN, DC, NC, and TN, and in Mexico (Chiapas, Distrito Federal, Guerrero, Hidalgo, Jalisco, México, Michoacán, Morelos, Oaxaca, Puebla, Sonora), Guatemala, and Nicaragua. It may be recognized as a variety; see synonymy. [= RAB, C, F, G, L, W, WH, WV, X; > *C. odontorhiza* var. *pringlei* (Greenman) Freudenstein – FNA, K, Z; > *C. odontorhiza* var. *odontorhiza* – FNA, K, Z; = *Corallorrhiza odontorhiza* – S, orthographic variant; > *C. pringlei* Greenman]

Corallorhiza trifida Châtelain, Early Coralroot, Pale Coralroot. Boreal forests, bogs, peaty swamps. May-July. NL (Labrador) to Alska, south to DC {specimen at NCU}, MD, WV, PA, NJ (Magrath & Freudenstein in FNA 2002, Kartesz 1999), allegedly GA (Small 1933), OH, IN, IL, SD, NM, CA. [= FNA, G, K, L, WV, Z; > *C. trifida* var. *verna* (Nuttall) Fernald – C, F; = *Corallorrhiza corallorrhiza* – S]

Corallorhiza wisteriana Conrad, Spring Coralroot. Moist forests. April-May. Widespread in e. North America, from NJ, PA, OH, IN, IL, MO, and OK south to FL, and TX, and also in the Rockies from MT and w. SD south to s. Mexico. [= RAB, C, F, FNA, G, K, L, W, WH, WV, X, Z; = *Corallorrhiza wisteriana* – S, orthographic variant]



Cypripedium Linnaeus 1753 (Lady's-slipper)

A genus of about 40-50 species, north temperate in distribution. References: Sheviak (1994)=Z; Case et al. (1998); Wallace & Case (2000)=Y; Sheviak in FNA (2002a); Pridgeon et al. (1999c); Correll (1950)=X. Key to yellow-flowered species adapted from Sheviak (1994).

1 Plant scapose, with 2 basal leaves; pouch-like lip of flower with a longitudinal fissure, pink (rarely nearly white); [section *Acaulia*]..... ***C. acaule***

1 Plant caulescent, with (2) 3-7 leaves alternate on the stem; pouch-like lip of flower with a rounded orifice, yellow or pink (rarely white).

2 Pouch-like lip of flower pink and white (rarely all white); lateral petals and dorsal sepal white, not twisted, obtuse to acute; [section *Obtusipetala*]..... ***C. reginae***

2 Pouch-like lip of flower yellow or white; lateral petals and dorsal sepal brown, purplish brown, or yellow, slightly to strongly twisted, acuminate-attenuate; [section *Cypripedium*].

3 Pouch-like lip of flower white, 1.5-2.5 cm long; orifice margin acute on the apical margin; [of calcareous barrens]..... ***C. candidum***

3 Pouch-like lip of flower bright yellow, pale yellow, or rarely white, (2.0-) 2.2-6.3 cm long (if pale yellow or white, then > 4 cm long); orifice margin rounded-octuse on the apical margin; [of various habitats].

4 Dorsal sepal 3.5-5.0 cm wide; pouch orifice 2.7-4.5 cm long; pouch-like lip 4.5-6.3 cm long, pale yellow or creamy white; plants robust, typically 5-8 dm tall..... ***C. kentuckiense***

4 Dorsal sepal 1.5-2.9 cm wide; pouch orifice 0.5-1.3 cm long; pouch-like lip (2.0-) 2.2-5.8 cm long, medium to rich yellow; plants not as robust, typically 2-5 (-6) dm tall.

5 Pouch-like lip 2.2-3.4 cm long; sepals and lateral petals usually densely and minutely spotted with dark reddish brown or purple, thus appearing uniformly dark ..... ***C. parviflorum*** *var.* ***parviflorum***

5 Pouch-like lip (2.0-) 3.0-5.8 cm long; sepals and lateral petals unmarked (greenish-yellow), or more often streaked, blotched, striped or reticulately marked with dark reddish brown or purple (but generally not extensively blotched)..... ***C. parviflorum*** *var.* ***pubescens***

Cypripedium acaule Aiton, Pink Lady's-slipper, Moccasin-flower. Dry to mesic, acid forests and woodlands, often under pine or other conifers. April-July. NL (Newfoundland) west to n. AB, south to NC, SC, GA, TN, n. IN, and MN. [= RAB, C, F, FNA, G, K, L, W, WV, X; = *Fissipes acaulis* (Aiton) Small – S]

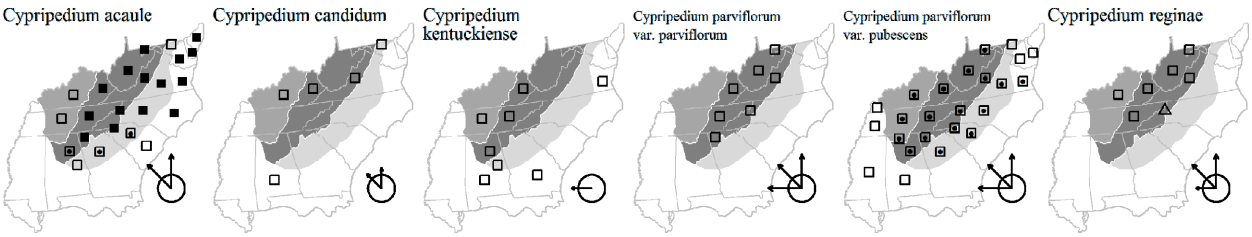
Cypripedium candidum Muhlenberg ex Willdenow, White Lady's-slipper. Calcareous barrens and bluffs. NY and NJ west to ND, south to w. VA, nw. and se. AL, and MO. [= C, F, FNA, G, K, L, X]

Cypripedium kentuckiense C.F. Reed, Kentucky Yellow Lady's-slipper. Sandy ravine bottoms and springhead seeps along small streams. First reported for our area by Weldy et al. (1996). *C. kentuckiense* C.F. Reed is similar to *C. parviflorum* var. *pubescens* and, in addition to the site discovered in e. VA, reaches AL, e. TN (Franklin and Scott counties, Cumberland Plateau) and e. KY. Case et al. (1998) studied isozymes of *C. kentuckiense* and related *Cypripedium spp*.; the recognition of *C. kentuckiense* as a species was supported. [= C, FNA, K, Y, Z; often included in a broad concept of *C. calceolus, C. pubescens*, or *C. calceolus* var. *pubescens* by most earlier authors]

Cypripedium parviflorum Salisbury *var.* ***parviflorum***, Small Yellow Lady's-slipper. Mesic forests, seepy forests over amphibolite, other habitats. April-June. VT, NY, OH, IN, IL, MO and KS, south to NC, GA, AL, AR, and OK. The exact range, abundance, and habitats of this variety in our area are obscure, because of confusion with the more northern var. *makasin* (Farwell) Sheviak and small-flowered forms of var. *pubescens*. See Sheviak (1994) for a discussion of why North American plants of yellow lady's-slippers are recognized as a species distinct from the European *C. calceolus* Linnaeus. [= FNA, Y, Z; < *C. calceolus* Linnaeus var. *pubescens* – RAB, G, X; = *C. parviflorum* – K, S, WV; = *C. calceolus* var. *parviflorum* (Salisbury) Fernald – C, F, L, W]

Cypripedium parviflorum Salisbury *var.* ***pubescens*** (Willdenow) Knight, Large Yellow Lady's-slipper, Whippoorwill Shoes. Rich mesic forests. April-June. NL (Labrador) and AK south to GA, AL, MS, NM, and AZ. [= FNA, Y, Z; < *C. calceolus* Linnaeus var. *pubescens* (Willdenow) Correll – RAB, G, X (also see *C. parviflorum* var. *parviflorum*); = *C. pubescens* Willdenow – K, S, WV; = *C. calceolus* var. *pubescens* (Willdenow) Correll – C, F, L, W]

Cypripedium reginae Walter, Showy Lady's-slipper, Queen Lady's-slipper. Over circumneutral to basic rocks, or (allegedly) in mossy wet forests under *Rhododendron*. May-June. NL (Newfoundland), ON and SK south to NC (?), GA, TN, AR, and ND. The native occurrence of this species in NC is questionable; the only definite specimen from the state is from an implausible habitat for the species (highly acid humus under rhododendron). [= RAB, C, F, FNA, G, K, L, S, W, WV, X]



Epidendrum Linnaeus 1759 (Green-fly Orchid)

A genus of about 1000 species, of tropical (and rarely subtropical) America. References: Hágsater in FNA (2002a); Pridgeon et al. (2005); Correll (1950)=X.

Epidendrum magnoliae Muhlenberg, Green-fly Orchid. Epiphytic on limbs of trees, especially *Magnolia grandiflora*, *Quercus virginiana*, and *Taxodium spp.*, in blackwater river swamps and mesic hardwood hammocks, usually on relatively horizontal limbs mixed with *Pleopeltis polypodioides*, also rarely in crevices of Altamaha Grit outcrops. July-October. The northernmost epiphytic orchid: se. NC south to c. peninsular FL, west to LA; also in ne. Mexico. It is locally rather common, but rarely seen as it occurs primarily in blackwater swamps, on upper limbs of *Taxodium, Nyssa*, and other trees, typically mixed with *Pleopeltis*. See Correll (1936) for additional discussion of this species at its northern limit. Hágsater (2000) indicates that *E. magnoliae* Muhlenberg has nomenclatural priority over *E. conopseum* R. Brown. [= FNA; = *E. conopseum* Aiton f. – RAB, L, WH, X; > *E. conopseum* var. *conopseum* – K; = *Amphiglottis conopsea* (Aiton f.) Small – S]

Epipactis Zinn 1757 (Helleborine)

A genus of about 25 species, of w. North America, Eurasia, and n. Africa (Brown & Argus in FNA 2002). References: Brown & Argus in FNA (2002a); Correll (1950)=X.

* ***Epipactis helleborine*** (Linnaeus) Crantz, Broad-leaved Helleborine. Forests; native of Europe. June-September. This species has been collected a handful of times in various parts of the mountains, some of the colonies dating back to the early 1960's; it has become common in ne. United States and se. Canada. [= C, F, FNA, K, L, WV, X; = *E. latifolia* (Linnaeus) Allioni – G]

Eulophia R. Brown ex Lindley 1823

A genus of about 215 species, pantropical (Romero-González in FNA 2002). References: Romero-González in FNA (2002a); Correll (1950)=X. [also see *Pteroglossaspis*]

Eulophia alta (Linnaeus) Fawcett & Rendle, Wild Coco. Flatwoods, swamps. S. GA south through the FL peninsula into the West Indies, Mexico, Central America, and South America. [= FNA, GW, K; = *Platypus altus* (Linnaeus) Small – S] {add X to synonymy}

Galearis Rafinesque 1833 (Showy Orchis)

A genus of 3-6 species, of e. North America and e. Asia. References: Sheviak & Catling in FNA (2002a); Pridgeon et al. (1999b); Correll (1950)=X.

Galearis spectabilis (Linnaeus) Rafinesque, Showy Orchis. Rich, deciduous forests, most typically over calcareous or mafic rocks. April-July. NB and QC west to MN, south to GA and AR. [= FNA, K, L, W; = *Orchis spectabilis* Linnaeus – RAB, C, F, G, WV, X; = *Galeorchis spectabilis* (Linnaeus) Rydberg – S]

Goodyera R. Brown 1813 (Rattlesnake Orchid)

A genus of about 55-100 species, widespread in distribution but primarily Northern Hemisphere. References: Kallunki in FNA (2002a); Pridgeon et al. (1999c); Correll (1950)=X.

1 Leaves blue-green, the upper surface variegated with white, the midrib broadly whitened (1-3 mm wide), the remainder of the network of white variegations narrow (< 0.5 mm wide), generally lacking any internal variation in color, the outlines of the variegations smooth; inflorescence cylindric, not secund or one-sided ..... ***G. pubescens***

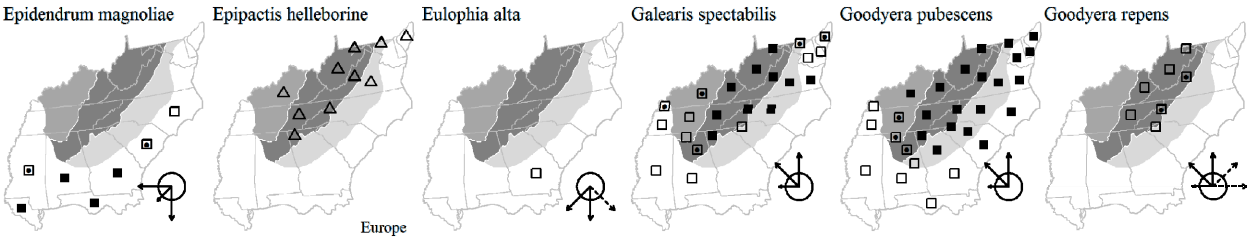
1 Leaves dark green, the upper surface variegated with pale green, the midrib only irregularly and narrowly pale green, most of the network of pale green variegations broad (0.5-1 mm wide), with a dark green center line (thus the variegations appearing double), the outlines of the variegations finely and irregularly toothed; inflorescence secund, primarily one-sided, or loosely spiraled.

2 Lip narrowly saccate (th pouch much longer than deep), with an elongate recurved apex ..... ***G. repens***

2 Lip deeply concave (the pouch about as deep as long), with a short spreading or recurved apex ..... ***G. tesselata***

Goodyera pubescens (Willdenow) R. Brown, Downy Rattlesnake-orchid. Dry to moist forests and woodlands. June-August. NB west to ON and MN, south to Panhandle FL, MS, and AR. One of the commonest of orchids in much of its range. [= RAB, C, F, FNA, G, K, L, W, WV, X; = *Peramium pubescens* (Willdenow) MacMillan – S]

Goodyera repens (Linnaeus) R. Brown, Lesser Rattlesnake-orchid. Moist forests, usually under conifers and rhododendrons. June-September. A circumboreal species of northern North America and Eurasia, this species reaching its southern limit in e. North America in NC and SC. [= FNA, K, L, W; > *Goodyera repens* var. *ophioides* Fernald – RAB, C, F, G, WV, X; > *Peramium ophioides* (Fernald) Rydberg – S]



Goodyera tesselata Loddiges, Checkered Rattlesnake-plantain. Mixed deciduous and pine woods. NL (Newfoundland) and MB south to NJ, MD, PA, n. OH, MI, WI, and MN. Probably an allopolyploid, derived from *G. oblongifolia* × *repens*. [= FNA, C, F, G, K, L, X]

Habenaria Willdenow 1805 (Longspur Orchid, Habenaria)

A genus of about 600 species, tropical and subtropical in the Old World and New World. References: Sheviak in FNA (2002a); Pridgeon et al. (1999b); Correll (1950)=X. [also see *Coeloglossum*, *Platanthera*]

1 Lip and lateral petals toothed ..... ***H. floribunda***
1 Lip or lateral petals divided into linear segments.
2 Spur 4-10 cm long; [terrestrial, though in moist habitats] ..... ***H. quinqueseta***
2 Spur 0.4-1.4 cm long; [aquatic or semi-aquatic in marshes and swamps] ..... ***H. repens***

Habenaria floribunda Lindley, Mignonette Orchid. Rich, moist hardwood hammocks. Ne. FL south to s. FL; West Indies, Mexico, Central America, South America. [= WH; = *H. odontopetala* Reichenbach f. – FNA, K; = *Habenella odontopetala* (Reichenbach f.) Small; = *Habenella floribunda* (Lindley) Szlachetko & Kras-Lapinska] {add X to synonymy}

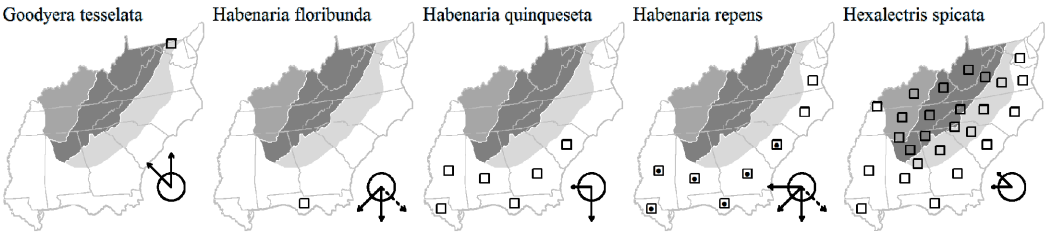
Habenaria quinqueseta (Michaux) A. Eaton, Long-horned Habenaria, Michaux's Orchid. Wet pine flatwoods, moist hardwood hammocks, Altamaha Grit outcrops, ditches. August-October. SC south to s. FL, west to se. TX. [= FNA, K, WH; = *H. quinqueseta* var. *quinqueseta* – L; < *H. quinqueseta* – RAB, GW, S, X]

Habenaria repens Nuttall, Water-spider Orchid, Floating Orchid. Blackwater swamps, pools, banks of creeks and rivers. April-November. NC south to FL and west to TX; West Indies, Mexico, Central America, and n. South America. Reported from se. VA. [= RAB, FNA, GW, K, L, S, WH, X]

Hexalectris Rafinesque 1825 (Crested Coralroot)

A genus of about 9 species, mycotrophic herbs, of s. North America, especially sw. United States and Mexico. References: Kennedy & Watson (2010)=V; Catling & Engel (1993)=Z; Catling (2004)=Y; Goldman, Coleman, Magrath, & Catling in FNA (2002a); Correll (1950)=X.

Hexalectris spicata (Walter) Barnhart, Crested Coralroot, Brunetta. Dry forests and woodlands, especially over mafic or calcareous rocks, such as diabase, gabbro, calcareous siltstone, and dolomite (though sometimes in distinctly acid situations), shell middens. April-August. MD, OH, and MO south to s. FL and w. and s. TX. The yellow and purple flowers borne on a brown stem present a very peculiar color combination. [= V; = *H. spicata* var. *spicata* – FNA, Y, Z; < *H. spicata* – RAB, C, F, G, K, L, S, W, WH, WV, X]



Isotria Rafinesque 1808 (Whorled Pogonia, Five-leaves, Fiveleaf Orchid)

A genus of 2 species, of e. North America. Cameron & Chase (1999) indicate that *Isotria* should perhaps be included in a more broadly circumscribed *Pogonia* (as was often done prior to 1922). References: Mehrhoff & Homoya in FNA (2002a); Correll (1950)=X.

Identification notes: Sterile *Isotria* is sometimes confused with *Medeola*. *Medeola* has a wiry-textured stem, with floccose hairiness, at least towards the base. *Isotria* has a fleshier stem, lacking hairs.

1 Sepals 12-30 mm long, greenish-brown; lip 10-15 mm long; pedicel of fruit (0-) 5-10 (-15) mm long; plant glaucous, the stem whitish-green.. ..... ***I. medeoloides***
1 Sepals 35-60 mm long, purple-brown; lip 20-25 mm long; pedicel of fruit (12-) 20-55 mm long; plant scarcely glaucous (if at all), the stem generally purplish ..... ***I. verticillata***

Isotria medeoloides (Pursh) Rafinesque, Small Whorled Pogonia, Little Five-leaves. Moist forests, in the mountains and upper Piedmont usually with *Pinus strobus*. May-June. Widespread (but very local) in ne. North America, from s. ME and MI south to c. and e. WV, w. VA, w. NC, e. TN, and n. GA. The reproductive biology of this species was studied by Vitt & Campbell (1997). Van Alstine et al. (1996) discuss the habitats of known occurrences in Virginia. [= RAB, C, F, FNA, G, K, L, W, X; = *I. affinis* (C.F. Austin) Rydberg – S; = *Pogonia affinis* C.F. Austin]

Isotria verticillata (Muhlenberg ex Willdenow) Rafinesque, Large Whorled Pogonia, Larger Five-leaves. Moist to dry forests. April-July. ME and MI south to Panhandle FL and e. TX. [= RAB, C, F, FNA, G, K, L, S, W, WV, X; = *Pogonia verticillata* (Muhlenberg ex Willdenow) Nuttall – WH]

Liparis L.C. Richard 1817 (Wide-lip Orchid, Twayblade)

A genus of about 250-350 species, cosmopolitan. Regerences: Magrath in FNA (2002a); Correll (1950)=X.

1 Lip (8-) 10-12 mm long, pale purple; pedicels 11-18 mm long, equal to or longer than the capsule ..... ***L. liliifolia***
1 Lip 4-5.5 mm long, yellowish-green; pedicels 3-7 mm long, shorter than the capsule ..... ***L. loeselii***

Liparis liliifolia (Linnaeus) L.C. Richard ex Ker-Gawler, Large Twayblade, Mauve Sleekwort, Russet-witch, Brown Wide-lip Orchid. Moist forests, floodplains. May-July. VT and ON west to MN, south to GA and AR; also in China. [= RAB, C, F, FNA, G, GW, K, L, S, W, WV, X]

Liparis loeselii (Linnaeus) L.C. Richard, Fen Orchid, Loesel's Twayblade, Bog Twayblade, Yellow Wide-lip Orchid. Seepages at moderate to high elevations in the mountains, mucky bay swamps (dominated by *Persea palustris* and *Magnolia virginiana*) at about sea level on the Outer Banks, and other moist, seepy habitats, especially over mafic or calcareous rocks. May-July. NS and QC west to NT and BC, south to ne. NC (Dare County), sw. NC, AL, AR, KS, NE, and WA. [= RAB, C, F, FNA, G, GW, K, L, S, W, WV, X]

Listera R. Brown 1813 (Twayblade)

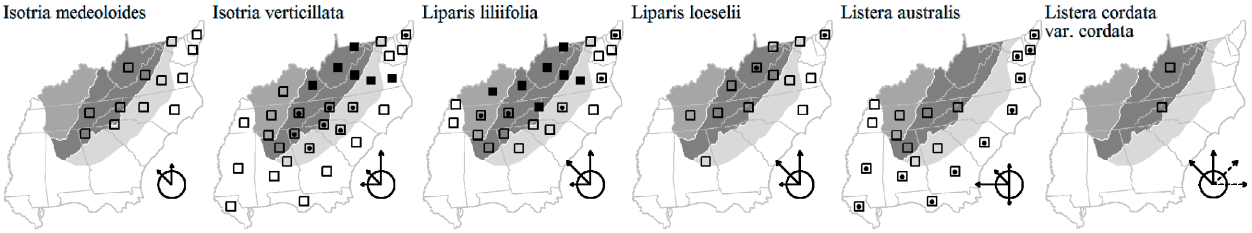
A genus of about 25 species, boreal, north temperate, and south temperate (Magrath & Coleman in FNA 2002). Recent studies suggest that *Listera* may be best included in *Neottia* Guettard. References: Magrath & Coleman in FNA (2002a); Correll (1950)=X.

1 Lip usually cleft about one-third its length, the two lobes oblong, with rounded apices ..... ***L. smallii***
1 Lip usually cleft about two-thirds its length, the two lobes linear, with acute apices.
  2 Lip 6-10 mm long, lacking prominent teeth near the base (but with 2 vertically-oriented lobes); pedicels and raceme axis glandular-puberulent; sepals and petals 1-2 mm long ..... ***L. australis***
  2 Lip 3-5 mm long, with 2 prominent teeth near the base, these diverging horizontally; pedicels and raceme axis glabrous; sepals and petals 1-5-3 mm long ..... ***L. cordata*** *var.* ***cordata***

Listera australis Lindley, Southern Twayblade. Swamps, second terraces in floodplain forests, wet woods under *Rhododendron maximum*. February-July. Mainly a Southeastern Coastal Plain species, from NJ south to wc. peninsular FL (Kunzer et al. 2009) and west to e. TX, but also scattered inland of the Coastal Plain and north into VT and s. Canada. [= RAB, C, F, FNA, G, GW, K, L, W, WH, X; = *Ophrys australis* (Lindley) House – S; = ***Neottia bifolia*** (Rafinesque) Baumbach]

Listera convallarioides (Swartz) Nuttall. Attributed to NC by Correll (1950); this record of this far-northern species is almost certainly an error. [= *Neottia convallarioides* (Swartz) Richard] {rejected; not keyed}

Listera cordata (Linnaeus) R. Brown *var.* ***cordata***, Heartleaf Twayblade, Lesser Twayblade. Northern hardwood and spruce-fir forests. June-July. A widespread circumboreal species of n. Eurasia and n. North America, south to NC (at least formerly, not seen in this century). Var. *cordata* is widespread in ne. United States and widespread in Canada; var. *nephrophylla* (Rydberg) Hultén is widespread in nw. North America. [= FNA, K, L; < *L. cordata* – RAB, C, F, G, W, WV, X; = ***Neottia cordata*** (Linnaeus) Richard]



Listera smallii Wiegand, Appalachian Twayblade, Small's Twayblade, Kidneyleaf Twayblade. Shaded swamps, wet slopes, nearly always beneath *Rhododendron maximum*. June-July. A Southern and Central Appalachian endemic: s. PA south to nw. SC and ne. GA. [= RAB, C, FNA, G, GW, K, L, W, WV, X; = *Ophrys smallii* (Wiegand) House – S; = ***Neottia smallii*** (Wiegand) Szlachetko]

Malaxis Solander ex Swartz 1788 (Adder's-mouth)

A genus of about 250-300 species, nearly cosmopolitan. References: Catling (1991)=Z; Catling & Magrath in FNA (2002a); Correll (1950)=X. Key adapted from Catling (1991).

1 Leaves 2-5; lip oriented upwards, erect, entire, obtuse to acuminate ..... ***M. spicata***
1 Leaf solitary; lip oriented downwards, deflexed, 3-lobed (the central lobe smaller than the 2 lateral lobes).
2 Pedicels 3-5 (-5.8) mm long (even in plants with inflorescences over 80 mm long); basal lobes of the lip prominent, 0.75-1.1 mm long, usually 1.5-2 (-2.5)× as long as the apical lateral lobes and > 0.6× as long as the length from the base to the tip of the mid-lobe; inflorescences loosely flowered above, the lower flowers withering slowly ..... ***M. bayardii***
2 Pedicels (4-) 5-10 (-13) mm long (and > 5 mm long in plants with inflorescences > 45 mm long); basal lobes of the lip not prominent, 0.4-1.1 mm long, mostly < 1.5× as long as the apical lateral lobes and < 0.6× as long as the length from the base to the tip of the mid-lobe; inflorescences densely flowered above, the lower flowers soon withering ..... ***M. unifolia***

Malaxis bayardii Fernald, Appalachian Adder's-mouth. Dry, open, upland forests, shale barrens. July-September. S. NY and se. MA south through CT, RI, NJ, PA, and VA to w. and c. NC, mostly in the mountains (but somewhat disjunct on the Coastal Plain of VA). See Catling (1991) for further discussion of the distinction of *M bayardii* from *M. unifolia*. [= F, FNA, K, Z; < *M. unifolia* – RAB, C, G, GW, L, S, W, WV, X]

Malaxis brachypoda (A. Gray) Fernald, White Malaxis, ranges as far south as sc. PA (Rhoads & Klein 1993) and n. NJ (Kartesz 2010), in moist forests and bogs; it is additionally reported by F to range south to the Mountains of TN, the documentation unknown. [= F, K; = *M. monophyllos* (Linnaeus) Swartz var. *brachypoda* (A. Gray) Morris & Eames – C, FNA, G, L, X; = *M. monophyllos* (Linnaeus) Swartz ssp. *brachypoda* (A. Gray) Á. & D. Löve] {rejected; not keyed}

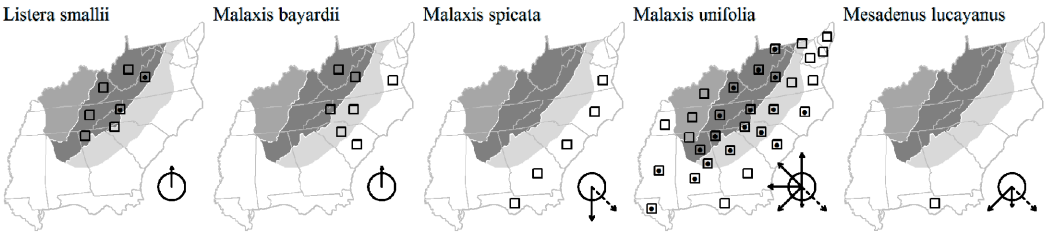
Malaxis spicata Swartz, Florida Adder's-mouth. Maritime swamp forests, calcareous but mucky swamps in the outer Coastal Plain, spring-fed swamps, wet hammocks. July-October. Se. VA south to FL; n. West Indies. [= RAB, C, FNA, G, GW, K, L, S, WH, X; ? *M. floridana* (Chapman) Kuntze – F]

Malaxis unifolia Michaux, Green Adder's-mouth. Bogs, moist forested slopes, in the Sandhills in longleaf-oak-hickory forests. June-August. NL (Newfoundland) and FL west to MN, IA, MO, e. OK, and e. TX; also in Mexico, Cuba, the West Indies, and Central America. [= F, FNA, K, Z; < *M. unifolia* – RAB, C, G, GW, L, S, W, WH, WV, X (also see *M. bayardii*)]

Mesadenus Schlechter 1920

A genus of 7 species, of tropical and subtropical s. North America, West Indies, Central America, and South America. References: Ackerman in FNA (2002a); Correll (1950)=X.

Mesadenus lucayanus (Britton) Schlechter, Gray Ladies'-tresses. Shell middens, dry calcareous hammocks. Late December-March. Ne. FL (Duval County) south to s. FL; West Indies; e. Mexico and n. Central America. [=FNA, S; < *Spiranthes polyantha* Reichenbach f. – L, WH] {add to genus key; add X to synonymy}



Platanthera L.C. Richard 1817 (Fringed Orchid, Fringeless Orchid)

A genus of about 200 species, largely of the temperate northern hemisphere, extending south into tropical Central America and tropical se. Asia. The recognition of *Gymnadeniopsis* as separate from *Platanthera* is uncertain at this time; originally named by Rydberg, its recognition was acknowledged as possibly warranted by Sheviak in FNA (2002a) and embraced by Brown (2006a).

Three of our species would belong to *Gymnadeniopsis*: *P. clavellata*, *P. integra*, and *P. nivea*. References: Sheviak in FNA (2002a); Correll (1950)=X; Reddoch & Reddoch (1993); Pridgeon et al. (1999b).

Identification Notes: Hybrids are frequent and are not keyed; they are generally intermediate in characters and are generally found in mixed populations of the two parents.

1 Lip entire, finely toothed, or eroded (neither fringed nor deeply divided into 3 lobes).
2 Leaves basal, 1 or 2, orbicular, (5-) 8-25 cm wide, prostrate on the ground, the stem naked or with a few bladeless bracts ..... ***P. orbiculata***
2 Leaves cauline, 1-10 or more, mostly lanceolate, 1-5 cm wide, ascending, the stem with at least 1 (usually several) bladed leaves.
3 Lip 11-15 mm long; spur mostly 40-50 mm long ..... ***P. integrilabia***
3 Lip 2-8 mm long; spur 4-23 mm long.
4 Flowers golden-yellow or bright-white.
5 Flowers golden-yellow; spur 4-8 mm long; lip minutely crenulate, directed downward ..... ***P. integra***
5 Flowers bright-white; spur 11-23 mm long; lip entire, directed upward ..... ***P. nivea***
4 Flowers green, greenish-white, yellowish-green, yellowish-white, or dull-white.
6 Larger stem leaves usually 1, rarely 2, near the middle of the stem; raceme 2-9 cm long, 2-3.5 cm in diameter; lip without a tubercle on the upper surface near the base, also lacking lateral auricles near the base ..... ***P. clavellata***
6 Larger stem leaves usually 2 (-5), near the middle of the stem or towards its base; raceme 5-20 cm long, 1.2-2 cm in diameter; lip with a tubercle on the upper surface near the base, also usually with 2 lateral auricles.
7 Most bracts of the inflorescence shorter than the flowers they subtend (the lowermost few exceeding the flowers); flowers sparsely distributed; lip orbicular, 1-1.5× as long as broad, yellowish-green ..... ***P. flava*** *var.* ***flava***
7 Most bracts of the inflorescence exceeding the flowers they subtend (the uppermost few sometimes shorter than the flowers); flowers densely distributed; lip oblong, 2-3× as long as broad, green ..... ***P. flava*** *var.* ***herbiola***
1 Lip either fringed, deeply divided into 3 lobes, or both.
8 Lip not deeply divided into 3 lobes, deeply fringed; flowers white, yellow, orange.
9 Flowers white; spur 15-50 mm long.
10 Spur 15-26 mm long, ca. 1× as long as the ovary; lip descending and thence curved back towards the stem, narrowed at its base to a very short isthmus (the section between the base and the fringed portion); lip fringing short and relatively coarse; [of NL (Newfoundland) west to MI and IL, south to GA] ..... ***P. blephariglottis***
10 Spur 30-50 mm long, ca. 2× as long as the ovary; lip projected forward; lip narrowed to an extended isthmus; lip fringing elongate and delicate; [of e. NC south to c. peninsular FL, west to e. TX] ..... ***P. conspicua***
9 Flowers yellow to orange; spur 5-33 mm long.
11 Spur 20-33 mm long, exceeding the 12-27 mm long ovary; undivided portion of lip 8-12 mm long ..... ***P. ciliaris***
11 Spur 4-17 mm long, equal to or shorter than the ovary; undivided portion of lip 4-6 mm long.
12 Spur 8-17 mm long, about as long as the 10-19 mm long ovary; spur orifice circular ..... ***P. chapmanii***
12 Spur 4-10 mm long, shorter than the 7-13 mm long ovary; spur orifice keyhole-shaped or triangular ..... ***P. cristata***
8 Lip deeply divided into 3 lobes, the lobes deeply fringed, shallowly fringed, eroded, or entire; flowers purple or greenish-white or yellowish-white.
13 Flowers greenish-white or yellowish-white; lateral lobes of lip deeply fringed (nearly or entirely to the point of junction with the central lobe of the lip).
14 Perianth greenish-white; lateral petals linear-spatulate, < 2 mm wide, blunt, entire to inconspicuously crenulate; lateral sepals deflexed ..... ***P. lacera***
14 Perianth white or cream; lateral petals cuneate to broadly obovate, 4-12 mm wide, toothed; lateral sepals divergent ..... ***P. leucophaea***
13 Flowers purple (or rarely white in albino forms); lateral lobes of lip entire, eroded, shallowly fringed, or deeply fringed.
15 Lobes of lip eroded or entire, few (if any) of the segments > 1 mm long ..... ***P. fissa***
15 Lobes of lip shallowly or deeply fringed, most or all of the segments > 1 mm long.
16 Lobes of the lip fringed < 1/3 of the way to the base of the lobes; opening to nectary dumbbell-shaped (the pollen sacs close together); spur 12-20 mm long ..... ***P. psycodes***
16 Lobes of lip fringed from 1/3 to nearly all the way to the base of the lobes; opening to nectary widely rounded (the pollen sacs spread widely apart); spur 20-35 mm long.
17 Lip segments moderately to deeply fringed; isthmus of the lip stout, about 2× as long as wide; spur 20-26 mm long, ca. 1.25× as long as the lip; orifice round; flowering mid June-early July ..... ***P. grandiflora***
17 Lip segments deeply and compoundly lacerate; isthmus of the lip slender, about 4× as long as wide; spur 21-35 mm long, 2-2.5× as long as the lip; orifice angled at top; flowering mid July-early August ..... ***P. shriveri***

Platanthera blephariglottis (Willdenow) Lindley, Small White Fringed Orchid. Seepages, sandhill-pocosin ecotones. July-September. NL (Newfoundland) west to MI and IL, south to GA. Following Brown (2006b), it seems best to recognize the two white-fringed orchids as separate species; they are morphologixcally distinctive, and where they co-occur their blooming time is offset. [= *Platanthera blephariglottis* (Willdenow) Lindley var. *blephariglottis* – FNA, K, L; < *Habenaria blephariglottis* (Willdenow) Hooker var. *blephariglottis* – RAB, X; < *Habenaria blephariglottis* var. *blephariglottis* – F (possibly misapplied); < *Habenaria blephariglottis* – GW; = *Blephariglottis blephariglottis* (Willdenow) Rydberg – S (possibly misapplied); < *Platanthera blephariglottis* (Willdenow) Lindley – W; = ***Blephariglottis albiflora*** Raf.]

Platanthera chapmanii (Small) Luer, Chapman's Orange-fringed Orchid. Pine savannas. S. GA and n. FL; e. TX. Previously generally confused with the hybrid between *P. ciliaris* × *cristata (P. ×chapmanii*); see Folsom (1984) and Brown (2004) for details. [= FNA, K, WH; = ***Blephariglottis chapmanii*** Small – S] {synonymy incomplete}

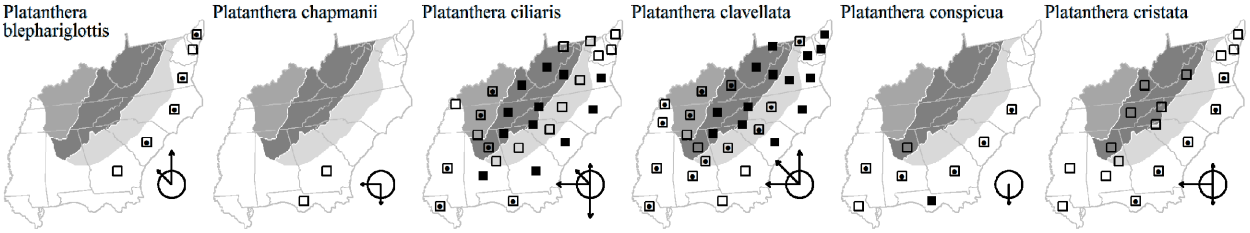
Platanthera ciliaris (Linnaeus) Lindley, Yellow Fringed Orchid. Savannas, moist roadbanks, meadows, pastures, bogs. July-September. NH, MI, IL, MO, and OK south to c. peninsular FL and TX. *P. ciliaris* is probably our most common and least habitat-specific *Platanthera*. [= FNA, K, L, W, WH; = *Habenaria ciliaris* (Linnaeus) R. Brown – RAB, C, F, G, GW, WV, X; = ***Blephariglottis ciliaris*** (Linnaeus) Rydberg – S]

Platanthera clavellata (Michaux) Luer, Small Green Wood Orchid. Seepages, bogs, swamps, other wet places. June-September. NL (Newfoundland) and ND south to Panhandle FL and TX. [= FNA, K, L, W, WH; = *Habenaria clavellata* (Michaux)

Sprengel – C, G, GW, WV, X; > *Habenaria clavellata* var. *wrightii* Olive – RAB; > *Habenaria clavellata* (Michaux) Sprengel var. *clavellata* – RAB, F; = ***Gymnadeniopsis clavellata*** (Michaux) Rydberg – S]

Platanthera conspicua (Nash) P.M. Brown, Large White Fringed Orchid. Savannas, seepages, sandhill-pocosin ecotones. July-September. NC south to c. peninsular FL, west to TX. Brown (2006b) and Sheviak in FNA (2002a) clarify the taxonomy of this complex; previous studies (such as Hardin 1961) used different characters, and interpreted the white-fringed orchid taxa differently. [= *Platanthera blephariglottis* (Willdenow) Lindley var. *conspicua* (Nash) Luer – FNA, K, L, WH; < *Habenaria blephariglottis* (Willdenow) Hooker var. *blephariglottis* – RAB, X; = *Habenaria blephariglottis* var. *conspicua* (Nash) Ames – C, F; < *Habenaria blephariglottis* – GW; = ***Blephariglottis conspicua*** (Nash) Small – S]

Platanthera cristata (Michaux) Lindley, Crested Fringed Orchid, Golden Fringed Orchid. Savannas, bogs, moist roadsides. June-September. *P. cristata* is more limited to the Coastal Plain than the related *P. ciliaris*, ranging from s. MA south to FL and west to TX, and also inland in KY, TN, AR, SC, and NC. [= FNA, K, L, W, WH; = *Habenaria cristata* (Michaux) R. Brown – RAB, C, F, G, GW, X; = ***Blephariglottis cristata*** (Michaux) Rafinesque – S]



Platanthera fissa Lindley, Purple Fringeless Orchid, Purple Spire Orchid, Pride-of-the-peak. Bogs, seepages, moist forests, moist meadows. June-October. NJ, s. PA, OH, c. IL, and se. MO south to nw. SC, n. GA, n. AL, c. MS, and c. AR. See Spooner & Shelly (1983) for a review of information about this species. [= *Platanthera peramoena* (A. Gray) A. Gray – FNA, K, L, W; = *Habenaria peramoena* A. Gray – RAB, C, F, G, GW, X; = *Blephariglottis peramoena* (A. Gray) Rydberg – S; = "***Blephariglottis fissa***" comb. nov.]

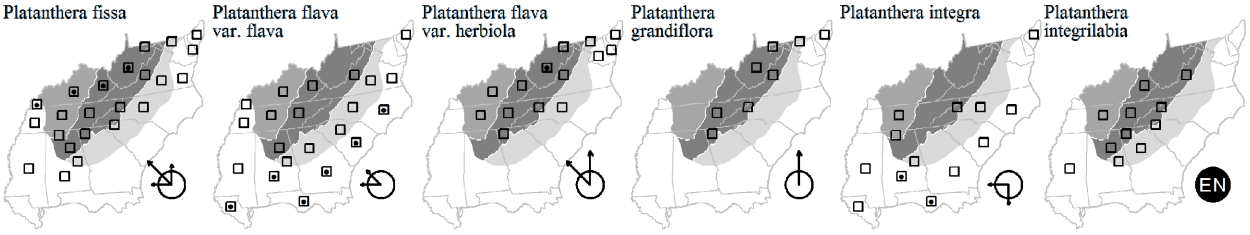
Platanthera flava (Linnaeus) Lindley *var.* ***flava***, Southern Rein Orchid, Southern Gypsy-spike. Shaded wet places, such as swampy forests. March-September. VA, IN, IL, MO, and OK, south to c. peninsular FL and TX; remarkably disjunct in s. NS, where it occurs associated with other disjuncts from the Southeastern Coastal Plain. See Homoya (1993) for additional discussion of the two varieties of *P. flava*. [= FNA, K, L; = *Habenaria flava* (Linnaeus) R. Brown var. *flava* – RAB, C, F, G, X; < *Habenaria flava* – GW; > *Perularia scutellata* (Nuttall) Small – S; > *Perularia bidentata* (Elliott) Small – S]

Platanthera flava (Linnaeus) Lindley *var.* ***herbiola*** (R. Brown) Luer, Tubercled Rein Orchid, Northern Gypsy-spike. Bogs, seepages. May-September. NS, QC, and MN south to NC, GA, TN, and MO. See Homoya (1993) for additional discussion of the two varieties of *P. flava*; he suggests that specific status may be warranted. [= FNA, K, L, W; = *Habenaria flava* (Linnaeus) R. Brown var. *herbiola* (R. Brown) Ames & Correll – RAB, C, F, G, WV, X; = *Perularia flava* (Linnaeus) Farwell – S, misapplied]

Platanthera grandiflora (Bigelow) Lindley, Large Purple Fringed Orchid, Plume-royal. Bogs, seepages, moist places at high elevations. June-early July. NL (Newfoundland) and ON south to NJ, OH, and MI, and south in the mountains to w. NC and ne. GA. Blooming 3-4 weeks earlier than either *P. psycodes* and *P. shriveri* when they grow in proximity. If *Orchis fimbriata* Aiton is conspecific, the correct name is *P. fimbriata* (Aiton) Lindley. [< FNA, K, L, W; < *Habenaria psycodes* (Linnaeus) Sprengel var. *grandiflora* (Bigelow) A. Gray – RAB, C, G, X; < *Habenaria fimbriata* (Aiton) R. Brown – F, WV; < ***Blephariglottis grandiflora*** (Bigelow) Rydberg – S; = ***Platanthera fimbriata*** (Aiton) Lindley]

Platanthera integra (Nuttall) A. Gray ex Beck, Golden Fringeless Orchid, Yellow Fringeless Orchid. Savannas in the Coastal Plain, bogs in the Mountains and Piedmont. July-September. Essentially endemic to the Southeastern Coastal Plain, ranging from s. NJ south to FL and west to se. TX, with disjunct occurrences in TN (Eastern Highland Rim) and in bogs at low elevations of the Blue Ridge of NC. It is apparently now extirpated in the Mountains and Piedmont of NC. [= FNA, K, L, WH; = *Habenaria integra* (Nuttall) Sprengel – RAB, C, F, G, GW, X; = ***Gymnadeniopsis integra*** (Nuttall) Rydberg – S]

Platanthera integrilabia (Correll) Luer, Monkey-face Orchid, White Fringeless Orchid. Bogs, red maple-gum swamps, seeps and streambanks. July-September. Endemic to KY, e. TN, sw. VA (Lee County, documentation uncertain), w. NC, nw. SC, n. GA, n. AL, and n. MS, primarily in the Cumberland Plateau. See Zettler, Ahuja, & McInnis (1996) for a discussion of pollination. [= FNA, K, L, W; = *Habenaria blephariglottis* (Willdenow) Hooker var. *integrilabia* Correll – RAB, F, X; = *Habenaria correlliana* Cronquist – C; *? Habenaria blephariglottis* var. *holopetala* (Lindley) A. Gray; = ***Blephariglottis integrilabia*** (Correll) Schrenk; =? ***Blephariglottis longicornis*** Rafinesque]



Platanthera lacera (Michaux) G. Don, Green Fringed Orchid, Ragged Fringed Orchid, Ragged Orchid. Swamps, bogs, seepages. June-August. Widespread in ne. North America, south to SC, GA, AL, AR, and OK. Var. *terrae-novae* (Fernald) Luer is not distinct, and is based on hybrid swarms involving *P. lacera* and *P. psycodes* (Catling 1997). [= FNA, K, W; = *Habenaria lacera* (Michaux) R. Brown – RAB, C, G, GW, WV, X; > *Habenaria lacera* var. *lacera* – F; = ***Blephariglottis lacera*** (Michaux) Farwell – S; > *Platanthera lacera* var. *lacera* – L]

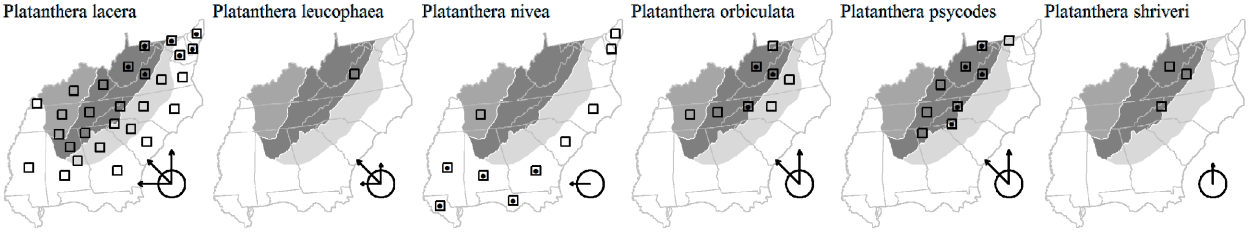
Platanthera leucophaea (Nuttall) Lindley, Prairie Fringed Orchid. Damp calcareous meadows. May-July. ME west to NE, south to w. VA, nw. PA, c. OH, c. IN, IL, MO, and OK. [= FNA, K, W; = *Habenaria leucophaea* (Nuttall) A. Gray var. *leucophaea* – C; = *Habenaria leucophaea* (Nuttall) A. Gray – G, X; = ***Blephariglottis leucophaea*** (Nuttall) Farwell]

Platanthera nivea (Nuttall) Luer, Snowy Orchid, Bog-spike. Wet savannas. May-September. Essentially a Southeastern Coastal Plain endemic, *P. nivea* ranges from s. NJ and DE (at least formerly) south to FL and west to TX, disjunct in Coffee County, TN (Eastern Highland Rim). This species is even more irregular than most *Platanthera* in its flowering, whole populations sometimes not flowering for a number of years. The flowers are so white as to seem illuminated from within. This species was once locally abundant in the outer Coastal Plain of the Carolinas and further south; Correll (1950) describes "large colonies of this species which form a blanket of white over the landscape." Also see the picture in B.W. Wells' Natural Gardens of North Carolina. [= FNA, K, L; = *Habenaria nivea* (Nuttall) Sprengel – RAB, C, F, G, GW, WH, X; = ***Gymnadeniopsis nivea*** (Nuttall) Rydberg – S]

Platanthera orbiculata (Pursh) Lindley, Large Round-leaved Orchid, Dinner-plate Orchid. Moist hardwood forests, especially over amphibolite. June-September. NL (Newfoundland) and NL (Labrador) west to AK, south to PA (and in the mountains to NC and TN), OH, IN, MN, SD, and OR. Reddoch & Reddoch (1993) have shown that *P. orbiculata* differs from *P. macrophylla* at the species level. Pollination is by night-flying moths, likely noctuids. [= FNA; = *Habenaria orbiculata* (Pursh) Lindley – RAB, WV; = *Habenaria orbiculata* var. *orbiculata* – C, F; < *Habenaria orbiculata* – G, W, X (also see *P. macrophylla*); = *Platanthera orbiculata* var. *orbiculata* – K, L; = *Lysias orbiculata* (Pursh) Rydberg – S]

Platanthera psycodes (Linnaeus) Lindley, Small Purple Fringed Orchid, Butterfly Orchid. Northern hardwood forersts, other moist forests, seepages, bogs. June-August. NL (Newfoundland) and MB, south to n. GA, TN, and MO. [= FNA, K, L, W; = *Habenaria psycodes* (Linnaeus) Sprengel var. *psycodes* – RAB, C, G, X; = *Habenaria psycodes* – F, GW; = ***Blephariglottis psycodes*** (Linnaeus) Rydberg – S]

Platanthera shriveri P.M. Brown, Shriver's Purple Fringed Orchid, Shriver's Frilly Orchid. Seepages, northern hardwoods forests, roadbanks. Mid July-August. Sw. PA south through e WV and w. VA to nw. NC. See Brown, Smith, & Shriver (2008) for additional information. [< FNA, K, L, W; < *Habenaria psycodes* (Linnaeus) Sprengel var. *grandiflora* (Bigelow) A. Gray – RAB, C, G, X; < *Habenaria fimbriata* (Aiton) R. Brown – F; < *Blephariglottis grandiflora* (Bigelow) Rydberg – S; = ***Blephariglottis shriveri*** (P.M. Brown) Baumbach & Löckel]



Platythelys Garay (Jug Orchid)

A genus of about 9 species, of the New World tropics and subtropics. References: Ackerman in FNA (2002a); Correll (1950)=X.

Platythelys querceticola (Lindley) Garay, Jug Orchid. Wet hammocks and swamps. Late July-September. N. FL south to s. FL, west to AL(?), MS, and LA; Mexico; West Indies; Central America; South America. [= FNA, K; = *Erythrodes querceticola* (Lindley) Ames – L, X; = *Physurus querceticola* Lindley – S; ? *P. latifolia* (Linnaeus) Garay & Ormerod – WH] {add to genus key}

Pogonia Antoine Laurent de Jussieu 1789 (Rose Pogonia, Pogonia)

A genus of 3 species, of temperate e. North America and e. Asia. Cameron & Chase (1999) indicate that molecular analyses indicate that there may be merit in the traditional broad circumscription of *Pogonia* to include *Isotria* and N. American taxa of *Cleistes*; alternatively, North American "*Cleistes*" can be segregated as *Cleistesiopsis*, as done here. References: Catling & Sheviak in FNA (2002a); Correll (1950)=X.

Pogonia ophioglossoides (Linnaeus) Ker-Gawler, Rose Pogonia, Snakemouth, Beardflower, Ettercap, Addermouth. Savannas, bogs, especially in open peaty or gravelly situations. March-June. NL (Newfoundland) and MB south to s. FL and TX. [= RAB, C, FNA, G, GW, K, L, S, W, WH, WV, X; > *P. ophioglossoides* var. *ophioglossoides* – F]

Ponthieva R. Brown 1813 (Shadow Witch)

A genus of about 30-53 species, of tropical and warm temperate America. References: Ackerman in FNA (2002a); Pridgeon et al. (1999b); Correll (1950)=X.

Ponthieva racemosa (Walter) C. Mohr, Shadow Witch. Bottomlands, floodplains, moist ravines, nearly always over calcareous rock ("marl" or coquina limestone). September-October. Se. VA south to s. FL and west to se. TX; disjunct in the Eastern Highland Rim, TN, and south into Central and South America. The basal rosette of leaves, white (suffused with green) flowers in fall, and habitat are distinctive. [= RAB, C, F, FNA, G, GW, K, S, WH, X; = *P. racemosa* var. *racemosa* – L]

Pteroglossaspis Reichenbach filius 1878 (Wild Coco)

A genus of 7-10 species, of s. North America, Cuba, Colombia, and tropical Africa (Romero-González in FNA 2002). References: Romero-González in FNA (2002a); Correll (1950)=X.

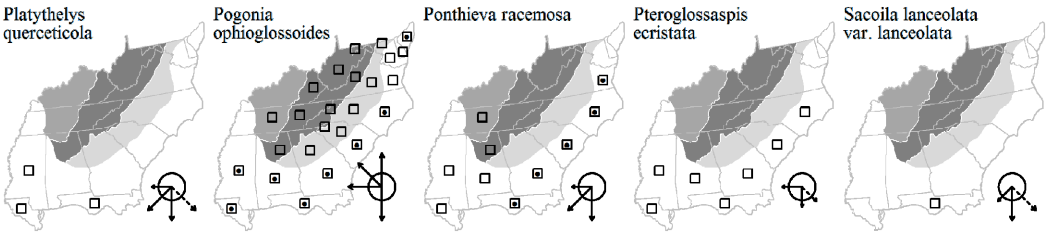
Identification notes: The long (to 7 dm), plicate leaves are distinctive among our orchids. Small individuals can be mistaken for *Calopogon* when not in bloom. *Pteroglossaspis* differs, however, in having the stem covered from node to node by a succession of sheaths (vs. the sheaths much shorter) and in having the leaves 2-3 on a separate shoot emerging from the corm before the bloom-stalk (vs. leaf 1, on the bloom-stalk).

Pteroglossaspis ecristata (Fernald) Rolfe, Spiked Medusa, Smooth-lipped Eulophia. Mesic pinelands with blackjack oak, other sandhills and dry-mesic to mesic longleaf pinelands. June-September; July-November. Se. NC south to FL, west to LA; West Indies (Cuba). One of the rarest orchids in our region. [= FNA, K, WH; = *Eulophia ecristata* (Fernald) Ames – RAB, L, X; = *Triorchos ecristatus* (Fernald) Small – S]

Sacoila Rafinesque 1838

A genus of ca. 10 species, of the tropics and subtropics. References: Brown & Catling in FNA (2002); Correll (1950)=X.

Sacoila lanceolata (Aublet) Garay *var.* ***lanceolata***. Pine flatwoods, road shoulders. April-June. Ne. and Panhandle FL south to s. FL; West Indies, Mexico, Central America, South America. [= FNA, WH; = *Stenorrhynchos lanceolata* (Aublet) L.C. Richard var. *lanceolata* – K; = *Spiranthes lanceolata* (Aublet) Léon var. *lanceolata* – L; < *Stenorrhynchos orchioides* (Swartz) L.C. Richard – S] {add to genus key; add X to synonymy}



Spiranthes L.C. Richard 1817 (Ladies'-tresses, Pearl-twist, Spiral Orchid)

A genus of about 30-40 species, mainly north temperate, but with species scattered in other areas. The *Spiranthes* flora of our region is still rather poorly understood, and the treatment here will undoubtedly change further. References: Sheviak & Brown in FNA (2002a); Luer (1975); Sheviak (1991); Pridgeon et al. (1999c). Key adapted largely from Sheviak & Brown in FNA (2002a); Correll (1950)=X. [also see *Sacoila*]

Identification notes: Flowering plants are necessary for identification of the species.

1 Rachis of inflorescence with all hairs **not** glandular, tapering to a pointed tip; [flowering March-September] ..... ***S. vernalis***
1 Rachis of inflorescence **either** glabrous **or** with some or all hairs gland-tipped, capitate or clavate.
  2 Lip bright yellow or orange-yellow, with greenish veins; sepals and petals pure white; [flowering May-July] ..... ***S. lucida***
  2 Lip either white, or lip yellowish and lacking greenish veins; sepals and petals creamy, ivory, yellow, or greenish; [collectively flowering February-December].
    3 Lip with conspicuous, terminally widened, greenish (rarely yellowish) diverging veins extending nearly to the tip; [flowering March-July].
      4 Flowers white, with green veins; sepals appressed; flowers 6-9 mm long ..... ***S. praecox***
      4 Flowers creamy green, with darker green veins; flowers 10-17 mm long..... ***S. sylvatica***
    3 Lip lacking conspicuous, terminally widened, greenish diverging veins (veins not terminally widened); [collectively flowering February-December].
      5 Rachis glabrous; flowers gaping from near middle, the tubular portion < 3 mm long; lip pure white; [flowering June-September] ..... ***S. tuberosa***
      5 Rachis pubescent or glabrous; flowers gaping only from beyond the middle, the tubular portion > 3 mm long; lip white, creamy, yellow, or centrally green; [collectively flowering February-December].
        6 Inflorescence with 3 or 4 flowers per cycle of spiral, the spiral usually tight and obscure, but then with 3 or 4 secondary ranks of flowers evident; [collectively flowering August-December] ..... **Key A**
        6 Inflorescence with 5 or more flowers per cycle of spiral, the spiral usually open and obvious; [collectively flowering February-December] ..... **Key B**

Key A

1 Petals ca. 6 mm long; lower portion of stem with recurved-spreading leaves
  2 Rostellum and viscidium absent; sepals 3.5-5 mm long ..... ***S. ovalis*** *var.* ***erostellata***

2 Rostellum and viscidium present; sepals 4-6.1 mm long ..... ***S. ovalis*** *var.* ***ovalis***
1 Petals 7.5 mm long or longer; leaves wholly basal, or lower portion of stem with recurved-spreading blades, or leaves absent at flowering.
3 Lip only slightly or not at all differentiated from the petals; buds often failing to open (but setting seed through agamospermy); column normal, or abnormal or aborted; leaves usually absent at flowering ..... ***S. cernua***
3 Lip clearly differentiated from petals; buds opening into normal flowers; column normal; leaves present or absent at flowering.
4 Basal callosity of the lip relatively short and conic,a wide as high, and usually < 1 mm long; lateral sepals free and spreading, often over the top of the flower; leaves absent at flowering; [of dry calcareous barrens of the Ridge and Valley and westward, in the Ridge and Valley of sw. VA and nw. GA, and westward] ..... ***S. magnicamporum***
4 Basal callosity of the lip 1-2 mm long; lateral sepals more or less appressed (very rarely spreading over the top of the flower); leaves present at flowering; [of various dry to wet sites, collectively widespread in our area].
5 Upper margin of the lateral sepals obviously separated from the adjacent margin of the dorsal sepal, the separation abrupt at the base (commonly by about 1 mm); lip strongly curving from the claw (the resulting angle 20-60 degrees), cuneate at the base; perianth creamy, yellowish, or greenish white; [of upland, dry to mesic sites] ..... ***S. ochroleuca***
5 Upper margin of the lateral sepals touching (or nearly so) the adjacent margin of the dorsal sepal, or only gradually separated with distance from the base; lip not strongly curving from the claw (angle < 30 degrees), cordate to truncate at the base; perianth white to creamy or ivory, the center of the lip ivory to pale yellowish or rarely greenish; [primarily of wet sites, such as bogs, fens, marshes, bottonland swamps].
6 Plants to about 50 cm tall, not colonial; leaves comparatively slender, flaccid-membranaceous with thickened midrib, the petioles of the basal leaves < 6 mm wide; leaves wholly basal or the lower sheaths with ascending-spreading blades; perianth usually 8-11 mm long; lip membranaceous to fleshy, < 7 mm long; [widespread in our area] ..... ***S. cernua***
6 Plants to over 100 cm tall, forming clonal colonies via stolons; leaves broad, stiffly aerenchymatous-thickened, the petioles of basal leaves 7 mm or more wide; leaves up the stem, with spreading recurved blades on the lower cauline sheaths, frequently also on the upper, with leaves extending to the inflorescence; perianth 10-15 mm long (sometimes smaller in depauperate plants); lip fleshy, usually over 7 mm long; [of the Coastal Plain] ..... ***S. odorata***

Key B

1 Lateral sepals widely diverging from the base, 8-10 mm long; lip dilated at base, oblong toward tip, yellow centrally; inflorescence secund to twisted usually only a half-turn from bottom to top; [flowering late October-December] ..... ***S. longilabris***
1 Lateral sepals spreading to appressed, not widely diverging, 3.8-10 mm long; lip ovate to oblong-quadrate, lacking a distinct basal dilation, white or creamy centrally; inflorescence usually with several spiral cycles (rarely nearly secund); [flowering February-November].
2 Lip with lacerate-dentate tip; leaves usually linear, > 30× as long as wide, persistent and present at flowering; [flowering May-August] ..... ***S. laciniata***
2 Lip with undulate to crisped tip; leaves lanceolate to ovate or obovate, < 30× as long as wide, either persistent and present at flowering, or withering prior to flowering.
3 Flowers comparatively large and stout, the perianth 5-10 mm long, white to yellowish, the lip often darker centrally but not green or greenish yellow; leaves ascending, relatively slender, not ovate or obovate, present at flowering; rachis conspicuously and densely glandular-pubescent; [flowering August-November] ..... ***S. cernua***
3 Flowers comparatively small and slender, the perianth usually < 5.5 mm long; leaves strictly basal, spreading and ovate to obovate or oblanceolate; rachis glabrous or densely but minutely glandular-pubescent; [flowering February-September].
4 Rachis densely pubescent; flowers yellowish to pale greenish yellow, the lip yellow centrally; [flowering February-April]; [of s. SC southward and westward] ..... ***S. brevilabris***
4 Rachis glabrous or sparsely and minutely pubescent; flowers yellowish to white, the lip yellowish or green centrally; [flowering February-September]; [collectively widespread in our area].
5 Flowers yellowish to pale greenish yellow; lip yellow centrally ..... ***S. floridana***
5 Flowers white, lip green centrally.
6 Leaves oblanceolate, withering at anthesis; lateral sepals spatulate, green at base; flowering February-May ..... ***S. eatonii***
6 Leaves ovate to obovate or elliptic, spreading, present or absent at anthesis; lateral sepals acuminate, white throughout; flowering July-September.
7 Flowers densely arranged on the spike (ratio of spike length in mm: flower number < 2.3); entire plant essentially glabrous; leaves usually absent at anthesis; [flowering earlier, mostly July] ..... ***S. lacera*** *var.* ***gracilis***
7 Flowers laxly arranged on spike (ratio of spike length in mm: flower number = or > 2.3); inflorescence capitate-pubescent; leaves usually persisting through anthesis; [flowering later, mostly August-September] ..... ***S. lacera*** *var.* ***lacera***

Spiranthes brevilabris Lindley, Short-lipped Ladies'-tresses. Pine savannas. Late February-April. Se. SC south to s. FL, west to se. TX. [= FNA, K, WH; = *S. gracilis* (Bigelow) Beck var. *brevilabris* (Lindley) Correll – GW; = *S. brevilabris* Lindley var. *brevilabris* – L]

Spiranthes cernua (Linnaeus) L.C. Richard, Nodding Ladies'-tresses. Bogs, swamps, ditches, usually in acidic, sphagnous situations. July-November. Widespread in e. North America. [= FNA, G, K, L, W, WH, WV; = *S. cernua* var. *cernua* – RAB, C, F, GW, L, X; < *S. cernua* var. *cernua* – F, X; = *Ibidium cernuum* (Linnaeus) House – S]

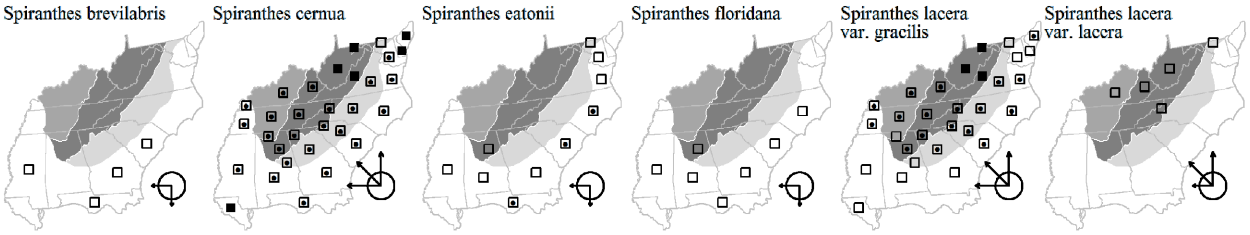
Spiranthes eatonii Ames ex P.M. Brown, Eaton's Ladies'-tresses. Pine savannas, dry to moist pine flatwoods. February-May. A Southeastern Coastal Plain endemic: se. VA south to s. FL, west to se. TX. Apparently previously confused with *S. lacera*, *S. floridana*, *S. brevilabris*, and *S. tuberosa*, but distinctive in the combination of spring blooming season, white flowers, and basal, narrowly oblanceolate leaves (Brown 1999). [= FNA, K, WH]

Spiranthes floridana (Wherry) Cory, Florida Ladies'-tresses. Wet savannas, other moist sites. April-May. A Southeastern Coastal Plain endemic: se. NC south to c. peninsular FL and west to TX, a Southeastern Coastal Plain endemic. [= FNA, K, WH; = *S. brevilabris* Lindley var. *floridana* (Wherry) Luer – L; = *S. gracilis* (Bigelow) Beck var. *floridana* (Wherry) Correll – RAB, GW, X; = *Ibidium floridanum* Wherry – S]

Spiranthes lacera (Rafinesque) Rafinesque *var.* ***gracilis*** (Bigelow) Luer, Southern Slender Ladies'-tresses. Fields, meadows, pastures, woodlands. August-September. NS, MI, WI, and KS south to GA and TX. [= C, FNA, K, L, W; = *S. gracilis*

(Bigelow) Beck var. *gracilis* – RAB, GW, X; = *S. gracilis* – F, WV; < *S. gracilis* – G (apparently including *S. lacera* var. *lacera*); = *Ibidium gracile* (Bigelow) House – S]

Spiranthes lacera (Rafinesque) Rafinesque *var.* ***lacera***, Northern Slender Ladies'-tresses. Clearings, openings. July. NS and NB west to SK, south to sw. NC, w. VA, TN, and MO. The occurrence of this species in NC is documented by a specimen at DUKE, collected at 5200 feet elevation on Tusquitee bald. [= C, FNA, K, L, W; = *S. lacera* – F (sensu stricto); < *S. gracilis* – G; < *S. gracilis* var. *gracilis* – X]



Spiranthes laciniata (Small) Ames, Lace-lip Ladies'-tresses. Pond cypress depressions and savannas, swamps. May-August. A Southeastern Coastal plain endemic: NJ south to s. FL and west to se. TX. [= RAB, C, FNA, K, L, WH, X; = *S. ×laciniata* – F, GW; = *Ibidium laciniatum* (Small) House – S]

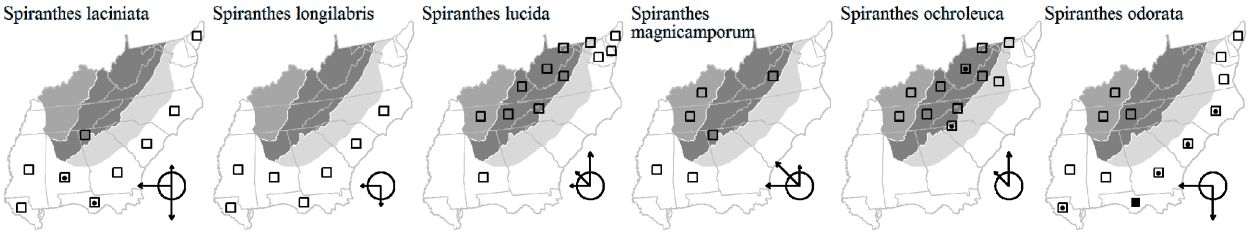
Spiranthes longilabris Lindley, Giant Spiral Orchid. Wet pine savannas. Late October-December. A Southeastern Coastal Plain endemic: se. NC south to s. FL and west to e. TX. [= RAB, FNA, GW, K, L, WH, X; = *Ibidium longilabre* (Lindley) House – S]

Spiranthes lucida (H.H. Eaton) Ames, Shining Ladies'-tresses. Sunny seepage over amphibolite or other basic rock, moist banks and shores. June. Widespread in ne. United States, south to NC, e. TN, sc. TN (Chester et al. 1993), c. AL, MO, and KS. The species was reported for NC by Fernald (1950) and by Small (1933), but was not treated by RAB; its occurrence in NC was verified in 1992 by its discovery in a seepage area in Ashe County. [= C, F, FNA, G, K, L, W, WV, X; = *Ibidium plantagineum* (Rafinesque) House – S]

Spiranthes magnicamporum Sheviak, Great Plains Ladies'-tresses. Grassy barrens and glades over limestone. Primarily in the Great Plains, from ND south to TX, east (often as widely disjunct populations) to sw. ON, se. PA, sw. VA (Ludwig 1999), KY, w. TN (Jones 2006), and nw. GA. [= C, FNA, K, L; < *S. cernua* – G; < *S. cernua* var. *cernua* – F, X]

Spiranthes ochroleuca (Rydberg) Rydberg, Yellow Nodding Ladies'-tresses. Meadows and pastures at moderate to high elevations, up to at least 1500m in elevation. September-October. Largely northeastern, extending south in the mountains to NC. See Sheviak & Catling (1980) and Catling (1983a) for further information on this species. [= FNA, K, L, W; = *S. cernua* var. *ochroleuca* (Rydberg) Ames – C, F, X; = *Ibidium ochroleucum* (Rydberg) House – S]

Spiranthes odorata (Nuttall) Lindley, Fragrant Ladies'-tresses, Marsh Ladies'-tresses. Swamps and marshes. September-November. A Southeastern Coastal Plain endemic: se. VA south to FL and west to se. TX. [= F, FNA, G, K, L, WH; = *S. cernua* var. *odorata* (Nuttall) Correll – RAB, C, GW, L, X; = *Ibidium odoratum* (Nuttall) House – S]



Spiranthes ovalis Lindley *var.* ***erostellata*** Catling, Oval Ladies'-tresses. Swamp forests, bottomland forests, hammocks, ravine forests. August-November. Var. *erostellata* is fairly widespread in se. North America, ranging from sc. PA, MI, and IL south to Panhandle FL, s. MS, and s. LA. Var. *ovalis* is limited to AR, LA, and TX, differing in having a viscidium and rostellum. See Catling (1983b) for further information about this variety and its biology. [= C, FNA, K, W, WH; < *S. ovalis* – RAB, F, G, GW, L, WV, X; < *Ibidium ovale* (Lindley) House – S; ? *S. montana* Rafinesque]

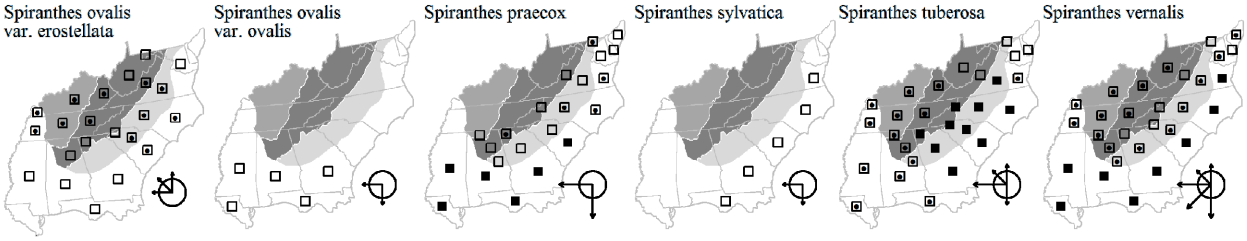
Spiranthes ovalis Lindley *var.* ***ovalis***, Oval Ladies'-tresses. Swamp forests, mesic ravines. October-November. GA, TN, AR, and TX, south to n. peninsular FL and LA. [= FNA, K, WH; < *S. ovalis* – GW, L, X; < *Ibidium ovale* (Lindley) House – S]

Spiranthes praecox (Walter) S. Watson, Grass-leaved Ladies'-tresses, Giant Ladies'-tresses. Savannas, swamps, bogs. March-July. A Southeastern Coastal Plain endemic: NJ south to s. FL and west to TX. [= WH; < *S. praecox* – RAB, C, F, FNA, G, GW, K, L, W, X (also see *S. sylvatica*); < *Ibidium praecox* (Walter) House – S (also see *S. sylvatica*)]

Spiranthes sylvatica P.M. Brown, Woodland Ladies'-tresses, Pale Green Ladies'-tresses. Live oak hammocks, other woodlands. Late March-early May. VA south to c. peninsular FL, west to e. TX. [= WH; < *S. praecox* – RAB, C, F, FNA, G, GW, K, L, X; < *Ibidium praecox* (Walter) House – S]

Spiranthes tuberosa Rafinesque, Little Ladies'-tresses, Little Pearl-twist. In a wide variety of habitats, especially relatively well-drained woodlands and fields, sandhills, dry hammocks, dry pine flatwoods. June-September. MA, OH, and MO south to c. peninsular FL and TX. [= C, FNA, G, K, L, W, WH, WV; > *S. grayi* Ames – RAB, L, X; > *S. tuberosa* var. *grayi* (Ames) Fernald – F; > *S. tuberosa* var. *tuberosa* – F; = *Ibidium beckii* (Lindley) House – S, misapplied]

Spiranthes vernalis Engelmann & A. Gray, Spring Ladies'-tresses. Savannas, bogs, marshes, fairly dry fields. March-July (-early September in the mountains). MA to s. FL and west to TX and SD, also in Mexico and Central America. [= RAB, C, F, FNA, G, GW, K, L, W, WH, X; = *Ibidium vernale* (Engelmann & A. Gray) House – S]



Tipularia Nuttall 1818 (Cranefly Orchid)

A genus of 3 species; the other species of the genus are e. Asian (1 in Japan and 1 in the Himalayas) (Catling & Sheviak in FNA 2002). References: Catling & Sheviak in FNA (2002a); Correll (1950)=X.

Identification notes: The leaves are present during the winter, withering before the flowering stalk appears, the plant thus occasionally mistaken for one of the saprophytic orchids. The leaves are usually purple underneath, a characteristic shared with *Aplectrum*, but *Tipularia* leaves are ovate, < 10 cm long, and are not notably plicate along the veins (vs. *Aplectrum*, with leaves narrowly elliptic, 10-20 cm long, and notably plicate along the very prominent, white, cartilaginous veins).

Tipularia discolor (Pursh) Nuttall, Cranefly Orchid. In a wide variety of mesic to rather dry forests. July-September. Se. MA, s. NY, OH, IN, and s. MI south to n. peninsular FL and TX. Along with *Goodyera pubescens*, *Tipularia* is one of the commonest orchids in e. North America. [= RAB, C, F, FNA, G, K, L, W, WH, WV, X; = *T. unifolia* (Muhlenberg) Britton, Sterns, & Poggenburg – S]

Triphora Nuttall 1818 (Three Birds Orchid)

A genus of about 25 species, of e. North America, the West Indies, and Central and South America (Medley in FNA 2002). References: Medley in FNA (2002a); Brown & Pike (2006)=Z; Correll (1950)=X.

1 Flowers yellow, erect, not opening fully, the lip uppermost ..... ***T. rickettii***
1 Flowers pink to white, nodding, opening fully, the lip lowermost..... ***T. trianthophoros*** *var.* ***trianthophoros***

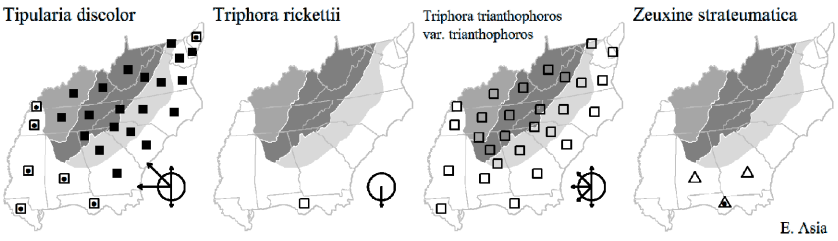
Triphora rickettii Luer. Upland hardwood hammocks. Late July-August. Ne. FL (Columbia County) south into wc. Peninsular FL. Sometimes treated as a disjunct component of the Mexican *T. yucatanensis*. [= L, WH, X; < *Triphora yucatanensis* Ames – FNA, K]

Triphora trianthophoros (Swartz) Rydberg *var.* ***trianthophoros***, Three Birds Orchid, Nodding Pogonia, Nodding Ettercap. Humid forests and swamps, rhododendron thickets, especially on rotten logs or on humus. July-September. The species is widespread (but scattered) in e. North America, and south into Central America. Var. *trianthophoros* occurs from ME and ON west to WI, south to c. peninsular FL and e. TX; disjunct in nc. Mexico; var. *mexicana* (S. Watson) P.M. Brown occurs from Mexico south to Central America. The recently named var. *texensis* P.M. Brown & R.B. Pike needs additional evaluation. The flowers are extremely ephemeral, making the species very difficult to locate. The correct spelling of the epithet is "*trianthophoros*." [= *Triphora trianthophora* (Swartz) Rydberg var. *trianthophora* – Z, orthographic variant; = *T. trianthophora* ssp. *trianthophora* – FNA, orthographic variant; < *T. trianthophora* – RAB, C, F, G, GW, K, L, S, W, WV, X; < *T. trianthophoros* – WH]

Zeuxine Lindley 1826 (Soldier Orchid)

A genus of about 26 species, of tropical and subtropical Old World (introduced elsewhere). References: Ackerman in FNA (2002a); Correll (1950)=X.

* ***Zeuxine strateumatica*** (Linnaeus) Schlechter, Lawn Orchid, Soldier Orchid. Lawns; native of Asia. [= FNA, GW, K, L, WH] {add X to synonymy}



67. HYPOXIDACEAE R. Brown 1814 (Stargrass Family) [in ASPARAGALES]

A family of about 7-9 genera and 100-220 species, herbs, subcosmopolitan (though not well distributed in the northern hemisphere of the Old World, and especially diverse in South Africa). The recognition of Hypoxidaceae at the family level is supported by a variety of authors, on morphologic and molecular grounds (see Judd 2000 for summary). References: Nordal in Kubitzki (1998a); Herndon in FNA (2002a); Judd (2000).

Hypoxis Linnaeus 1759 (Stargrass)

A genus of about 50-150 species, herbs, of tropical and warm temperate regions of the Old and New World, with a center of diversity in South Africa. See Zona et al. (2009) for detailed images of the seedcoat character states of the species. References: Judd (2000)=Z; Herndon in FNA (2002a); Nordal in Kubitzki (1998a); Zona et al. (2009). Key based on Herndon in FNA (2002a).

1 Leaves glabrous, or with a few trichomes near the base; seeds black.
  2 Leaves filiform, 0.3-1.2 mm wide, stiff; seeds pebbled (the exposed portion of each cell rounded); floral bracts 1-7 (-12) mm, > 2× as long as the pedicels; ovaries densely pubescent; [of Coastal Plain pinelands]..... ***H. juncea***
  2 Leaves over 2 mm wide, soft and flexible; seeds coarsely muricate (the exposed portion of each cell pointed-conical); floral bracts (1-) 2-20 (-80) mm; ovaries sparsely to densely pubescent; [collectively widespread].
    3 Ovaries longer than broad, cylindric, with scattered trichomes; floral bracts (3-) 5-20 (-80) mm long; pedicels usually shorter than the floral bracts; tepals equaling or shorter than ovaries; [of Coastal Plain bottomlands] ..... ***H. curtissii***
    3 Ovaries as broad as long or nearly so, deltate, densely pubescent; floral bracts (1-) 2-10 (-17) mm long; pedicels usually >2× as long as the floral bracts; tepals much longer than ovaries; [widespread] ..... ***H. hirsuta***
1 Leaves evenly pubescent, at least near the base; seeds black or brown.
  4 Pedicels usually >2× as long as the bracts; seeds black; [collectively widespread].
    5 Leaves flattened, > 1 mm wide; seeds coarsely muricate (the exposed portion of each cell pointed-conical); [widespread] ..... ***H. hirsuta***
    5 Leaves filiform, 0.3-1.2 mm wide; seeds pebbled (the exposed portion of each cell rounded); [of Coastal Plain pinelands] ..... ***H. juncea***
  4 Pedicels usually < 2× as long as subtending bracts; seeds black or brown; [of Coastal Plain pinelands].
    6 Anthers > 2 mm long; tepals longer than the pedicels; floral bracts longer than the pedicels; seeds black, pebbled with round pebbling (the exposed portion of each cell rounded)..... ***H. rigida***
    6 Anthers < 2 mm long; tepals shorter than to longer than the pedicels; floral bracts shorter than to longer than the pedicels; seeds brown, with detached, wrinkled cuticle.
      7 Tepals 1.5-2× as long as ovaries; seed coats iridescent ..... ***H. sessilis***
      7 Tepals ca. 1 (-1.5)× the length of the ovaries; seed coats not iridescent ..... ***H. wrightii***

Hypoxis curtissii Rose in Small, Swamp Stargrass. Swamp forests, alluvial forests, water courses, wet hammocks. March-June; May-July. E. NC south to c. peninsular FL, west to e. TX. [= FNA, K, WH, Z; = *H. hirsuta* (Linnaeus) Coville var. *leptocarpa* (Engelmann & A. Gray) Fernald – RAB; < *H. hirsuta* – C, G; = *H. leptocarpa* (Engelmann & A. Gray) Small – GW, S]

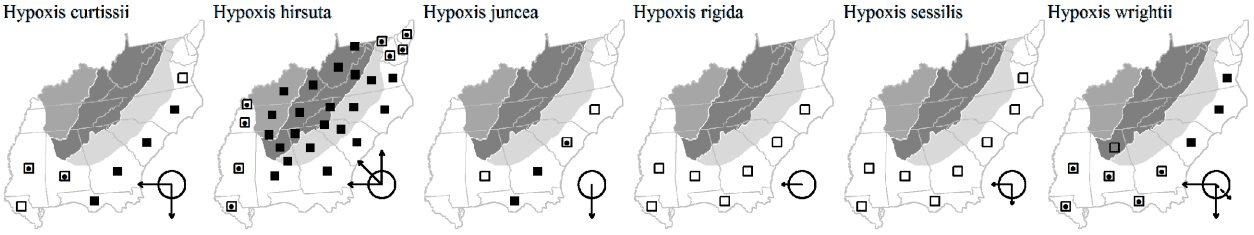
Hypoxis hirsuta (Linnaeus) Coville, Common Stargrass. In a wide variety of dry to moist forests. March-June; May-July. S. ME west to SK and ND, south to GA and e. TX. [= FNA, GW, S, WV, Z; = *H. hirsuta* var. *hirsuta* – RAB; < *H. hirsuta* – C, G, K]

Hypoxis juncea Sm., Fringed Stargrass. Wet pine savannas. April-May (-later, especially in response to fire); May-June.(-later, especially in response to fire). Se. NC south to s. FL, west to s. AL. [= RAB, FNA, GW, K, WH, S, Z]

Hypoxis rigida Chapman, Savanna Stargrass. Wet pine savannas. April (-later, especially in response to fire); May.(-later, especially in response to fire). Se. NC south to Panhandle FL, west to e. TX. [= RAB, FNA, GW, S, WH, Z; < *H. hirsuta* – K]

Hypoxis sessilis Linnaeus, Glossy-seed Stargrass. Wet pine savannas. April (-later, especially in response to fire); May (-later, especially in response to fire). NC south to s. FL, west to e. TX, s. AR, and se. OK. [= RAB, FNA, GW, K, S, WH, Z; > *H. longii* Fernald – C, F, G; > *H. sessilis* – C, F, G]

Hypoxis wrightii (Baker) Brackett, Bristleseed Stargrass. Wet pine savannas. March-April (-later, especially in response to fire); April-May (-later, especially in response to fire). Se. VA south to s. FL, west to TX; disjunct in the West Indies (Cuba, Bahamas, Jamaica, Hispaniola, Puerto Rico). [= FNA, K, Z; = *H. micrantha* Pollard – RAB, C, F, G, GW, S, misapplied]



71. IRIDACEAE A.L. de Jussieu 1789 (Iris Family) [in ASPARAGALES]

A family of about 65-82 genera and 1700-1810 species, herbs, of cosmopolitan distribution (most diverse in s. Africa). References: Goldblatt in FNA (2002a); Goldblatt, Manning, & Rudall in Kubitzki (1998a).

1 Inflorescence a spike or panicle of spikes; plants from corms; flowers slightly zygomorphic.
  2 Stem usually branched, the inflorescence appearing paniculate; tepals orange to red ..... ***Crocosmia***
  2 Stem unbranched, the inflorescence a spike; tepals any of a wide range of colors (including orange and red)
    3 Inflorescence bent at its base, the inflorescence axis more-or-less horizontal, the flowers facing upwards..... ***Freesia***
    3 Inflorescence erect, the flowers facing outwards..... ***Gladiolus***

1 Inflorescence an umbellate 1-sided cyme; plants from rhizomes or bulbs; flowers actinomorphic.
4 Leaves planar; plants from rhizomes (or indistinct) or a bulb (in *Iris xiphium*).
5 Style branches broad, petaloid, terminating in paired crests ..... ***Iris***
5 Style branches not broad or petaloid.
6 Tepals 16-35 mm long, orange or red; seeds 4-6 mm in diameter..... ***Iris domestica***
6 Tepals 6-15 mm long, blue, purple, lavender, pink, magenta, white, or yellowish-white; seeds 0.6-1.3 mm in diameter ..... ***Sisyrinchium***
4 Leaves plicate; plants from bulbs.
7 Tepals unequal, the inner whorl < ½ as long as the outer whorl ..... ***Herbertia***
7 Tepals nearly equal in length.
8 Style recurved, with 3 flat branches that are < 2 mm long ..... ***Calydorea***
8 Style straight, each of the 3 branches further divided into slender lobes
9 Style branches divided for ca. ½ their length; style arms arching over or between the anthers; tepals dark purple ..... ***Alophia***
9 Style branches divided nearly to base; style arms extending horizontally between the anthers; tepals blue, white in the center ..... ***Nemastylis***

Alophia Herbert (Propellor-flower)

A genus of ca. 5 species, of sc. North America, Mexico, Central America, and South America. References: Goldblatt in FNA (2002a).

Alophia drummondii (Graham) R.C. Foster, Propellor-flower. E. LA (and MS?) west to TX and OK; Mexico; Guyana. [= FNA, K; = *Herbertia drummondii* (Graham) Small]

Calydorea Herbert 1843 (Ixia)

A genus of about 8 species, of warm temperate and tropical America. The circumscription relative to *Nemastylis* is uncertain. References: Goldblatt in FNA (2002a); Goldblatt, Manning, & Rudall in Kubitzki (1998a).

Calydorea coelestina (Bartram) Goldblatt & Henrich, Bartram's Ixia. Pine flatwoods. Endemic to ne. FL (Chafin 2000); the single GA record is by P.O. Schallert, notoriously sloppy with his location data, and is therefore best discounted unless additional information comes to light. [= FNA, K; = *Salpingostylis coelestina* (Bartram) Small – S; = *C. caelestina* – WH, orthographic variant; = *Nemastylis coelestina* (Bartram) Nuttall; = *Sphenostigma coelestinum* (Bartram) R.C. Foster; = *Ixia coelestina* Bartram]

Crocosmia Planchon 1851 (Montbretia)

A genus of 8-9 species, herbs, native of sub-Saharan Africa. References: Goldblatt in FNA (2002a); Goldblatt, Manning, & Dunlop (2004); Goldblatt, Manning, & Rudall in Kubitzki (1998a).

* ***Crocosmia ×crocosmiiflora*** (V. Lemoine) N.E. Brown [*C. aurea* × *pottsii*], Montbretia. Disturbed areas, ditches, especially in moist to wet sites, including salt marshes; the parents of the hybrid both native to sub-Saharan Africa. Late June-July. Reported for Lowndes and Thomas counties, GA (Carter, Baker, & Morris 2009). [= FNA, K, WH; = *C. ×crocosmiflora* – RAB, orthographic variant]

Crocus Linnaeus 1753 (Crocus)

A genus of about 80 species, herbs, from Mediterranean Europe to w. China. References: Goldblatt, Manning, & Rudall in Kubitzki (1998a).

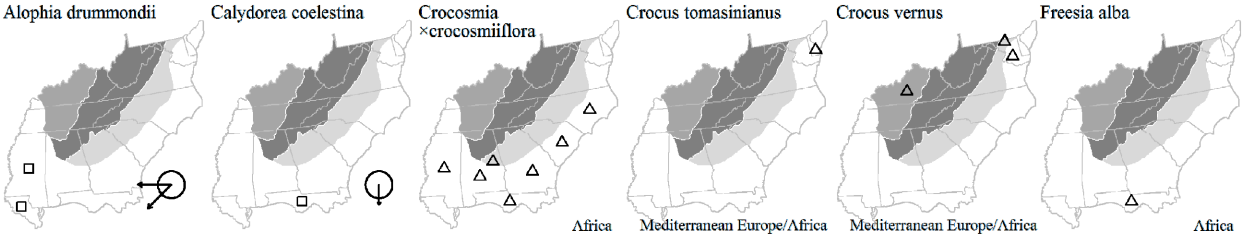
* ***Crocus tomasinianus*** Herbert, Woodland Crocus. Disturbed areas, long-persistent after cultivation around house-sites. Reported as rarely naturalizing in DE (McAvoy & Bennett 2001). {not yet keyed}

Crocus vernus (Linnaeus) Hill, Dutch Crocus. Disturbed areas, long-persistent after cultivation around house-sites. [= K] {not yet keyed}

Freesia Eklon ex Klatt 1865 (Freesia)

A genus of about 15 species, perennials, natives of s. Africa. References: Goldblatt in FNA (2002a).

* ***Freesia alba*** (G.L. Meyer) Gumbleton, Freesia. Disturbed areas; native of s. Africa. [= FNA, WH; ? *F. corymbosa* (Burmann f.) N.E. Brown – K]



Gladiolus Linnaeus 1754 (Gladiolus)

A genus of about 255 species, largely of Africa. References: Goldblatt in FNA (2002a); Goldblatt, Manning, & Rudall in Kubitzki (1998a). Key based on FNA.

1 Inner tepals 60-70 mm long ..... ***G. ×gandavensis***
1 Inner tepals < 60 mm long.
  2 Tepals white, cream, orange, or red; perianth tube plus dorsal sepal 60-95 mm long ..... ***G. dalenii*** *ssp.* ***dalenii***
  2 Tepals pink, reddish, or light purple, with white markings on the outer 3 tepals.
    3 Anthers 10-13 mm long; capsules oblong, 18-24 mm long; seeds winged..... ***G. communis***
    3 Anthers ca. 15 mm long; capsules globose, 10-12 mm long; seeds not winged..... ***G. italicus***

* ***Gladiolus communis*** Linnaeus, False Corn-flag. Commonly cultivated as ornamentals, rarely persisting or weakly spreading; native of Mediterranean Europe and n. Africa. [= FNA; > *G. papilio* Hooker – RAB, K, misapplied; > *Gladiolus communis* Linnaeus ssp. *byzantinus* (P. Miller) A. Hamilton – K; > *G. byzantinus* P. Miller]

* ***Gladiolus dalenii*** Van Geel *ssp.* ***dalenii***. Sometimes cultivated, rarely persisting or spreading; native of s. Africa. Introduced in AL and LA. [= FNA]

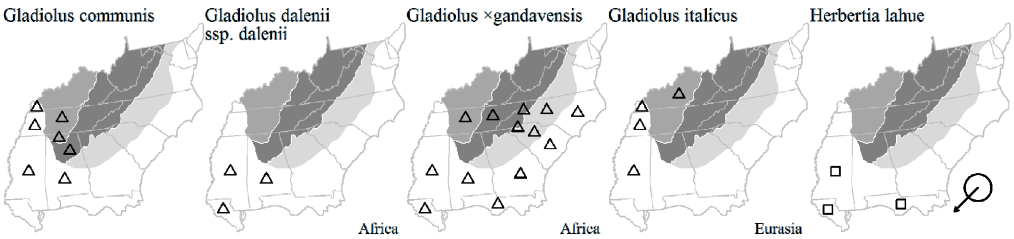
* ***Gladiolus ×gandavensis*** Van Houtte [*G. dalenii* × *oppositiflorus*]. Commonly cultivated as ornamentals, rarely persisting or weakly spreading; native of s. Africa. Goldblatt suggests that as many as 5 species are involved in the origin of the large-flowered garden gladiolus. [= RAB, FNA, K, WH; *?* *G. hortulanus* L.H. Bailey – S; ? *G. dalenii* Van Geel]

* ***Gladiolus italicus*** P. Miller. Sometimes cultivated, rarely persisting or spreading; native of Eurasia. Introduced in TN. [= FNA, K; *? G. segetum* Ker-Gawler – S]

Herbertia Sweet 1827 (Pleat-leaf Iris)

A genus of about 5 species, herbs, in se. North America and temperate South America. References: Goldblatt in FNA (2002a).

Herbertia lahue (Molina) Goldblatt, Prairie-nymph. Prairies and marshes. AL and FL west to TX; central South America. [= FNA, WH; > *H. lahue* ssp. *caerulea* (Herbert) Goldblatt – K; > *H. caerulea* Herbert – S]



Iris Linnaeus 1753 (Iris, Flag, Blackberry-lily)

A genus of about 225 species, herbs, of Eurasia, n. Africa, and North America. Wilson (2004) suggests that *Belamcanda* is phylogenetically nested within *Iris* and should be included there; Goldblatt & Mabberley (2005) make the appropriate nomenclatural combination. References: Henderson in FNA (2002a); Goldblatt in FNA (2002a); Goldblatt & Mabberley (2005)=Z; Wilson (2004); Goldblatt, Manning, & Rudall in Kubitzki (1998a). Key based on Henderson in FNA (2002a).

Identification notes: the **petals** are usually erect, smaller than the petaloid **sepals** (which are brightly colored, generally reflexed, and marked with a "signal"). The **styles** are also petaloid, arched over the sepals, and 2-cleft at the tip (except in *I. domestica*).

1 Plant from an ovoid bulb; [subgenus *Xiphium*] ..... ***I.. xiphium***
1 Plant from short to elongate rhizomes.
  2 Style branches not broad, petaloid, or crested; seeds black, shiny, in a blackberry-like cluster (the seeds exposed at maturity by dehiscence of the papery to chartaceous capsule walls) ..... ***I. domestica***
  2 Style branches broad, petaloid, terminating in paired crests; seeds tan to brown, in a capsule.
    3 Sepal "signal" (see above) of multicellular hairs (the “beard”), along the midrib of the the claw and the base of the blade; [subgenus *Iris*].
      4 Spathes green (or purplish) and herbaceous, with scarious margins ..... ***I. germanica***
      4 Spathes scarious, silvery-white..... ***I. pallida***

3 Sepal "signal" consisting of contrasting color, ridges, small unicellular hairs, and/or a cockscomb-like crest; [subgenus *Limniris*].
5 Rhizome branches cord-like, with scale-like leaves, enlarging at the apex to produce vegetative leaves, additional branches, and flowering stems.
6 Stems 30-80 cm tall; leaves 30-60 cm long, 0.2-0.7 cm wide; cordlike portions of rhizomes to 4 dm long; [of wetlands]; [section *Limniris*, series *Prismaticae*] ..... ***I. prismatica***
6 Stems 2-15 cm tall; leaves 10-45 cm long, 0.3-2.5 cm wide; cordlike portions of rhizomes to to 2 dm long; [of dry to mesic uplands].
7 Sepals crested with a 3-ridged, toothed crest; leaves 10-25 mm wide, green, falcate; flowers not or only slightly fragrant; rhizomes surficial (one can "pull" them off the ground by gently tugging on the leaves); [generally of mesic and fertile soils]; [section *Lophiris*] ..... ***I. cristata***
7 Sepals not crested; leaves 3-13 mm wide, blue-green, straight or nearly so; flowers strongly fragrant; rhizomes deeply buried (not easily "pulled"); [generally of dry and acid soils; [section *Limniris*, series *Vernae*].
8 Leaves 5-13 mm wide; rhizomes 1-3 cm between offshoots, thus forming clumps; capsules 1.7-3.2 cm long; [primarily of the Mountains, and upper Piedmont, extending into the Coastal Plain in sw. GA and Panhandle FL] .. ***I. verna*** *var.* ***smalliana***
8 Leaves 3-8 mm wide; rhizomes 5-15 cm between offshoots, thus hardly clump-forming; capsules 1.2-1.8 cm long; [of the Coastal Plain and lower Piedmont, from e. GA northward] ..... ***I. verna*** *var.* ***verna***
5 Rhizome branches like the primary rhizome, not as above.
9 Petals 1-2 cm long; [section *Limniris*; series *Tripetalae*] ..... ***I. tridentata***
9 Petals 2-9.5 cm long.
10 Stems hollow; [section *Limniris*; series *Sibirica*].
11 Spathes herbaceous at flowering time; capsule 3.5-5.5 cm long ..... ***I. sanguinea***
11 Spathes scarious at flowering time; capsule 2-3.5 cm long ..... ***I. sibirica***
10 Stems solid.
12 Capsules 3-angled or nearly round in cross-section; [section *Limniris*; series *Laevigatae*].
13 Perianth yellow ..... ***I. pseudacorus***
13 Perianth blue-violet (rarely white).
14 Flowers 8-15 cm in diameter; leaves 0.5-1.5 cm wide; [alien, cultivated, rarely escaped] ..... ***I. ensata***
14 Flowers 6-8 cm in diameter; leaves 1-4 cm wide; [native].
15 "Signal" a greenish-yellow, papillate patch, surrounded by an area of heavily veined purple-on-white; [of VA northward] ..... ***I. versicolor***
15 "Signal" a bright yellow, pubescent patch.
16 Plants to 10 dm tall, usually with 1-2 well-developed branches; capsule 7-11 cm long ..... ***I. virginica*** *var.* ***shrevei***
16 Plants to 6 dm tall, little or not at all branched; capsule 4-7 cm long ..... ***I. virginica*** *var.* ***virginica***
12 Capsules 6-angled or ridged in cross-section; [section *Limniris*; series *Hexagonae*].
17 Perianth dull copper or orange-brown (or dark yellow) (fading in nature or drying in the herbarium to a bluish or purplish color); petals spreading or declining ..... ***I. fulva***
17 Perianth blue-violet (rarely white); petals erect to spreading.
18 Stems declining or semi-erect, sharply zigzag ..... ***I. brevicaulis***
18 Stems erect, slightly if at all zigzag.
19 Capsules 2.5-3.5 cm long, hexagonal in cross-section, 3 sides flat, the alternating sides with 2 rounded ridges separated by a shallow groove ..... ***I. hexagona***
19 Capsules 6-10 cm long, slightly to strongly hexagonal in cross-section.
20 Capsules with 6 broad rounded lobes, indehiscent ..... ***I. giganticaerulea***
20 Capsules with 6 sharp, winglike ridges, dehiscent ..... ***I. savannarum***

Iris brevicaulis Rafinesque, Short-stem Iris, Lamance Iris. Swamps, bottomlands, bogs, seeps, marshes. OH west to KS, south to Panhandle FL and TX. [= C, F, FNA, G, GW, K, WH; > *I. foliosa* Mackenzie & Bush – S; > *I. mississippiensis* Small – S]

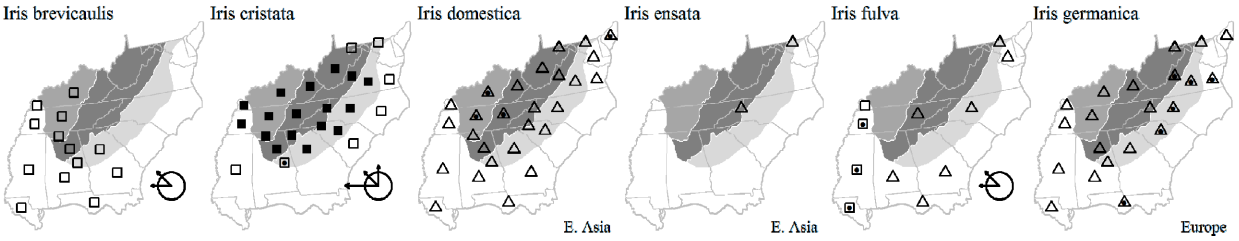
Iris cristata Aiton, Dwarf Crested Iris. Moist forests, rich woods, roadbanks. April-May; June-July. MD west to IN and MO, south to NC, AL, MS, AR, and e. OK. [= RAB, C, F, FNA, G, K, W, WV; = *Neubeckia cristata* (Aiton) Alefani – S]

* ***Iris domestica*** (Linnaeus) Goldblatt & Mabberley, Blackberry-lily. Dry woodlands, forests, edges of granitic flatrocks, suburban areas; native of e. Asia. June-August. [= Z; = *Belamcanda chinensis* (Linnaeus) de Candolle – RAB, C, F, FNA, G, K, S, W, WH, WV]

* ***Iris ensata*** Thunberg, Japanese Iris. Roadsides; cultivated and rarely escaped, native of Japan, n. China, and Sakhalin. Also reported from se. PA (Rhodes & Klein 1993). [= K; *I. kaempferi* Siebold ex Lamarck]

Iris fulva Ker-Gawler, Red Flag, Copper Iris. Swamp forests, wet hammocks. S. IL, MO, and TN south to GA, w. Panhandle FL, AL, and LA (introduced elsewhere). [= C, F, FNA, G, GW, K, S, WH]

* ***Iris germanica*** Linnaeus, German Iris, Fleur-de-Lys. Roadsides, old homesites, ditches; cultivated and rarely persistent or escaped, native of Europe. April-May. [= RAB, C, F, FNA, G; > *I. flavescens* Delile – K; > *I.* ×*germanica* – K]



Iris giganticaerulea Small, Giant Blue Iris. Marshes and swamps. MS west to e. TX. [= FNA, K; > *I. giganticaerulea* Small – S; > *I. alticristata* Small – S; > *I. aurilinea* Alexander – S; > *I. citricristata* Small – S; > *I. elephantina* Small – S; > *I. fluviatilis* Small – S; > *I. miraculosa* Small – S; > *I. paludicola* Amexander – S; > *I. parvicaerulea* Alexander – S; > *I. rivularis* Small – S; > *I. venulosa* Alexander – S; > *I. wherryana* Small – S]

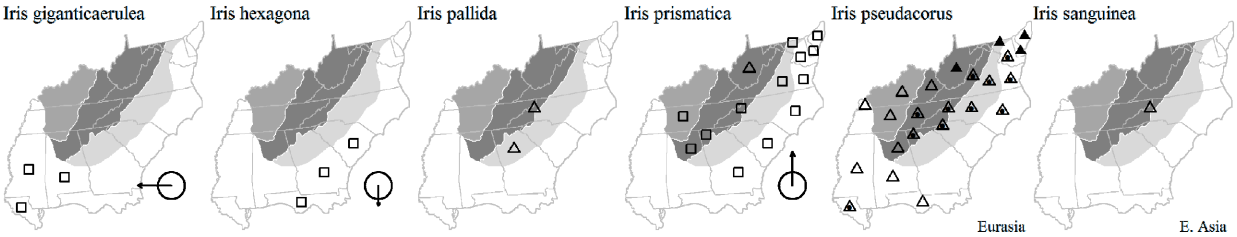
Iris hexagona Walter, Anglepod Blue Flag. Swamps. May-June. SC south to s. FL. [= RAB, FNA, GW, S, WH; = *I. hexagona* var. *hexagona* – K; > *I. hexagona* – S]

* ***Iris pallida*** Lamarck in J. Lamarck et al., Sweet Iris. Cultivated and persistent around buildings in GA and elsewhere (FNA). [= F, FNA, K]

Iris prismatica Pursh ex Ker-Gawler, Slender Blue Iris, Slender Blue Flag. Bogs and marshes. May-June; June-July. NS south to GA, disjunct in w. NC (Henderson County) and sc. TN (Coffee County). [= RAB, C, FNA, G, GW, K, S, W; > *I. prismatica* var. *prismatica* – F; > *I. prismatica* var. *austrina* Fernald – F]

* ***Iris pseudacorus*** Linnaeus, Water Flag, Yellow Flag. Swamps, marshes, streams, ponds, cultivated as a water plant; native of Eurasia and Africa. May-July; August-October. [= RAB, C, F, FNA, G, GW, K, S, W, WH, WV]

* ***Iris sanguinea*** Hornemann ex Donn, Japanese Iris. Roadsides, cultivated and rarely escaped; native of Japan, n. China, Korea, Japan, and w. Russia. [= K]



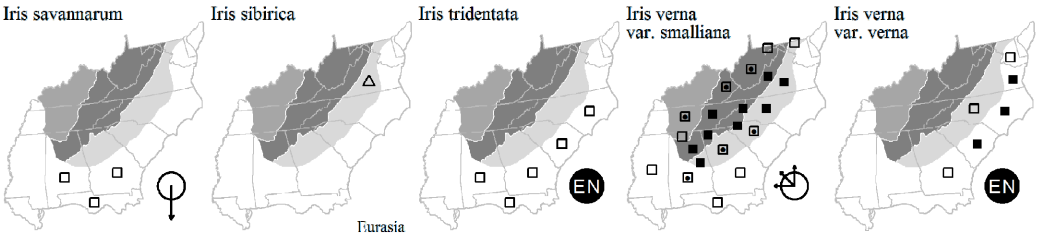
Iris savannarum Small. {habitat}. GA and AL south to s. FL. [= FNA, S; = *I. hexagona* Walter var. *savannarum* (Small) R.C. Foster – K; > *I. kimballiae* Small – S; > *I. alabamensis* Small – S]

* ***Iris sibirica*** Linnaeus, Siberian Iris. Cultivated and escaping or persisting near plantings; native of Eurasia (c. and e. Europe west to Lake Baikal). [= FNA, K]

Iris tridentata Pursh. Wet savannas, pine flatwoods, margins of pineland pools. Late May-June; August-October. Se. NC south to ne. FL and Panhandle FL. [= RAB, FNA, GW, K, WH; *? I. tripetala* – S, misapplied]

Iris verna Linnaeus *var.* ***smalliana*** Fernald ex M.E. Edward, Upland Dwarf Iris. Dry, rocky or sandy woodlands and forests. April-May; June-early August. Sc. PA and WV south to w. NC, e. TN, n. GA, se. GA, Panhandle FL, and AL. [= RAB, F, FNA, K, W, WH, WV; < *I. verna* – C, G; < *Neubeckia verna* (Linnaeus) Alefani – S]

Iris verna Linnaeus *var.* ***verna***, Coastal Plain Dwarf Iris, Sandhill Iris. Longleaf pine sandhills, dry, rocky forests and woodlands. March-May; May-June. MD south to se. SC and e. GA, primarily on the Coastal Plain, but extending into the Piedmont. [= RAB, F, FNA, K; < *I. verna* – C, G; < *Neubeckia verna* (Linnaeus) Alefani – S]



Iris versicolor Linnaeus, Northern Blue Flag, Poison Flag. Marshes, swamps, shores. May-July. Reported as occurring as far south as VA in C, F, and W. [= C, FNA, G, K, S?, W]

Iris virginica Linnaeus *var.* ***shrevei*** (Small) E. Anderson. Marshes, swamps, streams. May-July; July-September. Sw. QC to MN, south to w. NC, n. AL, e. TN, AR, and e. KS. [= C, F, K, WV; < *I. virginica* – RAB, FNA, W; = *I. shrevei* Small – G, S]

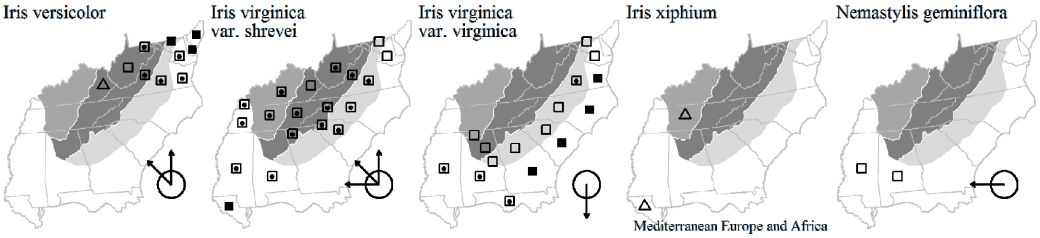
Iris virginica Linnaeus *var.* ***virginica***, Southern Blue Flag. Marshes, swamps, streams. April-May; July-September. Se. VA south to c. peninsular FL, west to e. TX, north in the interior to w. TN; disjunct in sc. TN. [= C, F, K; < *I. virginica* – RAB, FNA, W; = *I. virginica* – G, S]

* ***Iris xiphium*** Linnaeus, Spanish Iris. Disturbed areas; native of Spain and Portugal. [= K]

Nemastylis Nuttall 1835 (Celestial-lily)

A genus of about 5 species, herbs, of s. North America and Central America. The circumscription relative to *Calydorea* is uncertain. References: Goldblatt in FNA (2002a); Goldblatt, Manning, & Rudall in Kubitzki (1998a).

Nemastylis geminiflora Nuttall, Prairie Celestial, Prairie Pleatleaf. Prairies. MO and e. KS south to w. LA and TX; disjunct eastward in AL and MS. [= FNA, K; *Ixia acuta* Bartram; *Nemastylis acuta* Herbert]



Sisyrinchium Linnaeus 1753 (Blue-eyed-grass, Irisette)
by A.S. Weakley & B.A. Sorrie

A genus of about 80 species, herbs, of the Americas. *Sisyrinchium* is a very difficult genus, with a number of taxonomic questions remaining in our area. References: Cholewa & Henderson in FNA (2002a); Hornberger (1991)=Y; Bicknell (1896, 1899a, 1899b); Goldblatt, Manning, & Rudall in Kubitzki (1998a).

Identification notes: For fully successful identification, it is necessary to collect underground parts; fibrous remains of leaves, and rhizomes (if any), are critical characters.

1 Perianth with tepals campanulate basally, flaring distally; annual; plants usually <2 dm tall; tepals lavender, pink, white, magenta, or yellow, with a maroon blaze near the base (*S. rosulatum*) or the base wholly yellow (*S. minus*).
2 Stems with 3-6 nodes; tepals yellow basally; mature capsules broadly fusiform or elliptical, uniformly light brown; [of MS to TX]..... ***S. minus***
2 Stems with 1-2(-3) nodes; tepals with maroon blaze near base; mature capsules globose, tan with purple sutures; [widespread] ..... ***S. rosulatum***
1 Perianth with tepals abruptly spreading in a plane; perennial, plants usually >2 dm tall; tepals blue, violet, or white.
3 Inflorescences paired (each inflorescence composed of 1-several flowers, their pedicels emanating from within 2 chartaceous scales; thus, there are 2 pairs of scales within the 2 outer, leaflike, green spathe bracts); outer spathe bract connate 0-1 mm.
4 Stems 1.3-3.4 mm wide, obviously winged; base of plant without fibrous remains of leaves; [of the Piedmont and Mountains] ..... ***S. albidum***
4 Stems 0.5-1.0 mm wide, wiry, not or scarcely winged; base of plant with numerous fibrous remains of leaves; [of the Coastal Plain] ..... ***S. capillare***
3 Inflorescence solitary, not paired (within the 2 green spathe bracts there is only one pair of chartaceous scales); outer spathe bract connate 2-6 mm (except 0-1 mm in *S. campestre*).
5 Stems simple, unbranched (rarely branched).
6 Spathe bracts connate 0-1 mm..... ***S. campestre***
6 Spathe bracts connate >1 mm.
7 Base of plant with fibrous remains of leaves..... ***S. sagittiferum***
7 Base of plant without fibrous remains of leaves
8 Spathe bracts equal or subequal, outer bract up to 4.2 mm longer than inner; [coastal sw LA-s TX]..... ***S. biforme***
8 Spathe bracts distinctly unequal, outer usually >6 mm longer than inner; [southern Appalachians and northward].
9 Stems (1.5-)2-4 mm wide, obviously winged; spathe bracts green, rarely purplish; capsules 4-6.8 mm long; [northern, extending south to n. VA]..... ***S. montanum***
9 Stems 1-2 mm wide, narrowly winged; spathe bracts purple on margins at least (often throughout); capsules 3.2-5.5 mm long; [northern, extending south to nw. GA and c. AL]..... ***S. mucronatum***
5 Stems branched, with 1-5 nodes.
10 Stems with 2-5 nodes, the branching dichotomous; tepals white, recurved at maturity; [of escarpment region of sw. NC and nw. SC] ..... ***S. dichotomum***
10 Stems with 1-3 nodes, the branching uneven; tepals blue to violet, oriented in a plane; collectively widespread.
11 Plant bases with fibrous remains of leaves (usually abundant).
12 Main stems 0.5-2.1 mm wide (usually <2 mm wide).
13 Stems mostly 1.5-2.1 mm wide, scabrous; plants drying dark brown or blackish; spathe bracts 15-20(-25) mm long..... ***S. fuscatum***
13 Stems 0.5-1.2 mm wide, not scabrous; plants drying pale brown or greenish brown; spathe bracts 12-14(-15) mm long ..... ***S. rufipes***
12 Main stems 1.5-6 mm wide (usually >2 mm wide).
14 Stems and leaves shiny, especially in life; stems mostly 3-6 mm wide; mature capsules mostly 5.5-8 mm long; [of FL and sw. GA] ..... ***S. xerophyllum***
14 Stems and leaves dull; stems 1.5-4.5 mm wide; mature capsules 2.5-6 mm long; [widespread].
15 Stems and branches smooth on margins; stems mostly 2.3-4.5 mm wide; plants dry dull green or brownish green; [widespread] ..... ***S. nashii***
15 Stems and branches scabrous on margins at least distally; stems 1.5-3.0 (-3.5) mm wide; plants dry dark brown or blackish; [of the Coastal Plain].
16 Stems mostly 2.0-3.0(-3.5) mm wide; mature capsules 4-6 mm long; [of e. MD northward to sw. Nova Scotia]..... ***S. arenicola***
16 Stems mostly 1.5-2.1 mm wide; mature capsules 2.5-4 mm long; [of se. VA to se. LA] ..... ***S. fuscatum***
11 Plant bases without fibrous remains of leaves
17 Main stems usually >2 mm wide.
18 Spathe bracts connate 2.5-4 mm; spathe bracts and stems with abundant white spicules or papillae, sometimes these +/- flattened like lenticels; stems 1-2.8 mm wide; leaf blades scabrous..... ***S. pruinosum***

18 Spathe bracts connate 4-6 mm; spathe bracts and stems without spicules or papillae; stems 2.3-5 mm wide; leaf blades not scabrous.
19 Plant <45 cm tall; stems branched 1 time; nodes geniculate, nodes green; mature capsules pale brown.....***S. angustifolium***
19 Plant 30-70 cm tall; stems branched 2(-3) times; nodes not geniculate, nodes purplish; mature capsules dark brown to black.....***S. corymbosum***
17 Main stems usually <2 mm wide.
20 Rhizome present and obvious (although not longer than about 3 cm), about 2 mm thick, hard, blackish; hyaline margins of inner spathe bract acute (contra *S. atlanticum*).....***S. miamiense***
20 Rhizome absent or at least not evident; hyaline margins of inner spathe bract various.
21 Ovaries and capsules black, strongly contrasting with foliage (which dries pale yellowish or tan); hyaline margins of inner spathe bract obtuse or truncate apically, sometimes projecting as lobes.....***S. atlanticum***
21 Ovaries and capsules pale to medium brown; foliage drying dull green or brownish; hyaline margins of inner spathe bract acute, never projecting as lobes.
22 Spathe bracts and stems without spicules or papillae; outer spathe bract usually > inner by 1-2.7 mm; spathe bracts purple tinged basally and sometimes also on margins; plants usually densely cespitose..... ***S. langloisii***
22 Spathe bracts and stems with abundant white spicules or papillae, sometimes these +/- flattened like lenticels; outer spathe bract usually > inner by 2.5-5.5 mm; spathe bracts green; plants usually with few-several stems, not densely cespitose .....***S. pruinosum***

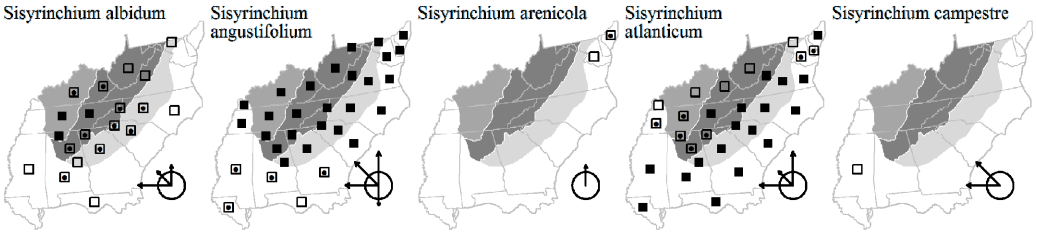
Sisyrinchium albidum Rafinesque. Woodlands, savannas?, mesic sandhills, open limestone barrens. March-May; May-June. S. NY west to s. WI, south to Panhandle FL and e. TX. [= C, F, FNA, G, K, Y; < *S. albidum* – RAB, W, WH (also see *S. capillare*); > *S. albidum* – S; > *S. scabrellum* E.P. Bicknell – S]

Sisyrinchium angustifolium P. Miller. March-June. Woodlands, forests, meadows, sandhill swales. March-June; May-July. VT, NH, and s. ON west to WI, e. KS, and OH, south to GA, AL, LA, and TX. [= RAB, C, F, FNA, GW, K, W, WV, Y; = *S. graminoides* E.P. Bicknell – G, S]

Sisyrinchium arenicola E.P. Bicknell, Sandyland Blue-eyed-grass. Sandy habitats. A Coastal Plain endemic: MA to e. MD (Caroline Co.). [= F; < *S. fuscatum* – FNA]

Sisyrinchium atlanticum E.P. Bicknell, Atlantic Blue-eyed-grass. Dry, sandy or rocky places. March-June; June-August. NS and ME west to OH, IN, and MO, south to s. FL and LA. [= C, F, FNA, G, GW, K, S, W, Y; = *S. mucronatum* var. *atlanticum* (E.P. Bicknell) Ahles – RAB; < *S. angustifolium* – WH]

Sisyrinchium campestre E.P. Bicknell, Prairie Blue-eyed-grass. Prairies. MI and SD south to MS and NM. [= FNA, K] {add to synonymy}



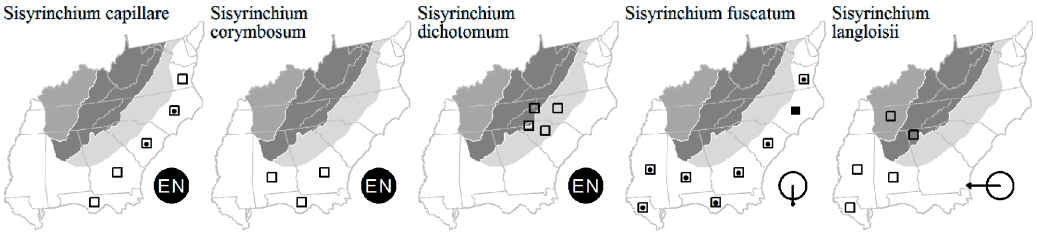
Sisyrinchium capillare E.P. Bicknell, Wiry Blue-eyed-grass. Wet pine savannas and flatwoods. March-June; May-June. Coastal Plain, from se. VA south to ne. FL. [= C, F, FNA, G, GW, K, S; < *S. albidum* – RAB, W, WH]

Sisyrinchium corymbosum E.P. Bicknell. Pinelands. Se. GA and ne. FL west to s. AL. See Ward (2005a) for its resurrection. [< *S. atlanticum* Bicknell – FNA, K; < *S. angustifolium* – WH]

Sisyrinchium dichotomum E.P. Bicknell, White Irisette, Isothermal Irisette. Dry to mesic woodlands and forests, usually over mafic rocks (such as amphibolite), at low to moderate elevations (400-1000 m) in the Blue Ridge escarpment. May-June; June-August. Endemic to Henderson, Polk, and Rutherford counties, NC, and Greenville County, SC. [= FNA, K, W]

Sisyrinchium fuscatum E.P. Bicknell. Xeric to dry soils of pine barrens, Carolina bay rims, sandhills, fluvial sand ridges. Late April-June; June-October. E. VA south to n. FL, west to LA. [= RAB, F, G, GW; < *S. fuscatum* – C, FNA, K; > *S. fuscatum* – S; > *S. incrustatum* E.P. Bicknell – S; < *S. nashii* – WH]

Sisyrinchium langloisii Greene. {habitats}. AR and OK south to w. LA and s. TX; disjunct eastwards in AL, GA, MS, TN, and nw. GA. [= FNA; < *S. langloisii* – K (also see *S. pruinosum*)]



Sisyrinchium miamiense E.P. Bicknell. {habitats}. Ne FL and s. GA south to s. FL and west to s. MS. [= FNA, K; < *S. angustifolium* – WH] {add S to synonymy}

Sisyrinchium minus Engelmann & A. Gray. {habitats}. E. LA west to c. TX. Reported for NC (Sida 1962) and MS {check}. [= K] {add to synonymy}

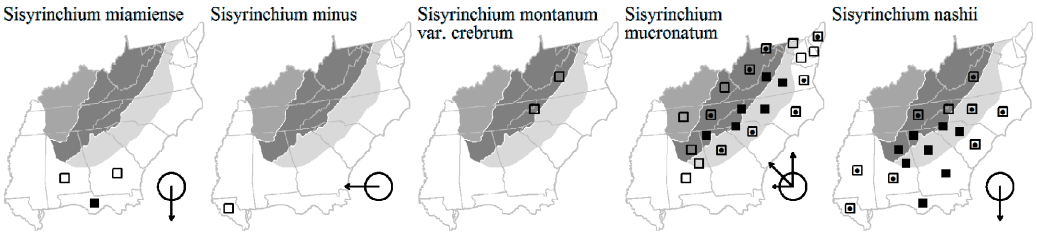
Sisyrinchium montanum Greene *var.* ***crebrum*** Fernald. {habitat in our area not known}. May-July. NL (Newfoundland) and ON south to NY. The status of this taxon in our area is not clear. *S. montanum* var. *crebrum* is reported for VA by F, and *S.*

montanum (variety not specified) is reported for NC and VA by C and G. FNA considers var. *crebrum* to range south only to NY, and var. *montanum* south only to OH and PA. Herbarium documentation is needed. [= C, F, FNA, K; < *S. montanum* – G; > *S. angustifolium* – G, S, misapplied]

Sisyrinchium montanum Greene var. *montanum*. Reported for n. WV (Harmon, Ford-Werntz, & Grafton 2006). {rejected; not keyed; not mapped} [= C, F, FNA, K; < *S. montanum* – G]

Sisyrinchium mucronatum Michaux. Forests, woodlands, fields. April-June; June-July. ME west to SK, south to SC, GA, MI, MN. [= C, F, FNA, GW, G, K, S, W, WV; = *S. mucronatum* var. *mucronatum* – RAB]

Sisyrinchium nashii E.P. Bicknell, Nash's Blue-eyed-grass. Woodlands and forests. April-June. NC and TN (sw. VA?) south to s. FL and MS. [= FNA, K, W; > *S. fibrosum* E.P. Bicknell – S; < *S. nashii* – WH]



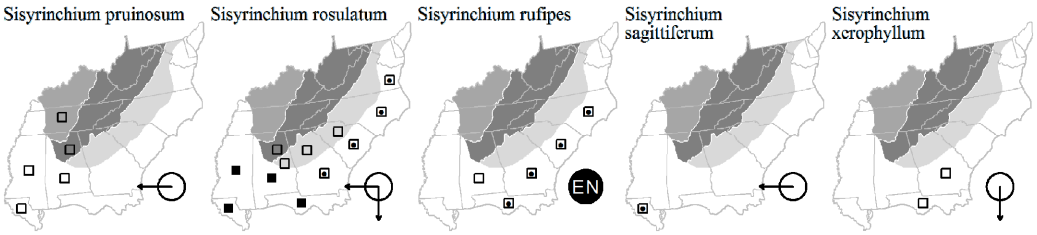
Sisyrinchium pruinosum E.P. Bicknell. {habitats}. AR south to w. LA and AR; disjunct at scattered localities eastwards in e. LA, MS, AL, and sc. TN. [= FNA; < *S. langloisii* – K] {add to synonymy}

Sisyrinchium rosulatum E.P. Bicknell, Lawn Blue-eyed-grass, Fairy-stars. Lawns, roadsides. April-May; May-June. Se. VA south to FL, west to e. TX. [= RAB, FNA, GW, K, S, WH, Y; > *S. exile* E.P. Bicknell]

Sisyrinchium rufipes E.P. Bicknell. Xeric-dry longleaf pine sandhills, fluvial sand ridges. Se. NC to n. FL, west to s. AL. [= S; < *S. fuscatum* – FNA, K; < S. nashii – WH]

Sisyrinchium sagittiferum E.P. Bicknell. Ranges east to AL (FNA). [= FNA, K] {add to synonymy}

Sisyrinchium xerophyllum Greene, Florida Blue-eyed-grass. Xeric sands. S. GA south to s. peninsular FL; also alleged to occur in NC (FNA) but this report does not seem plausible. [= FNA, K, S, WH]



73. XANTHORRHOEACEAE R. Brown 1810 (Day-lily Family) [in ASPARAGALES]

A family of about 35 genera and 900 species, herbs, shrubs, and trees, of the Old World and especially Australia and s. Africa. Here circumscribed broadly to include Hemerocallidaceae, Phormiaceae, Aloaceae, and Asphodelaceae, following the suggestion of APG III (2009) and Chase, Reveal, & Fay (2009). References: Chase, Reveal, & Fay (2009); APG III (2009); Zomlefer (1998, 1999); Clifford, Henderson, & Conran in Kubitzki (1998a).

Hemerocallis Linnaeus 1753 (Day-lily)

A genus of about 15-30 species, temperate, of e. Asia. References: Zomlefer (1998)=Z; Straley & Utech in FNA (2002a).

1 Flowers tawny-orange (or many variants thereof), not fragrant; inner tepal margins wavy.....***H. fulva***
1 Flowers lemon-yellow, fragrant; inner tepal margins planar.....***H. lilioasphodelus***

* ***Hemerocallis fulva*** (Linnaeus) Linnaeus, Orange Day-lily, Tawny Day-lily. Commonly cultivated, frequently escaping to forests, streambanks, suburban woodlands, lawns, waste places; native of Asia. Late May-early July. [= RAB, C, FNA, G, K, W, WH, WV, Z; > *H. fulva* var. *fulva* – F; > *H. fulva* var. *kwanso* Regel – F]

* ***Hemerocallis lilioasphodelus*** Linnaeus, Yellow Day-lily, Lemon Day-lily. Roadsides, bottomlands, less commonly cultivated, only rarely escaping; native of Asia. May-July. [= C, FNA, K, Z; = *H. flava* (Linnaeus) Linnaeus – F, G, WV]

74. AMARYLLIDACEAE J. St. Hilaire 1805 (Amaryllis Family) [in ASPARAGALES]

A family of about 59 genera and 850 species, nearly cosmopolitan (especially diverse in the tropics). Here circumscribed to include the Alliaceae following the recommendation of APG III (2009). References: Dahlgren, Clifford, & Yeo (1985); Müller-Doblies & Müller-Doblies (1996); Meerow & Snijman in Kubitzki (1998a); Fay & Chase (1996); Rahn in Kubitzki (1998a). [also see *AGAVACEAE* and *HYPOXIDACEAE*]

1 Ovary superior; [subfamily *Allioideae*].
2 Inflorescence a solitary flower; flowers blue, lavender, or white; fresh plant with an onion odor; [tribe *Gillesieae*] ..... ***3. Tristagma***
2 Inflorescence an umbel; flowers white, greenish white, cream, pink, or magenta-purple; fresh plant with or without an onion odor.
3 Tepals 2-9 mm long; ovary 3-celled, each with 1-2 ovules; fresh plant with an onion odor; [tribe *Allieae*] ..... ***1. Allium***
3 Tepals 10-15 mm long; ovary 3-celled, each with 6-10 ovules; fresh plant usually without an onion odor; [tribe *Gillesieae*] ..... ***2. Nothoscordum***
1 Ovary inferior; [subfamily *Amaryllidoideae*].
4 Corona present (a fused tubular or flattened petaloid structure in the center of the flower, above the tepals).
5 Filaments fused with the corona; corona very membranous in texture, distinctly thinner than the tepals; flowers white; [native, of riverine or tidal shores and marshes]; [tribe *Hymenocallideae*, subtribe *Hymenocallidinae*] ..... ***12. Hymenocallis***
5 Filaments not fused with the corona; corona membranous in texture, but similar to the tepals (in texture, though sometimes of a different color); flowers usually at least partly yellow or orange (sometimes purely white); [alien, naturalized in primarily upland and disturbed habitats]; [tribe *Narcisseae*, subtribe *Narcissinae*] ..... ***8. Narcissus***
4 Corona absent.
6 Flowers red; stamens about 2× as long as the tepals; [tribe *Lycoridae*] ..... ***5. Lycoris***
6 Flowers white, yellow, copper, or white-pink; stamens shorter than or about as long as the tepals.
7 Flowers yellow to copper.
8 Tepals apiculate at the tip, especially the outer 3 tepals; scape hollow; [tribe *Hippeastreae*, subtribe *Zephyranthinae*] ..... ***10. Habranthus***
8 Tepals rounded at the tip; scape solid; [tribe *Narcisseae*, subtribe *Narcissinae*] ..... ***9. Sternbergia***
7 Flowers white or white-pink.
9 Tepals 3-16 cm long, white or sometimes white-pink.
10 Tepals spreading, separate, the perianth rotate; inflorescence a several-flowered umbel terminating the stem; leaves arranged spirally; leaf margins finely toothed; [tribe *Amaryllideae*, subtribe *Crininae*] ..... ***4. Crinum***
10 Tepals ascending, overlapping, the perianth tubular; inflorescence of a single flower; leaves arranged distichously; leaf margins smooth; [tribe *Hippeastreae*, subtribe *Zephyranthinae*] ..... ***11. Zephyranthes***
9 Tepals 0.4-2.5 cm long, white, with small green or yellow spots; [tribe *Galantheae*].
11 Inner 3 tepals distinctly shorter and blunter than the outer 3 tepals ..... ***6. Galanthus***
11 Inner 3 tepals and outer 3 tepals of similar size and shape ..... ***7. Leucojum***

1. Allium Linnaeus 1753 (Onion, Garlic, Leek, Ramps, Chives)

A genus of 500-700 species, herbs, of Eurasia, n. Africa, and North America (especially diverse in c. Asia). References: Mathew (1996)=Z; Rahn in Kubitzki (1998a); McNeal & Jacobsen in FNA (2002a). [also see *Nothoscordum*]

1 Leaves appearing before the flowers and withering before anthesis; leaves lanceolate to elliptic (the margins not parallel for most of the length), mostly > 2 cm wide; [subgenus *Rhizirideum*].
2 Leaves (1.5-) 2-4 (-4.5) cm wide, without a distinct petiolar base, the basal portion white; flowers (6-) 10-18 (-25) per umbel (fruits often fewer by abortion); spathe bracts 1-2 cm long; fruiting pedicels (8-) 10-15 (-18) mm long ..... ***A. burdickii***
2 Leaves (3-) 5-8 (-9) cm wide, with a distinct petiolar base, the petioles usually red or pink; flowers (15-) 30-55 (-63) per umbel (fruits often fewer by abortion); spathe bracts 2-3 cm long; fruiting pedicels (10-) 15-25 (-30) mm long ..... ***A. tricoccum***
1 Leaves present at flowering; leaves linear (the margins parallel for most of the length), mostly < 2 cm wide.
3 Leaves cylindric (round or channeled-indented in cross section), hollow.
4 Stem stout, usually > 10 mm in diameter; peduncles with a distinct swollen portion ..... ***A. cepa***
4 Stem slender, < 5 mm in diameter; peduncles without a distinct swollen portion; [subgenus *Allium*]
5 Stems clustered, 1-3 dm tall; pedicels shorter than the flowers ..... ***A. schoenoprasum*** *var.* ***schoenoprasum***
5 Stems solitary, 3-10 dm tall; pedicels longer than the flowers ..... ***A. vineale***
3 Leaves variously flattened or keeled (flat or V-shaped in cross section), not hollow.
6 Stem leafy for half its length; leaves 1.5-4.5 cm wide; [subgenus *Allium*].
7 Inflorescence of flowers only ..... ***A. ampeloprasum***
7 Inflorescence of bulblets (and often flowers as well).
8 Leaves 2-4 mm wide; bulbs simple at maturity; involucral bracts 2 ..... ***A. oleraceum***
8 Leaves 6-12 mm wide; bulbs compound at maturity (with separable cloves); involucral bract 1 ..... ***A. sativum***
6 Stem scapose, leafy only at its base; leaves < 1.4 cm wide; [subgenus *Amerallium*].
9 Inflorescence erect, the peduncle not bent.
10 Ovary or capsule crested with projections about 1 mm long; tepals acuminate.
11 Spathe bracts usually 5-nerved; ovary crests contorted, ascending; tepals reflexed; leaves 3-10 mm wide ..... ***A. cuthbertii***
11 Spathe bracts 1-nerved; ovary crests plane, flattened, spreading; tepals spreading; leaves 1-2 mm wide ..... ***A. speculae***
10 Ovary or capsule not crested with projections; tepals acute.
12 Inflorescence partly or entirely of bulblets ..... ***A. canadense*** *var.* ***canadense***
12 Inflorescence entirely of normal flowers ..... ***A. canadense*** *var.* ***mobilense***
9 Inflorescence nodding, the peduncle bent 30-150 degrees in its uppermost several cm (at least in bud – in *A. stellatum* becoming erect in flower or fruit).
13 Flowers stellate, the tepals spreading; scape nodding in bud, becoming erect in flower or fruit; bulb ovoid ..... ***A. stellatum***
13 Flowers urceolate, campanulate, to nearly rotate, the tepals strongly to slightly incurved; scape nodding in bud, flower, and fruit; bulb elongate.
14 Perianth urceolate, deep magenta-purple; tepals obtuse; [plants of moderate to high elevations in the Mountains] ..... ***A. allegheniense***
14 Perianth campanulate to nearly rotate, pink, pale pink, or nearly white; sepals acute (obtuse in *A. oxyphilum*); [of moderate to low elevations in the Mountains, Piedmont, and Coastal Plain].

15 Plants flowering late August-early October; tepals 6-9 mm long, pale pink to nearly white; leaves moderately to strongly keeled in cross section (the angle between the two lower flat faces generally 90-135 degrees), 4-12 mm wide; [of calcareous wet savannas of the outer Coastal Plain] ..... ***A. species 1***

15 Plants flowering June-early August; tepals 5-6.5 mm long, pink to pale pink (white to greenish white in *A. oxyphilum*); leaves rounded to moderately keeled in cross section (if keeled, the angle between the two lower flat faces generally 120-165 degrees), 2-8 mm wide; [of the Piedmont and Mountains].

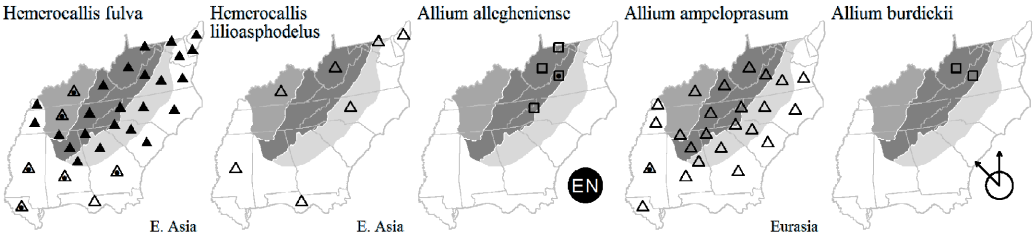
16 Pedicels relatively stout, 1.6-3 cm long; tepals pink or pale pink (sometimes nearly white); plants flowering June to early August; [widespread in our area, on moderately to strongly calcareous substrates] ..... ***A. cernuum***

16 Pedicels relatively slender, 2-4 cm long; tepals greenish white to white; plants flowering August; [of barrens developed over strongly acid shales in e. WV] ..... ***A. oxyphilum***

Allium allegheniense Small, Allegheny Onion. In thin soils around outcrops, generally of mafic rocks (such as amphibolite or hornblende gneiss) or calcareous rocks, primarily at moderate to fairly high elevations (1000-1600m). July-early September; August-October. Known from w. NC, w. VA, and e. WV, possibly more widespread. Although not recognized by most recent authors, *A. allegheniense* seems distinctive enough in morphology, ecology, and distribution to warrant taxonomic recognition at some level; additional study is needed. [= K, S; < *A. cernuum* – RAB, C, F, FNA, G, W]

* ***Allium ampeloprasum*** Linnaeus, Wild Leek, Yorktown Onion. Roadsides and other disturbed areas; native of Eurasia. Late May-early July; July-August. [= RAB, C, F, FNA, G, W, Z; > *A. ampeloprasum* var. *ampeloprasum* – K; > *A. ampeloprasum* var. *atroviolaceum* (Boiss.) Regel – K]

Allium burdickii (Hanes) A.G. Jones, Narrow-leaf Ramps, White Ramps. Northern hardwood forests, primarily at higher elevations than *A. tricoccum*, perhaps also in cove forests and rich mountain slopes. June; August. Only recently determined to be a separate taxon, *A. burdickii* is apparently rare in our area. It blooms about a month earlier than *A. tricoccum*. See Jones (1979) for more details and discussion. Largely sympatric with *A. tricoccum*, it is somewhat more northern and midwestern, ranging from ME west to ND and south to NJ, and in the Mountains to (?) w. VA. All material ascribed to *A. burdickii* in w. NC and e. TN appears to be *A. tricoccum*. [= K, W; = *A. tricoccum* var. *burdickii* Hanes – C, FNA; < *A. tricoccum* – F, G]



Allium canadense Linnaeus *var.* ***canadense***, Wild Onion. Bottomland forests, pastures, roadsides. Mid April-May; late May-June. NB west to ND, south to c. peninsular FL and TX. Though native, often appearing weedy. [= RAB, C, FNA, K, WH; = *A. canadense* – F, G, S, W]

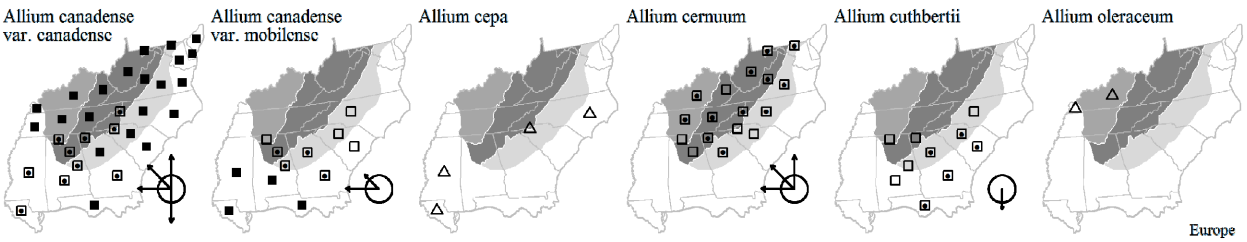
Allium canadense Linnaeus *var.* ***mobilense*** (Regel) Ownbey. Dry woodlands. Mid April-May; Late May-June. S. SC south to ne. FL and Panhandle FL, west to TX. This taxon is perhaps better treated as a distinct species. [= RAB, FNA, K, WH; > *A. microscordion* Small – S; = *A. mutabile* Michaux – F; > *A. arenicola* Small – S; *A. canadense* ssp. *mobilense* (Regel) Traub & Ownbey]

* ***Allium cepa*** Linnaeus, Garden Onion. Persisting from gardens, or appearing around compost or trash piles; native to c. Asia. May-June; July. [= RAB, C, FNA, G; > *A. cepa* var. *cepa* – K]

Allium cernuum Roth, Nodding Onion. Generally in open woodlands or around outcrops of shale, mafic, ultramafic, or calcareous rocks, in the mountains at low elevations. June-early August; August-October. NY, MI, MN, and BC, south to GA and AZ; the distribution is oddly fragmented into largely Rocky Mountain, Ozarkian, and Appalachian segments, and it is quite possible that cryptic taxa are involved. See discussion of *A. oxyphilum* at end of genus. [= S; < *A. cernuum* – RAB, C, F, FNA, G, W (also see *A. allegheniense* and/or *A. oxyphilum*); > *A. cernuum* var. *cernuum* – K]

Allium cuthbertii Small, Cuthbert's Onion. Sandhills, granite domes and flatrocks, in NC in thin soils around rock outcrops, receiving nutrient-rich seepage and occurring with many strict calciphiles. May-June; June-July. The bright emerald green ovary of the fresh flowers is striking and distinctive. Two morphological forms occur in our area, probably warranting taxonomic recognition. Typical *A. cuthbertii* occurs on xeric Coastal Plain sands from c. SC south through GA and AL to ne. FL; the perianth is white and the plants 1.5-3.5 dm tall. In NC, a peculiar form of *A. cuthbertii* is apparently limited to a series of unusual granitic domes in the Brushy Mountains of Alexander and Wilkes counties; these plants are more robust (4-8 dm tall), and the perianth is always pink. [= RAB, FNA, K, S, W, WH]

* ***Allium oleraceum*** Linnaeus, Field Garlic. Disturbed areas, native of Europe. July-September. [= C, F, FNA, G, J, K]



Allium oxyphilum Wherry. Shale barrens. Endemic to WV (Greenbrier, Mercer, Monroe, and Summers counties). Although there has been much discussion of its taxonomic status, it is apparently distinct from *A. cernuum*. It should be expected

in VA, although the outcrops of suitable shales are quite limited (Bartgis, pers. comm.; Wieboldt, pers. comm.). [= K; < *A. cernuum* – C, F, FNA, G, W]

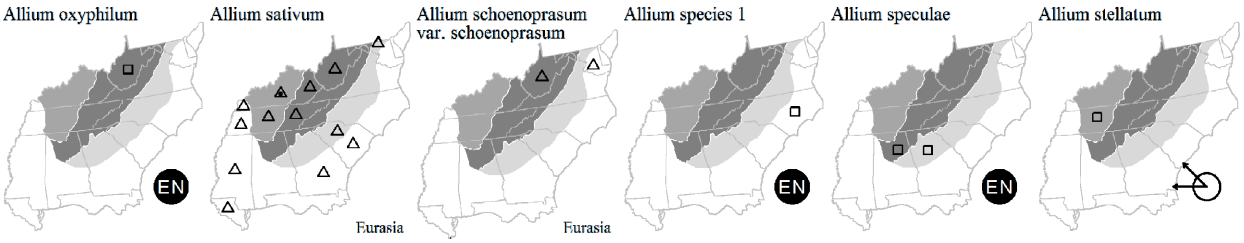
* ***Allium sativum*** Linnaeus, Garlic. Gardens, trash heaps, fields; commonly cultivated, rarely occurring as a waif or persistent in gardens, native of Eurasia. [= C, F, FNA, G, K, Z]

* ***Allium schoenoprasum*** Linnaeus *var.* ***schoenoprasum***, Chives. Disturbed areas, native of Eurasia. June-August. [= C, F, G; < *A. schoenoprasum* – FNA, K]

Allium species 1, Savanna Onion. Wet savannas over coquina limestone (marl). Late August-early October; late September-November. This remarkable Coastal Plain relative of *A. cernuum* was first discovered in 1981 by Steve Leonard in Pender County; it has since been found in similar sites in Onslow and Brunswick counties, always associated with other endemic species of primarily montane genera, such as *Thalictrum cooleyi* and *Parnassia caroliniana*. It appears to warrant taxonomic status.

Allium speculae Ownbey & Aase, Flatrock Onion. Seepy edges of vegetation mats on Lithonia granitic gneiss and on sandstone in ne. AL. May-June; mid June-mid July. Endemic to wc. GA and ne. AL. See Patrick, Allison & Krakow (1995) for additional information. [= FNA, K]

Allium stellatum Nuttall ex Ker-Gawler, Glade Onion, Prairie Onion. Limestone glades. July-September. ON and SK south to n. AR and e. TX; disjunct east of the Mississippi in c. TN. [= C, F, FNA, G, K]



Allium tricoccum Aiton, Ramps, Red Ramps, Wild Leek, Rampscallions. Cove forests and mesic slope forests. June-July: August-September. See *A. burdickii* for a discussion of the two taxa of ramps. NS and ND south to n. GA, n. AL, and MO. [= RAB, K, W; < *A. tricoccum* – F, G (also see *A. burdickii*); = *A. tricocum* var. *tricoccum* – C, FNA; = *Validallium tricoccum* (Aiton) Small – S]

* ***Allium tuberosum*** Rottler ex Sprengel, Chinese Chives, Oriental Garlic. Dunes. July-August. [= FNA] {not yet keyed}

* ***Allium vineale*** Linnaeus, Field Garlic. Lawns, pastures, other disturbed places; native of Eurasia. Late May-June; June-August. This is the common weed, often known as "onion grass". [= RAB, C, F, FNA, G, S, W; > *A. vineale* ssp. *vineale* – K; > *A. vineale* var. *vineale* – Z; > *A. vineale* var. *capsuliferum* Koch – Z; > *A. vineale* var. *compactum* (Thuill.) Coss. – Z]

2. Nothoscordum Kunth 1843 (Grace Garlic, False Garlic)

A genus of about 25 species, herbs, of the Americas (primarily South America). References: Rahn in Kubitzki (1998a)=Z; Jacobsen & McNeal in FNA (2002a).

1 Leaves 1-4 (-5) mm wide; tepals distinct or only slightly connate at the base; flowers 3-6 (-10) per umbel; flowers not fragrant .....***N. bivalve***
1 Leaves 4-12 mm wide; tepals connate up to 1/3 of their length; flowers 10-20 per umbel; flowers fragrant (similar to cocoa) .....***N. gracile***

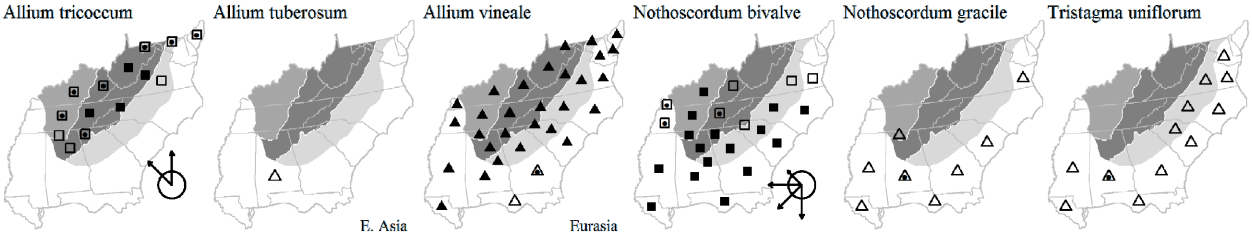
Nothoscordum bivalve (Linnaeus) Britton, Grace Garlic, False Garlic. Around granite flatrocks, in glades and barrens of various kinds, in open woodlands, and also weedy in fields and along roadsides. Mid March-mid May, and again in September-October; May-June, and again in October-November. Se. VA west to s. OH and KS, south to c. peninsular FL, TX, and South America. An onion-like plant, but generally lacking the odor of onion. [= C, F, G, K, S, W, WH, Z; = *Allium bivalve* (Linnaeus) Kuntze – RAB]

* ***Nothoscordum gracile*** (Aiton) Stearn. Disturbed areas, lawns; native of South America. [= FNA, K; = *Nothoscordum borbonicum* Kunth – WH, Z, misapplied?; = *Allium inodorum* Aiton – RAB; = *N. fragrans* (Ventenat) Kunth – S]

3. Tristagma Poeppig (Star-of-Bethlehem)

A genus of 3 species, herbs, of South America. References: Rahn in Kubitzki (1998a).

* ***Tristagma uniflorum*** (Graham) Traub, Star-of-Bethlehem. Commonly cultivated, escaping to lawns, suburban woodlands, bottomlands, disturbed places; native of South America. March-April. Reported for South Carolina by Hill & Horn (1997). [= K; = *Ipheion uniflorum* (Graham) Rafinesque – RAB, WH]



4. Crinum Linnaeus 1753 (Swamp Lily, String Lily)

A genus of about 65 species, pantropical, extending locally into warm temperate regions. References: Holmes in FNA (2002a); Meerow & Snijman in Kubitzki (1998a).

Identification notes: *Crinum* can be distinguished vegetatively from *Hymenocallis* by its spiral (vs. distichous) leaf arrangement and leaf margins finely toothed (vs. entire).

1 Leaves 7.5-12 cm wide; umbels 20-100-flowered..... ***C. asiaticum***
1 Leaves 1-5 (-7) cm wide; umbels 2-13-flowered.
2 Umbels 2-5-flowered; perianth white; [native]..... ***C. americanum*** *var.* ***americanum***
2 Umbels 8-13-flowered; perianth usually at least in part reddish; [exotic].
3 Flowers pedicellate; bulb 6-8 cm in diameter..... ***C. bulbispermum***
3 Flowers sessile; bulb 12-15 cm in diameter..... ***C. zeylanicum***

Crinum americanum Linnaeus *var.* ***americanum***, Swamp-lily, String-lily. Swamp forests. June-October. Se. NC south to s. FL and west to TX. Var. *traubii* (Moldenke) R.S. Hannibal is endemic in se. TX. [= FNA; < *C. americanum* – GW, K, S, WH]

* ***Crinum asiaticum*** Linnaeus, Poison-bulb. Disturbed areas, native of Asia. Reported for e. LA (East Baton Rouge Parish) and s. FL. [= FNA, K, WH]

* ***Crinum bulbispermum*** (Burman f.) Milne-Redhead & Schweickerdt, Milk-and-wine Lily, Grass-lily, African Swamp-lily. Commonly cultivated, occasional in waste areas; native of s. Africa. June-July. [= FNA, K, WH; ? *C. longifolium* (Linnaeus) Thunberg – S]

* ***Crinum zeylanicum*** (Linnaeus) Linnaeus, Milk-and-wine Lily. Disturbed areas, escaped or persistent from cultivation; native of Sri Lanka and w. India. [= FNA, K, WH]

5. Lycoris Herbert 1819 (Magic Lily)

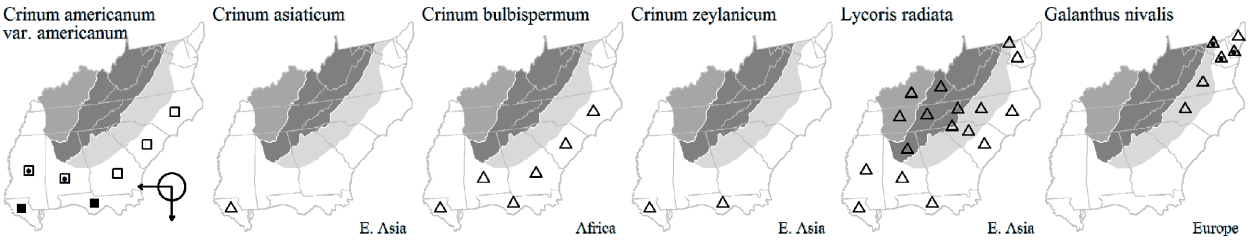
A genus of about 20 species, primarily e. Asian. References: Meerow & Snijman in Kubitzki (1998a).

* ***Lycoris radiata*** (L'Héritier) Herbert, Magic Lily, Surprise Lily, Hurricane Lily. Frequently cultivated, sometimes persistent for long periods of time, especially in lawns around older homes; native of e. Asia. September-October. Leaves and flowers are not present at the same time. Reported as "established as waifs over past decade in lawn" in Jackson County, NC by Pittillo & Brown (1988). [= RAB, K, WH]

6. Galanthus Linnaeus 1753 (Snowdrop)

A genus of about 17 species, of Europe and w. Asia. See Bishop, Davis, & Grimshaw (2001) for detailed information on the genus, especially on cultivars. References: Stace (2010)=Z; Straley & Utech in FNA (2002a); Bishop, Davis, & Grimshaw (2001); Meerow & Snijman in Kubitzki (1998a).

* ***Galanthus nivalis*** Linnaeus, Snowdrop. Persistent after cultivation; native of s. and c. Europe. February-March. [= F, FNA, K, Z]



7. Leucojum Linnaeus 1753 (Snowflake)

A genus of about 10 species, of Europe, n. Africa, and w. Asia. References: Straley & Utech in FNA (2002a); Meerow & Snijman in Kubitzki (1998a).

1 Seeds black; flowers (1-) 2-5 (-7) per stem, flowering March-April; tepals 10-22 mm long ..... ***L. aestivum***
1 Seeds pale; flowers 1 (-2) per stem, flowering January-March; tepals 15-25 mm long ..... ***L. vernum***

* ***Leucojum aestivum*** Linnaeus, Summer Snowflake. Persistent after cultivation; native of Europe. March-April. Reported naturalized in NC by Leonard (1971b). [= RAB, C, F, FNA, G; > *L. aestivum* ssp. *aestivum* – K]

Leucojum vernum Linnaeus, Spring Snowflake. Persistent after cultivation; native of Europe. January-March. [= FNA, K, WH]

8. Narcissus Linnaeus 1753 (Daffodil, Jonquil, Narcissus, Buttercup)

A genus of about 40-60 species, of Europe, n. Africa, and w. Asia. References: Stace (2010)=Z; Jefferson-Brown (1991)=Y; Straley & Utech in FNA (2002a); Hanks (2002); Jefferson-Brown (1969); Meerow & Snijman in Kubitzki (1998a).

Identification notes: The familiar flower consists of 6 tepals spreading in more or less a plane, and a fused, tubular, corona. The hypanthial tube is below the perianth lobes. Other taxa are under cultivation and may be expected as persistent or escaped in our area. Manuals of cultivated plants and the extensive horticultural literature on *Narcissus* (such as the references listed above) should be consulted by those interested in more information on members of this genus.

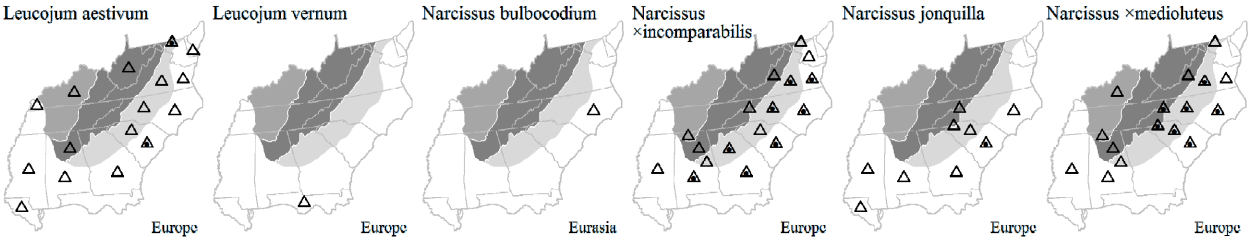
1 Perianth lobes 10-15 mm long; corona 3-5 mm long; leaves and stems cylindrical, hollow; umbel (or spathe, or stem) with 3-10 flowers ..... ***N. jonquilla***
1 Perianth lobes 20-50 mm long; corona 5-50 mm long; leaves and stems flattened, solid; umbel (or spathe, or stem) with 1-4 flowers.
  2 Hypanthial tube (below the tepals) parallel-sided (though sometimes suddenly expanded at its apex); corona < 10 mm long, usually wider than high; corona < 0.5× as long as the perianth lobes; corona rarely undulate; umbel (or spathe, or stem) with 1-10 flowers; stamens of 2 distinct lengths.
    3 Corona rim red, contrasting with the white or yellow corona; umbel (or spathe, or stem) with 1 flower ..... ***N. poeticus***
    3 Corona of a single color, all white or yellow; umbel (or spathe, or stem) with (1-) 2-8 (-20) flowers.
      4 Umbel (or spathe, or stem) with (1-) 2 (-3) flowers; pollen sterile ..... ***N. ×medioluteus***
      4 Umbel (or spathe, or stem) with (2-) 3-8 (-20) flowers; pollen fertile.
        5 Corona white; umbel (or spathe, or stem) with <20 flowers ..... ***N. papyraceus***
        5 Corona yellow; umbel (or spathe, or stem) with (2-) 3-8 (-15) flowers ..... ***N. tazetta***
  2 Hypanthial tube (below the tepals) distinctly widening toward its apex; corona usually > 10 mm long, usually as long as wide or longer than wide; corona > 0.5× as long as the perianth lobes; corona margin undulate; umbel (or spathe, or stem) with 1 flower; stamens of the same length or nearly so.
    6 Tepals linear to lanceolate, < 5 mm wide ..... ***N. bulbocodium***
    6 Tepals ovate, triangular-ovate, or suborbicular, > 10 mm wide.
      7 Corona 30-50 mm long, about as long as the perianth lobes ..... ***N. pseudonarcissus***
      7 Corona 10-25 mm long, distinctly shorter than the perianth lobes
        8 Umbel (or spathe, or stem) with 1 flower; corona usually conspicuously darker in color than the tepals; leaves somewhat glaucous, > 8 mm wide; stem distinctly2-edged ..... ***N. ×incomparabilis***
        8 Umbel (or spathe, or stem) with (1-) 2-4 flowers; corona and tepals the same color; leaves green, < 8 mm wide; stem nearly terete ..... ***N. ×odorus***

* ***Narcissus bulbocodium*** Linnaeus, Hoop-petticoat Daffodil. Grassy roadsides, established; native of Eurasia. March. [= Y, Z]

* ***Narcissus ×incomparabilis*** P. Miller (pro sp.) [*poeticus* × *pseudonarcissus*], Nonesuch Daffodil. Cultivated as an ornamental, persistent and naturalized in lawns, roadsides, woodland borders, and disturbed areas; native of Europe. March-April. [= C, FNA, K, Z; = *N. incomparabilis* – RAB, F, G]

* ***Narcissus jonquilla*** Linnaeus, Jonquil, Apodanthus Daffodil. Cultivated as an ornamental, persistent and naturalized in lawns, roadsides, woodland borders, and disturbed areas; native of Europe. March-April. [= RAB, C, F, FNA, G, K, Z]

* ***Narcissus ×medioluteus*** P. Miller (pro sp.) [*poeticus* × *tazetta*], Primrose-peerless. Cultivated as an ornamental, persistent and naturalized in lawns, roadsides, woodland borders, and disturbed areas; native of Europe. March-May. [= FNA, K, Z; = *N. tazetta* × *poeticus* – RAB]



* ***Narcissus ×odorus*** Linnaeus (pro sp.) [*jonquilla* × *pseudonarcissus*], Campernelle Jonquil, Sweet-scented Jonquil. Cultivated as an ornamental, persistent and naturalized in lawns, roadsides, and disturbed areas; native of Europe. [= FNA, K, Z]

* ***Narcissus papyraceus*** Ker Gawler, Paper-white Daffodil. Cultivated as an ornamental, persistent and naturalized in lawns, roadsides, and disturbed areas; native of Mediterranean Europe. [= FNA, K, Z]

* ***Narcissus poeticus*** Linnaeus, Poet's Narcissus, Pheasant's-eye Daffodil. Cultivated as an ornamental, persistent and naturalized in lawns, roadsides, woodland borders, and disturbed areas; native of Europe. March-May. [= RAB, C, F, FNA, G, K, Z]

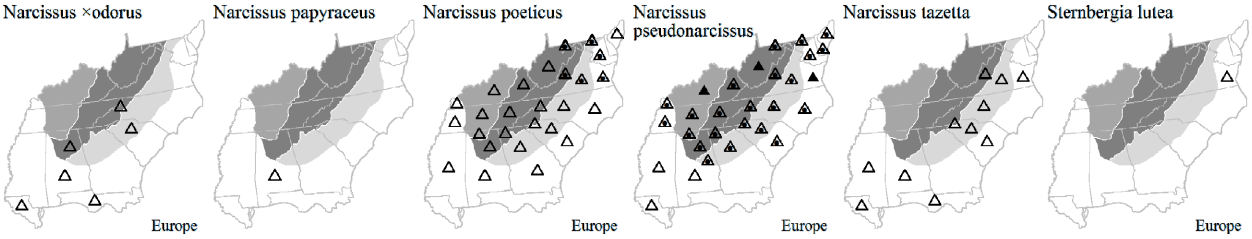
* ***Narcissus pseudonarcissus*** Linnaeus, Daffodil, Buttercup. Cultivated as an ornamental, persistent and naturalized in lawns, roadsides, woodland borders, and disturbed areas; native of Europe. February-April. [= RAB, C, FNA, K, Z; = *N. pseudo-narcissus* – F, G, orthographic variant]

Narcissus tazetta Linnaeus, Bunch-flowered Daffodil. Cultivated as an ornamental, persistent and naturalized in lawns, roadsides, and disturbed areas; native of Mediterranean Europe. [= FNA, K, Z]

9. Sternbergia Waldst. & Kit. 1805 (Winter Daffodil)

A genus of about 8 species, of Mediterranean Europe, n. Africa, and w. Asia. References: Meerow & Snijman in Kubitzki (1998a).

* ***Sternbergia lutea*** (Linnaeus) Ker-Gawler ex Sprengel, Winter Daffodil, Lily-of-the-field. Cultivated as an ornamental, persistent and naturalized in lawns, roadsides, woodland borders, and disturbed areas; native of Europe. This species has yellow, *Crocus*-like flowers, in the autumn. [= K]



10. Habranthus Herbert (Copper-lily)

A genus ca. 30 species, perennial bulbous herbs, of s. North America and South America.

* ***Habranthus tubispathus*** (L'Héritier) Traub, Rio Grande Copperlily. Road shoulders, lawns, disturbed areas; native of s. Brazil. Reported for Coastal Plain of AL (Woods & Diamond 2006), GA (Carter, Baker, & Morris 2009), and FL. [= FNA, K]

11. Zephyranthes Herbert 1821 (Atamasco-lily, Zephyr-lily, Rain-lily)

A genus of about 70 species, from s. North America and the West Indies south to s. South America. References: Flagg, Smith, & Flory in FNA (2002a); Meerow & Snijman in Kubitzki (1998a). Key adapted in part from FNA.

1 Stigma 1, capitate; perianth **either** 3-5 cm long **or** (7.3-) 9-14 (-16) cm long; stamen filaments **either** 1-2 cm long **or** 0.2-0.5 cm long; leaves up to 5 mm wide.
  2 Perianth yellow. ..... ***Z. citrina***
  2 Perianth white (to pinkish).
    3 Perianth 3-4.5 cm long; perianth tube shorter than the spathe; perianth tube shorter than the filaments ..... ***Z. candida***
    3 Perianth (7.3-) 9-14 (-16) cm long; perianth tube longer than the spathe; perianth tube longer than the filaments ..... ***Z. chlorosolen***
1 Stigmas 3 (trifid); perianth (4-) 4.3-9.5 (-11) cm long; stamen filaments (1.5-) 1.6-4.4 (-4.7) cm long; leaves up to 8 mm wide.
  4 Stamen filaments 0.1-0.2 mm long; perianth tube 3-4 (-4.7) cm in length, the stigmas included ..... ***Z. drummondii***
  4 Stamen filaments (1.5-) 1.6-4.4 (-4.7) cm long; perianth tube (0.8-) 1-3.3 (-4) cm in length, the stigmas exserted.
    5 Anthers 13-22 mm long..... ***Z. grandiflora***
    5 Anthers 3-6 (-8) mm long.
      6 Style and stigma as long as or shorter than the anthers; perianth segments erect-ascending at full anthesis, (4-) 4.3-8.5 (-10) cm long.. ..... ***Z. simpsonii***
      6 Style and stigmas extending beyond the anthers; perianth segments spreading at full anthesis, (5.5-) 6.6-9.5 (-11) cm long.
        7 Mature leaves concave, 3-8 mm wide; perianth tube (0.8-) 1-2 (-2.1) cm long; filaments > 1.5× as long as the perianth tube..... ***Z. atamasca***
        7 Mature leaves grooved, 1-4 mm wide; perianth tube usually (1.7-) 2-3 (-3.1) cm long; filaments < 1.5× as long as the perianth tube ..... ***Z. treatiae***

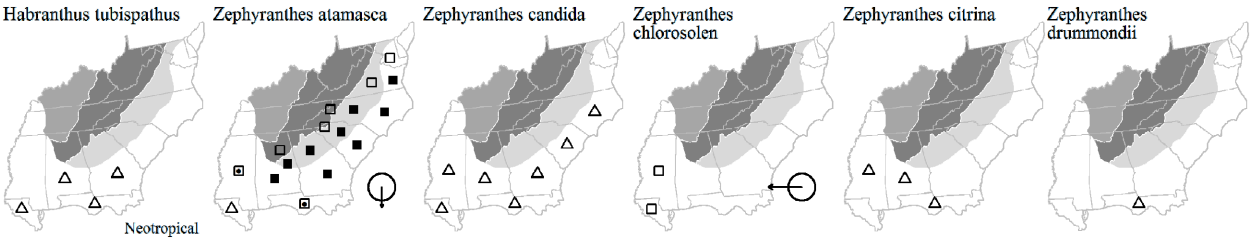
Zephyranthes atamasca (Linnaeus) Herbert, Common Atamasco-lily. Bottomland forests and adjacent road shoulders, wet meadows. Late March-April; May-June. Se. and sc. VA south to n. FL, west to s. MS. [= FNA; = *Z. atamasco* – RAB, C, F, G, GW, orthographic variant; = *Zephyranthes atamasca* var. *atamasca* – K, WH; = *Atamosco atamasco* (Linnaeus) Greene – S, orthographic variant]

* ***Zephyranthes candida*** (Lindley) Herbert. Cultivated, persistent or spreading from cultivation; native of South America. Late September-October. [= RAB, FNA, K, WH; = *Atamosco candida* (Lindley) Small – S]

Zephyranthes chlorosolen (Herbert) D. Dietrich. Prairies and other moist to dry habitats. May-October. [= FNA; = *Cooperia drummondii* Herbert – GW, S; = *Cooperia chlorosolen* Herbert – K]

* ***Zephyranthes citrina*** Baker, Yellow Zephyr-lily, Citron Rain-lily. Disturbed areas; native of South America. [= FNA, K, WH]

* ***Zephyranthes drummondii*** (Herbert) D. Don, Ceboletta. Disturbed areas; native of TX and Mexico. [= FNA, WH; = *Cooperia pedunculata* Herbert – K]



* ***Zephyranthes grandiflora*** Lindley. Disturbed areas; native of Mexico. [= K, SE]

Zephyranthes simpsonii Chapman, Florida Atamasco-lily. Dry to dry-mesic sandy soils (usually with admixture of shell hash) of coastal fringe sandhills or mainland maritime forests, usually associated with *Quercus hemispherica*, on barrier islands or within about 10 km of the ocean (NC, SC), pine flatwoods (FL, GA). April-May; May-June. Se. NC (Brunswick and Columbus counties) and ne. SC (Horry and Georgetown counties); s. GA, c. and s. peninsular FL. The disjunct populations in NC and SC may differ from *Z. simpsonii* (sensu stricto) of s. GA and c. and s. peninsular FL, and need additional study. [= RAB, FNA, GW, K, WH; = *Atamosco simpsonii* (Chapman) Greene – S]

Zephyranthes treatiae S. Watson. Wet savannas. January-April. S. GA (Jones & Coile 1998) south to c. peninsular FL. [= FNA, GW; = *Z. atamasca* (Linnaeus) Herbert var. *treatiae* (S. Watson) Meerow – K, WH; = *Atamasco treatiae* (S. Watson) Greene – S]

12. Hymenocallis Salisbury 1812 (Spider-lily)

A genus of about 50 species, from s. North America and the West Indies south to ne. South America. The appropriate systematics and nomenclature of *Hymenocallis* in se. United States are still unstable and uncertain. Recent publications by Smith and co-workers (e.g. Smith & Garland 1996, 2003; Smith & Flory 1990; Smith & Flory in FNA (2002a) have revolutionized our understanding of southeastern United States *Hymenocallis*. References: Smith & Garland (2003)=Z; Meerow & Snijman in Kubitzki (1998a); Smith & Flory in FNA (2002a). Key adapted from Smith & Flory in FNA (2002a).

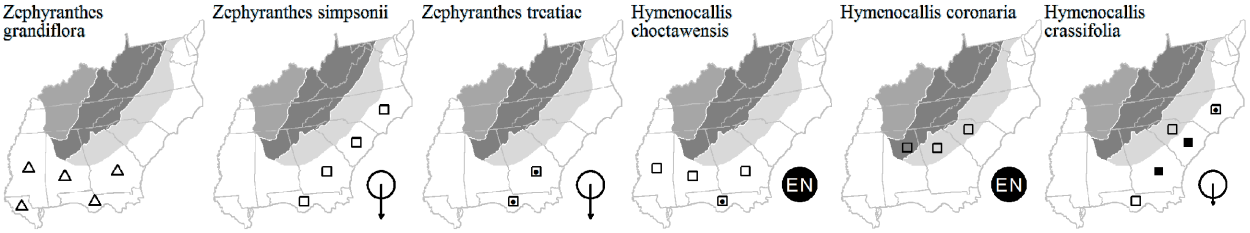
Identification notes: *Hymenocallis* can be distinguished vegetatively from *Crinum* by its distichous (vs. spiral) leaf arrangement and leaf margins entire (vs. finely toothed).

1 Ovules 4-8 per locule; ovary 14-30 mm long, 6-15 mm wide; [FL].
  2 Corona 6-9 cm wide ..... ***H. rotata***
  2 Corona 3-6 cm wide.
    3 Tepals white ..... ***H. godfreyi***
    3 Tepals yellowish-green to pale green.
      4 Flowers 1 per inflorescence; tepals ascending, equal to or shorter than the perianth tube; [ne. FL south to s. FL] ..... ***H. palmeri***
      4 Flowers 2 per inflorescence; tepals spreading, nearly always longer than the perianth tube; [Panhandle FL].
        5 Leaves strongly glaucous; tepals to 16 cm long; plants in loose to dense clumps; [east of the Apalachicola River (Liberty County, FL)] ..... ***H. henryae*** *var.* ***glaucifolia***
        5 Leaves green to slightly glaucous; tepals to 13 cm long; plants singly or in loose clumps; [west of the Apalachicola River (Bay, Gulf, and Walton counties, FL)] ..... ***H. henryae*** *var.* ***henryae***
1 Ovules 1-3 (-4) per locule; ovary 7-15 mm long, 5-10 mm wide; [collectively more widespread].
  6 Staminal cup >4.5 cm long; [rocky river shoals of the Piedmont of SC, GA, and AL] ..... ***H. coronaria***
  6 Staminal cup <4.5 cm long; [Coastal Plain, Piedmont floodplains, and the GA Ridge and Valley].
    7 Leaves oblanceolate, slightly to distinctly wider toward the tip.
      8 Leaves not coriaceous, distinctly glaucous; scape bracts 4-7 cm long, the tip long-acuminate; bulbs non-rhizomatous; [of moist but not mucky habitats] ..... ***H. occidentalis*** *var.* ***occidentalis***
      8 Leaves coriaceous, not glaucous; scape bracts 3-4 (-6) cm long, the tip acute; bulbs rhizomatous; [of wet habitats].
        9 Scape bracts 3-4 (-6) cm long, the tip acute; leaves distinctly wider towards the tip; bulb 3-6 cm long, 1.5-5 cm wide ..... ***H. choctawensis***
        9 Scape bracts 4-5 cm long, the tip acuminate; leaves slightly wider towards the tip; bulb 4.5-7.5 cm long, 2.5-5.5 cm wide ..... ***H. gholsonii***
    7 Leaves liguliform, not wider toward the tip, the margins parallel throughout.
      10 Flowers (3-) 5-12 per inflorescence ..... ***H. liriosme***
      10 Flowers 1-3 (rarely more) per inflorescence.
        11 Staminal cups rotate at full anthesis; leaves chiefly arching low, often appearing prostrate; [of s. GA south into FL] ..... ***H. duvalensis***
        11 Staminal cups funnelform at full anthesis but gradually spreading in time; leaves suberect to erect; [of se. NC south to FL].
          12 Perianth segments 5.0-6.5 cm long; leaves 1.5-4 dm long ..... ***H. pygmaea***
          12 Perianth segments (6-) 7-11.5 cm long; leaves 3-7 dm long
            13 Scape bracts narrowly lanceolate, 2.5-5 cm long, 7-12 mm wide; [NC south to ne. FL] ..... ***H. crassifolia***
            13 Scape bracts lanceolate, 3-4.5 cm long, 10-15 mm wide; [lower Ochlockonee River, Panhandle FL] ..... ***H. franklinensis***

Hymenocallis choctawensis Traub, Florida Panhandle Spiderlily, Choctaw Spiderlily. Floodplains. GA (floodplain of the Ochlockonee River) and Panhandle FL west to LA. [= FNA, K, WH, Z; < *Hymenocallis sp. ?* – GW]

Hymenocallis coronaria (LeConte) Kunth, Shoals Spiderlily, Cahaba Lily. Rocky river shoals, usually with *Justicia americana* and *Podostemum ceratophyllum*. Mid May-July; July-September. SC south and west to AL. Notable stands of this spectacular plant occur at Landsford Canal State Park (on the Catawba River south of Rock Hill, SC), on the Saluda River (SC), on the Savannah River below I-20 (GA-SC border), and on the Cahaba River (Bibb County, AL). [= FNA, Z; *? H. occidentalis* (Le Conte) Kunth – RAB, S, misapplied; < *Hymenocallis sp. ?* – GW; *? H. caroliniana* (Linnaeus) Herbert – K, misapplied]

Hymenocallis crassifolia Herbert. Tidal marshes, margins of tidal guts, banks of blackwater rivers. May-June; June-July. Se. NC south to ne. FL. [= RAB, FNA, S, WH, Z; < *Hymenocallis sp. ?* – GW; *? H. floridana* (Rafinesque) Morton – K, misapplied]



Hymenocallis duvalensis Traub, Dixie Spiderlily, Duval Spiderlily. Blackwater floodplain (Suwanee River). S. GA (floodplain of the Suwanee River) south to n. FL. [= FNA, K, WH, Z; < *Hymenocallis sp. ?* – GW]

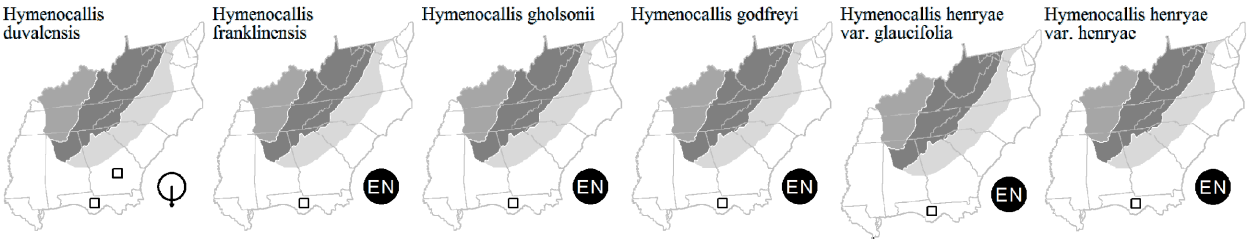
Hymenocallis franklinensis G. Lom. Smith, L.C. Anderson, & Flory, Cow Creek Spiderlily. Slightly brackish river margins. Endemic to the Ochlockonee River (Franklin and Wakulla counties) in the FL Panhandle. [= FNA, WH, Z; < *Hymenocallis sp. ?* – GW] {synonymy incomplete}

Hymenocallis gholsonii G. Lom. Smith & Garland, Gholson's Spiderlily. Pineland bogs. April-May. Endemic to Liberty County in the FL Panhandle. See Smith & Garland (2008) for detailed information. [< *Hymenocallis sp. ?* – GW]

Hymenocallis godfreyi G. Lom. Smith & Darst, Godfrey's Spiderlily, St. Marks Marsh Spiderlily. Brackish marshes. Endemic to Wakulla County in the FL Panhandle. [= FNA, K, WH, Z; < *Hymenocallis sp. ?* – GW] {synonymy incomplete}

Hymenocallis henryae Traub *var.* ***glaucifolia*** J.N. Henry & G. Lom. Smith, Liberty Spiderlily, Blue Spiderlily. Cypress depressions and wet pine flatwoods. Endemic to Liberty County in the FL Panhandle. [= FNA, WH, Z; < *Hymenocallis sp. ?* – GW; < *H. henryae* – K] {synonymy incomplete}

Hymenocallis henryae Traub *var.* ***henryae***, Henry's Spiderlily, Green Spiderlily. Cypress depressions and wet pine flatwoods. Endemic to Bay, Gulf, and Walton counties in the Panhandle of FL. [= FNA, WH, Z; < *Hymenocallis sp. ?* – GW; < *H. henryae* – K] {synonymy incomplete}



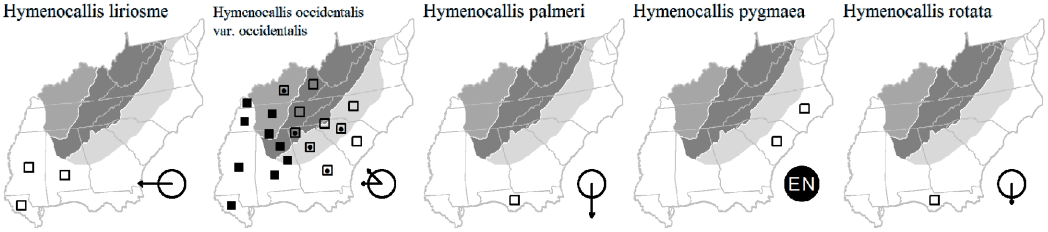
Hymenocallis liriosme (Rafinesque) Shinners, Western Marsh Spiderlily; Louisiana Marsh Spiderlily. Swamps, bottomlands, ditches. March-May. AR and OK south to s. AL and TX. [= FNA, Z; < *Hymenocallis sp. ?* – GW; > *H. liriosme* – K]

Hymenocallis occidentalis (LeConte) Kunth *var.* ***occidentalis***, Hammock Spiderlily, Woodland Spiderlily. Mesic soils of slopes and floodplain forests, gabbro glades and other calcareous upland flats. NC west to AR and LA. Var. *eulae* (Shinners) G. Lom. Smith & Flory is endemic in the West Gulf Coastal Plain. [= FNA, Z; < *Hymenocallis sp. ?* – GW; < *H. occidentalis* – S, WH; = *H. caroliniana* (Linnaeus) Herbert – K, misapplied]

Hymenocallis palmeri S. Watson, Alligator-lily. Cypress swamps; wet pine flatwoods, disturbed wet areas. From ne. FL (Bradford and Duval counties) south to s. peninsular FL. [= FNA, WH, Z; < *Hymenocallis sp. ?* – GW; < *H. palmeri* S. Watson – K] {synonymy incomplete}

Hymenocallis pygmaea Traub, Pygmy Spiderlily, Waccamaw Spiderlily. Banks of blackwater rivers. May-June; June-July. Se. NC south to ne. SC, perhaps endemic to the Waccamaw River drainage. Needing further study, but strikingly different in appearance from *H. crassifolia*. [= FNA, Z; < *Hymenocallis sp. ?* – GW; < *H. palmeri* S. Watson – K]

Hymenocallis rotata (Ker Gawler) Herbert, Spring-run Spiderlily. Spring-runs. Endemic to FL, in the Panhandle (Wakulla County) and n. peninsular FL (Alachua, Columbia, and Duval counties southward to c. peninsular FL). [= FNA, K, WH, Z; < *Hymenocallis sp. ?* – GW] {synonymy incomplete}



75a. ASPARAGACEAE A.L. de Jussieu 1789 (Asparagus Family) [in ASPARAGALES]

A family of a single genus and 170-300 species, widespread in Europe, Africa, Asia, and Australia (introduced elsewhere). References: Dahlgren, Clifford, & Yeo (1985); Kubitzki & Rudall in Kubitzki (1998a).

Asparagus Linnaeus (Asparagus)

A genus of 170-300 species, widespread in Europe, Africa, Asia, and Australia (introduced elsewhere). References: Kubitzki & Rudall in Kubitzki (1998a); Straley & Utech in FNA (2002a).

1 Cladophylls flattened, ca. 2 mm wide ..... ***A. aethiopicus***
1 Cladophylls filiform, < 0.7 mm wide.
  2 Flowers in 1-3-flowered axillary racemes; berries 6-10 mm long, red; erect herb (sometimes arching in age) ..... ***A. officinalis***
  2 Flowers in 1-4-flowered terminal umbels; berries 4-5 mm long, purplish-black; scrambling vine ..... ***A. setaceus***

* ***Asparagus aethiopicus*** Linnaeus, Sprenger's Asparagus-fern, Emerald-fern. Disturbed areas; native of s. Africa. Recently found in SC by R. Stalter (pers. comm. 2009). Kunzer et al. (2009) report several locations for Panhandle FL. [= FNA, WH; ? *A. densiflorus* (Kunth) Jessop (misapplied); ? *A. sprengeri* Regel]

* ***Asparagus officinalis*** Linnaeus, Asparagus, Sparrowgrass, Garden Asparagus. Commonly cultivated, commonly escaped to fencerows, roadsides, disturbed areas; native of Eurasia. April-May (or later); July-October. [= RAB, C, F, FNA, G, K, S, W]

* ***Asparagus setaceus*** (Kunth) Jessop, Climbing Asparagus-fern. Disturbed areas, sometimes epiphytic; native of e. and s. Africa. Reported for Camden and Lowndes counties GA (Carter, Baker, & Morris 2009). [= FNA, WH]

75b. RUSCACEAE M. Roemer 1840 (Ruscus Family) [in ASPARAGALES]

As here circumscribed, a family of about 28 genera and 500 species, of North America, Central America, Europe, and Asia. The Convallariaceae has been supported by molecular studies (Judd 2003, Bogler & Simpson 1995). Molecular studies show that *Nolina* is much more closely related to *Convallaria*, *Polygonatum*, etc. than to the Agavaceae (*Yucca* and *Manfreda* in our flora), with which it has often been associated. References: Bogler & Simpson (1995); Bogler in Kubitzki (1998a); Yeo in Kubitzki (1998a); Conran & Tamura in Kubitzki (1998a); Yamashita & Tamura (2000).

1 Plant with an upright stem with alternate leaves.
  2 Shrub; "leaves" (actually phylloclades) coriaceous, evergreen, glossy; [exotic, rarely naturalized]; [tribe *Rusceae*] ..... ***Danae***
  2 Herb; leaves herbaceous, deciduous, dull or slightly glossy; [native]; [tribe *Polygonatae*].
    3 Inflorescence terminal, a raceme or panicle; tepals separate ..... ***Maianthemum***
    3 Inflorescence of 1-several axillary flowers; tepals fused ..... ***Polygonatum***
1 Plant tufted, the leaves essentially basal (although the sheathing bases form a 'false' stem in *Convallaria*).
  4 Leaves 2-3, narrowly elliptic; tepals fused, white or greenish; [tribe *Convallarieae*] ..... ***Convallaria***
  4 Leaves many, linear; tepals separate (or fused basally), white or violet.
    5 Fruit dehiscent, dry and capsular; inflorescence a panicle or raceme, to 15 dm tall; [natives, of longleaf pine woodlands of SC, GA, and FL]; [tribe *Nolineae*] ..... ***Nolina***
    5 Fruit indehiscent, quickly exposing berry-like seeds with a fleshy seed coat; inflorescence spikelike, to 4 dm tall; [aliens, naturalized from horticultural plantings]; [tribe *Ophiopogoneae*].
      6 Flowers erect, the pedicel strict; ovaries superior ..... ***Liriope***
      6 Flowers nodding, the pedicel recurved; ovaries inferior or half-inferior ..... ***Ophiopogon***

Convallaria Linnaeus 1753 (Lily-of-the-Valley)

A genus of 3 species, of north temperate n. Eurasia and e. North America. References: Utech in FNA (2002a); Judd (2003)=Z; Conran & Tamura in Kubitzki (1998a).

1 Leaf blades averaging 10-15 cm long, 3-5 cm wide; rhizomes short-creeping, the "individual" plants spaced closely (typically 5-10 cm apart); flowering scape > ½ as long as the leaves; longer bracts of the inflorescence 4-10 mm long; [introduced, persistent around old home sites and other plantings] ..... ***C. majalis***
1 Leaf blades averaging 15-35 cm long, 5-13 cm wide; rhizomes absent or long-creeping, the individual plants spaced widely (usually at least 15 cm apart); flowering scape < ½ as long as the leaves; longer bracts of the inflorescence 8-20 mm long; [native, of forests of the Mountains and upper Piedmont] ..... ***C. majuscula***

* ***Convallaria majalis*** Linnaeus, European Lily-of-the-Valley. Persistent after cultivation; native of Eurasia. April-May; July-August. [= F, K, W, WV; = *C. majalis* var. *majalis* – RAB, FNA; < *C. majalis* – C, G, S, Z (also see *C. majuscula*)]

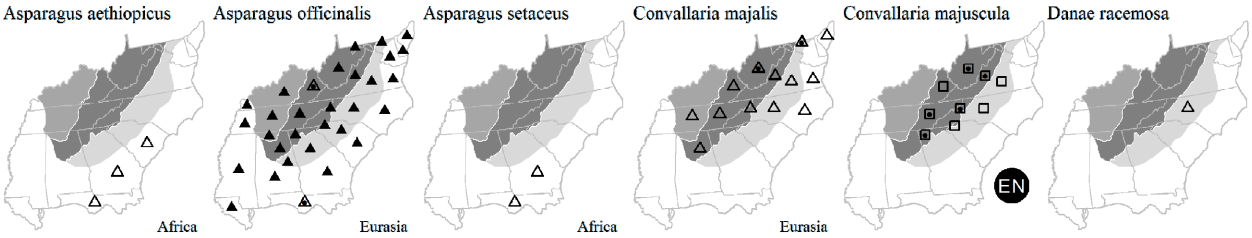
Convallaria majuscula Greene, American Lily-of-the-Valley. Mountain forests, particularly in rocky woodlands or forests on or near ridgetops under northern red oak at about 1000 to 1500 m elevation, sometimes at lower elevations (down to at least 700 m) and under *Quercus montana*. April-June; August. Endemic to the Southern Appalachians: WV and VA through NC and TN to ne. GA (Jones & Coile 1988) and nw. SC. Cronquist's (1991) statement that Southern Appalachian plants "may reflect an early escape of a different phase of the species from cultivation" can be discounted; there is no doubt that *C. majuscula* is both native and taxonomically distinct, at a varietal level at least. Utech in FNA (2002a) states that our plants are more closely related to the Asian taxon, variously treated as *C. keiskei* Miquel or *C. majalis* var. *keiskei* (Miquel) Makino, than to the European *C. majalis* s.s. As best as can be determined, Rafinesque's name *Convallaria montana* does not apply to this species. [= K; = *C.*

majalis Linnaeus var. *montana* (Rafinesque) Ahles – RAB, FNA, apparently misapplied; < *C. majalis* – C, G, S, Z; = *C. montana* Rafinesque – F, W, WV, apparently misapplied]

Danae Medikus (Alexandrian Laurel, Danaë)

A monotypic genus, a shrub, of sw. Asia.

* ***Danae racemosa*** (Linnaeus) Moench, Alexandrian Laurel. Suburban forests; rare, uncommon in cultivation, rarely escaping to suburban forests; native of sw. Asia. The "leaves" are actually odd structures called phylloclades, and represent modified stems.



Liriope Loureiro 1790 (Liriope, Lilyturf)

A genus of 8 species, herbs, of e. and se. Asia. References: Nesom (in prep.)=Y; Conran & Tamura in Kubitzki (1998a); Judd (2003)=Z. Key based on Y.

1 ..... ***L. muscari***
1 ..... ***L. spicata***

* ***Liriope muscari*** (Decaisne) L.H. Bailey, Liriope, Big Blue Lilyturf. Commonly planted, rarely persistent and escaping, but locally abundant; native of China, Japan, and Taiwan. [= K, Y, Z]
* ***Liriope spicata*** Loureiro, Creeping Lilyturf. Commonly planted, rarely persistent and escaping; native of {}. [= Y, Z; = *L. spicatum* – K, orthographic variant]

Maianthemum G.H. Weber ex Wiggers 1780 (Mayflower, Solomon's-plume)

A genus of about 28 species, herbs, of n. Europe, e. Asia, North America, and Central America. The inclusion of the traditional *Smilacina* in *Maianthemum* will cause considerable consternation; LaFrankie's (1986) reasoning, however, seems very strong, and has been additionally supported by more recent evidence (Conran & Tamura in Kubitzki 1998a). The only consistent difference between the two previously accepted genera is whether the flowers are dimerous (*Maianthemum*) or trimerous (*Smilacina*). LaFrankie cites research that shows that the dimerous flowers of *Maianthemum* (*sensu stricto*) are the result of reduction from trimerous flowers, as indicated by vestigial vascular traces. Consideration of the many close similarities, particularly as compared to similar genera such as *Prosartes*, *Polygonatum*, *Streptopus*, and *Clintonia*, may convince the skeptical (see LaFrankie 1986 and Therman 1956). As an example, the fruits of *M. canadense* and *M. racemosum* are closely similar in form, coloration, and size; much more similar than the fruits of our 2 species of *Prosartes*. References: LaFrankie (1986)=Z; Judd (2003)=Y; LaFrankie in FNA (2002a); Conran & Tamura in Kubitzki (1998a).

1 Flowers in a terminal panicle ..... ***M. racemosum*** *ssp.* ***racemosum***
1 Flowers in a simple raceme.
  2 Perianth segments 4 (flowers 2-merous); leaves (1-) 2 (-3) ..... ***M. canadense***
  2 Perianth segments 6 (flowers 3-merous); leaves 6 or more ..... ***M. stellatum***

Maianthemum canadense Desfontaines, Canada Mayflower, False Lily-of-the-valley. Moist forests, especially at high elevations. Mid May-early July; August-September. NL (Labrador) and NL (Newfoundland) west to NT, south to MD, NC, n. GA (Jones & Coile 1988), KY and SD. Two varieties have been described, but their recognition is not strongly supported. Var. *canadense*, with leaves glabrous beneath, the margins entire or minutely crenulate, cross-veins of the leaf well-developed, is widepread in the distribution of the species. Var. *interius* Fernald has the leaves pubescent beneath, the leaf margins distinctly ciliate, and cross-veins obscure; it is not known from our area, but extends east and south as far as MA, NY, and OH. Further study of these varieties is needed. Weller (1970) reports equivocal results on the recognition of varieties, based on a study in n. MI. [= RAB, FNA, K, W, WV, Y, Z; > *Maianthemum canadense* Desfontaines var. *canadense* – C, F, G; = *Unifolium canadense* (Desfontaines) Greene – S]

Maianthemum racemosum (Linnaeus) Link *ssp.* ***racemosum***, Eastern Solomon's-plume, False Solomon's-seal. Forests. Mid April-June; August-October. The species ranges from NS west to BC, south to GA, FL Panhandle, and AZ. A variety of chromosome races are known (2n = 36, 72, 144). The eastern ssp. *racemosum* is tetraploid; ssp. *amplexicaule* (Nuttall) LaFrankie is diploid and more western; these are perhaps more appropriately treated as species. Under the generic name *Smilacina*, two varieties had been described for our area, *Smilacina racemosa* var. *racemosa* and *S. racemosa* var. *cylindrata* Fernald, the former larger in nearly all respects and more northern than the latter, smaller, and more southern form (see F for

details). If these varieties are determined to have merit (further research is needed), the appropriate transfer to *Maianthemum* will need to be made. [= FNA, K, Y, Z; < *Smilacina racemosa* (Linnaeus) Desfontaines – RAB, C, G, W; > *S. racemosa* var. *racemosa* – F, WV; > *S. racemosa* var. *cylindrata* Fernald – F, WV; > *Vagnera racemosa* (Linnaeus) Morong – S; > *Vagnera australis* Rydberg – S; < *M. racemosum* – WH]

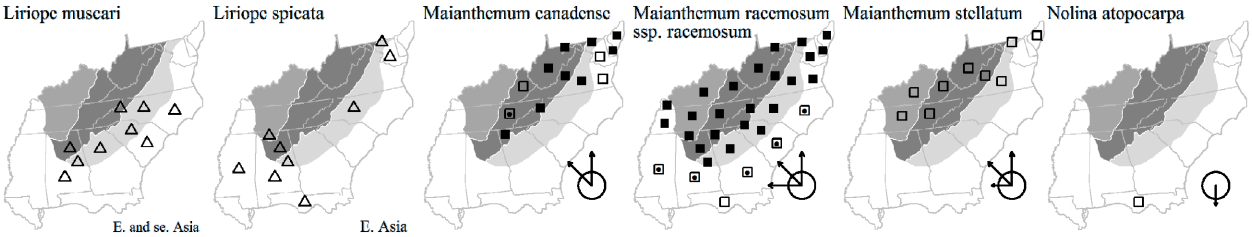
Maianthemum stellatum (Linnaeus) Link, Starry Solomon's-plume. Alluvial forests. April-June; August-October. NL (Newfoundland) west to BC, south to NJ, w. VA, e. TN, IN, MO, and CA. [= FNA, K, Y, Z; = *Smilacina stellata* (Linnaeus) Desfontaines – C, F, G, W, WV]

Nolina Michaux 1803 (Beargrass)

A genus of about 30 species, rosette shrubs and trees, of s. United States and Mexico. References: Hess in FNA (2002a); Judd (2003)=Z; Bogler in Kubitzki (1998a).

1 Leaves 3-4 (-5) mm wide; fruit 4-4.5 mm long, strongly asymmetrical; [of moist flatwoods of the FL Coastal Plain]..... ***N. atopocarpa***
1 Leaves 4-10 mm wide, glaucous; fruit 6.5-8 mm long, symmetrical; [of dry to dry-mesic sandhills of the GA and SC Coastal Plain] ..... ***N. georgiana***

Nolina atopocarpa Bartlett, Florida Beargrass. Pine flatwoods and savannas. Endemic to Panhandle FL (Liberty and Franklin counties) and e. peninsular FL (St. Johns and Brevard counties). [= FNA, K, S, WH, Z]



Nolina georgiana Michaux, Georgia Beargrass, Sandhills Lily. Sandhills, sometimes locally common on slightly less xeric lower sandhill slopes. Late May-June; late June-August. Nc. SC south to sc. GA. This species has been attributed to FL (Small 1933), but is not included in either Clewell (1985) or Wunderlin (1982, 1998). [= RAB, FNA, K, S, Z]

Ophiopogon Ker-Gawler (Mondo Grass)

A genus of 54 species, perennial herbs, of e. Asia. References: Nesom (in prep.)=Y; Conran & Tamura in Kubitzki (1998a).

* ***Ophiopogon japonicus*** (Thunberg) Ker-Gawler, Mondo Grass, Black Mondo. Suburban forests; native of China, Taiwan, Japan, and Korea. [= K, Y]

Polygonatum P. Miller 1754 (Solomon's-seal)

A genus of about 57 species, of temperate Eurasia and North America (most diverse in e. Asia). The *P. biflorum* complex is in need of further study. References: Ownbey (1944)=Z; Judd (2003)=Y; Utech in FNA (2002a); Eigsti (1942); Therman (1950, 1953); Kawano & Iltis (1963); Conran & Tamura in Kubitzki (1998a).

1 Leaves pubescent on the veins beneath; flowers 7-13 mm long ..... ***P. pubescens***
1 Leaves glabrous; flowers 12-21 mm long.
  2 Stem robust, 5-13 mm thick below the leaves; plants to 20 dm tall; lower axillary peduncles strongly flattened, with (2-) 3-6 (-15) flowers; lowest peduncle in the axil of the (3rd-) 4th-5th (-8th) leaf; larger leaves 9-25 cm long, 3.5-13 cm wide; lower leaves clasping to 300° ..... ***P. biflorum*** *var.* ***commutatum***
  2 Stem slender, 1.5-5 mm in diameter; plants to 9 dm tall; lower axillary peduncles terete or nearly so, with (1-) 2-3 (-5) flowers; lowest peduncle in the axil of the (1st-) 3rd (-5th) axil; larger leaves 5.5-15 cm long, 1.2-6 cm wide; lower leaves clasping to 90 (-180)°.
    3 Corolla (11-) 13-15 (-19) mm long; larger leaves 5.5-15 cm long, 1.2-6 cm wide, 3-6× as long as broad; [widespread] ..... ***P. biflorum*** *var.* ***biflorum***
    3 Corolla 20-23 mm long; larger leaves 6.5-13 cm long, 0.8-2 cm wide, 5-9× as long as broad; [endemic to Panhandle FL]..... ***P. biflorum*** *var.* ***hebetifolium***

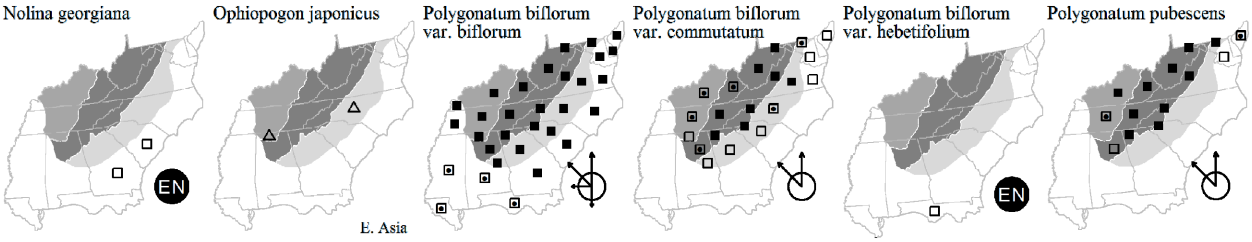
Polygonatum biflorum (Walter) Elliott *var.* ***biflorum***, Small Solomon's-seal. Moist to dry forests. April-June; August-October. CT, NY, and s. ON west to MI, NE, and IN, south to n. FL and s. AL. In addition to the varieties recognized for our area, *P. biflorum* includes two additional varieties: var. *melleum* (Farwell) R. Ownbey of MI and ON, and var. *necopinum* R. Ownbey from the Black Hills of SD. The complex needs additional study. See var. *commutatum* for discussion of its distinction from var. *biflorum*. [= Z; < *P. biflorum* – RAB, C, FNA, W, WH, Y; = *P. biflorum* – F, G, WV; < *P. biflorum* var. *commutatum* (J.A. & J.H. Schultes) Morong – K; < *P. commutatum* (J.A. & J.H. Schultes) A. Dietrich – S]

Polygonatum biflorum (Walter) Elliott *var.* ***commutatum*** (J.A. & J.H. Schultes) Morong, Large Solomon's-seal, King Solomon's-seal. Moist forests, roadbanks. May-June; September-October. NH west to s. MB, south to SC, GA, LA, and TX.

There has been a wide divergence of opinion regarding the merits (and practicality) of distinguishing this taxon from typical *P. biflorum*, and the characters considered most reliable; the two taxa may differ in chromosome number and geographical distribution; they are not, however, always readily distinguished morphologically. I prefer to recognize this taxon as a variety. See references for additional discussion. [< *P. biflorum* – RAB, C, FNA, W, Y; = *P. canaliculatum* (Muhlenberg ex Willdenow) Pursh – F, G, WV, misapplied; < *P. biflorum* var. *commutatum* (J.A. & J.H. Schultes) Morong – K; < *P. commutatum* (J.A. & J.H. Schultes) A. Dietrich – S; = *P. commutatum* – Z]

Polygonatum biflorum (Walter) Elliott) *var.* ***hebetifolium*** R.R. Gates, Apalachicola Solomon's-seal. Rich bluff forests. Endemic to FL Panhandle. [= K, Z; < *P. biflorum* – FNA, WH; < *P. commutatum* (J.A. & J.H. Schultes) A. Dietrich – S]

Polygonatum pubescens (Willdenow) Pursh. Moist forests, especially cove forests. Late April-June; August-October. S. QC west to s. MB, south to nw. SC, WV, KY, IN, WI, and IA. [= RAB, C, F, FNA, G, K, W, WV, Y, Z; = *P. biflorum* – S, misapplied]



75c. AGAVACEAE Endlicher 1841 (Agave Family) [in ASPARAGALES]

A family of about 25 genera and 640 species, herbs and rosette shrubs, of temperate and tropical America. The placement of *Camassia*, *Schoenolirion*, and *Hastingsia*, sometimes grouped as Hyacinthaceae subfamily Chlorogaloideae, is uncertain; they are probably better placed in the Agavaceae, a position supported by molecular, serological, and biogeographic evidence. References: Verhoek & Hess in FNA (2002a); Bogler & Simpson (1995, 1996); Verhoek in Kubitzki (1998a).

1 Plants with erect woody stems; leaves cauline ..... ***Yucca***
1 Plants acaulescent; leaves in basal rosettes.
  2 Margins of leaves fraying into coarse, whitish, curly fibers; tepals about 4 cm long; leaves stiff and > 15 mm wide ..... ***Yucca***
  2 Margins of leaves entire, not fraying; tepals < 2 cm long; leaves stiff and wiry (and < 5 mm wide), herbaceous, or fleshy.
    3 Leaves oblong-acute, 2-9 cm wide, 2-10× as long as wide, fleshy ..... ***Manfreda***
    3 Leaves linear, 0.3-1.8 cm wide, 20-100× as long as wide, herbaceous or wiry.
      4 Leaves narrowly linear, 3-5 mm wide, wiry and grasslike; inflorescence a diffuse panicle; perianth segments 2-4 mm long, white..... ***[Nolina** – see RUSCACEAE]*
      4 Leaves linear, 2-18 mm wide, herbaceous; inflorescence a raceme; perianth segments 13-18 mm long, blue or nearly white.
        5 Perianth segments 13-18 mm long, blue or nearly white ..... ***Camassia***
        5 Perianth segments 5-7 mm long, white, cream, or yellow ..... ***Schoenolirion***

Camassia Lindley 1832 (Wild Hyacinth, Quamash Lily, Camas Lily)

A genus of 6 species, of North America. The family placement of *Camassia* is uncertain; there is increasing evidence that the affinities of *Camassia* are with the Agavaceae, rather than the Hyacinthaceae (Fay & Chase 1996, Bogler & Simpson 1996, Speta in Kubitzki 1998a). References: Ranker & Hogan in FNA (2002a); Speta in Kubitzki (1998a).

Camassia scilloides (Rafinesque) Cory, Wild Hyacinth, Quamash Lily, Eastern Camas Lily. Moist forests, over circumneutral soils, in GA, VA, and WV on limestone, in NC on slopes and natural levees along the Roanoke River, in SC over gabbro. April-May. W. PA and s. ON west to s. WI and e. KS, south to nw. GA (Jones & Coile 1988) and TX, nearly entirely west of the Blue Ridge, with only a few disjunct occurrences in the Piedmont and Coastal Plain. [= RAB, C, F, FNA, G, K, W; = *Quamasia hyacintha* (Rafinesque) Britton – S]

Manfreda Salisbury 1866 (False-aloe)

A genus of about 26 species, primarily in sw. United States, Mexico, and Central America. References: Verhoek in FNA (2002a); Speta in Kubitzki (1998a).

Manfreda virginica (Linnaeus) Salisbury ex Rose, Rattlesnake-master, Eastern False-aloe. Granite flatrocks, diabase glades, xeric woodlands over mafic or calcareous rocks, sandhill woodlands. Late May-August; August-October. E. SC, c. NC, sw. VA, w. WV, s. OH, s. IN, s. IL, and MO south to c. peninsular FL and TX. [= FNA, K, W, WH; = *Agave virginica* Linnaeus – RAB, C, F, WV; > *M. tigrina* (Engelmann) Small – S; > *M. virginica* – S; = *Polianthes virginica* (Linnaeus) Shinners]

Schoenolirion Torrey ex Durand (Sunnybell)

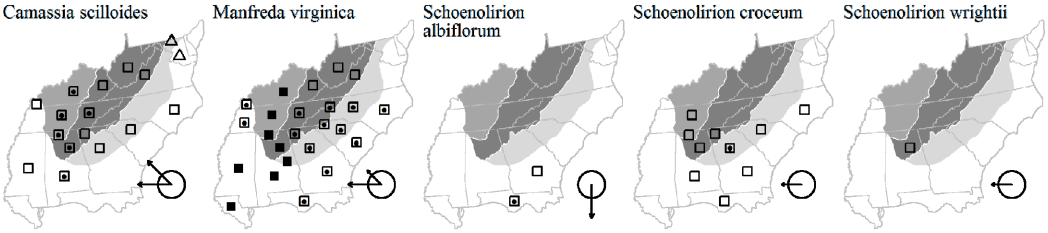
A genus of 3 species, herbs, of s. North America. References: Sherman in FNA (2002a).

1 Inflorescence with 1-6 branches; leaves without fleshy bases, withering to a persistent fibrous crown ..... ***S. albiflorum***
1 Inflorescence rarely branched; leaves with fleshy bases, not fibrous.
2 Perianth golden-yellow ..... ***S. croceum***
2 Perianth white ..... ***S. wrightii***

Schoenolirion albiflorum (Rafinesque) R.R. Gates, White Sunnybell. Wet pinelands, cypress depressions, *Hypericum* depressions, wet hammocks. E. GA south to s. FL and west to AL. [= FNA, K, WH; = *S. elliottii* Feay ex A. Gray – GW; = *Oxytria albiflora* (Rafinesque) Pollard – S]

Schoenolirion croceum (Michaux) Wood, Yellow Sunnybell. Wet pine savannas, bogs, seepage slopes, seepages on granite flatrocks. April-May; May-June. SC (and allegedly NC) south to ne. FL, west to se. TX; and in c. TN on limestone glades (Chester et al. 1993). The occurrence in NC in "wet pinelands" in Richmond County referred to in RAB has not been relocated or further documented. [= RAB, FNA, GW, K, WH; = *Oxytria crocea* (Michaux) Rafinesque – S]

Schoenolirion wrightii Sherman, Texas Sunnybell. Seepage over sandstone. April-early May. N. AL; w. LA and e. TX. [= FNA, K; = *Oxytria texana* (Scheele) Pollard – S]



Yucca Linnaeus 1753 (Yucca, Adam's-needle)

A genus of about 40 species, of sw. North America, n. Mexico, se. United States, and the West Indies. References: Hess & Robbins in FNA (2002a); Speta in Kubitzki (1998a); Ward (2004c)=Z; Ward (2006a).

1 Leaf margins fraying into filamentous threads or fibrils; plant acaulescent (or essentially so); fruit erect.
2 Inflorescence branches glabrous; tepals 5-7 cm long; leaves 2-6 cm wide, stiff, the apex acute-acuminate to obtuse, often concave upward at the apex, the marginal fibrils usually elongate (to 20 cm long) ..... ***Y. filamentosa***
2 Inflorescence branches scurfy-pubescent; tepals 3-5 cm long; leaves 1.5-4 cm wide, pliable, the apex attenuate-acuminate, not notably concave, the marginal fibrils usually short (to 4 cm long).
3 Leaves 1.5-4 cm wide, abundantly filiferous-margined; [widespread] ..... ***Y. flaccida***
3 Leaves 1-3 cm wide, sparingly filiferous-margined; [mainly west of the Mississippi River, rarely in the Florida parishes of e. LA] ..... ***Y. louisianensis***
1 Leaf margins not fraying, minutely notched-serrulate or entire, and hyaline; plant with a trunk; fruit pendulous (or erect in *Y. recurvifolia*).
3 Leaf margins minutely notched-serrulate, particularly toward the base; seeds 2.5 mm thick, marginless ..... ***Y. aloifolia***
3 Leaf margins entire, smooth, hyaline-brown or hyaline-tellow; seeds ca. 1 mm thick, margined.
4 Leaf blades rigid, straight; fruits pendent, 5.5-8 cm long; [of NC south to FL] ..... ***Y. gloriosa***
4 Leaf blades recurved, flexible; fruits generally erect, 2.5-4.5 cm long; [of GA westward] ..... ***Y. recurvifolia***

Yucca aloifolia Linnaeus, Spanish Dagger. Dunes. June-early July; October-December. Se. VA south to s. FL and west to LA. [= RAB, FNA, K, S, WH]

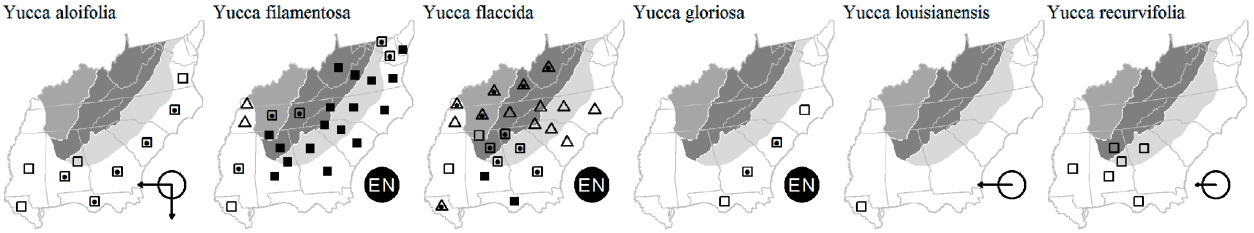
Yucca filamentosa Linnaeus, Curlyleaf Yucca, Spoonleaf Yucca. Woodlands, forests, dunes, roadsides, disturbed areas. Late April-early June; September-October. S. NJ south to GA, west to MS; escaped from cultivation over a broader area of e. United States. [= FNA, F, S, W, WV, Z; = *Y. filamentosa* var. *filamentosa* – RAB; < *Y. filamentosa* – C, G, K (also see *Y. flaccida*); > *Y. concava* Haworth – S; > *Y. filamentosa* – S]

Yucca flaccida Haworth, Weakleaf Yucca. Thin soils around rock outcrops, woodlands, roadsides, disturbed areas. Late April-early June; September-October. C. NC and TN south to s. FL and AL. Whether or not this taxon is valid (and if so, as a variety or as a species) has been unclear; further research is needed. The occurrence of this species in VA is apparently the result of cultivation and persistence. [= S, W; = *Y. filamentosa* var. *smalliana* (Fernald) Ahles – RAB; < *Y. filamentosa* – C, G, K, WH; = *Y. smalliana* Fernald – F, WV; < *Y. flaccida* Haworth – FNA; > *Y. flaccida* var. *flaccida* – Z; > *Y. flaccida* var. *smalliana* (Fernald) D.B. Ward – Z]

Yucca gloriosa Linnaeus, Mound-lily Yucca, Spanish Bayonet. Dunes, shell middens, also regularly cultivated and often persistent or weakly escaped around old homesites inland. (April-) October; November-December. E. NC (Dare County) south to ne. FL and w. peninsular FL (Sorrie & LeBlond 2008). [= RAB, K, S; = *Y. gloriosa* var. *gloriosa* – FNA; < *Y. gloriosa* – WH]

Yucca louisianensis Trelease, Louisiana Yucca. Dry sandy areas. April-June. [= K; < *Y. flaccida* Haworth – FNA]

Yucca recurvifolia Salisbury, Curve-leaf Yucca. Dunes, dry sandy soils. GA west to w. LA. [= S; = *Y. gloriosa* Linnaeus var. *recurvifolia* (Salisbury) Engelmann – FNA; < *Y. gloriosa* – WH]



75d. HOSTACEAE B. Mathew 1988 (Hosta Family) [in ASPARAGALES]

A family of a single genus, of about 25 species, of temperate e. Asia. This family is closely related to the Agavaceae, and its inclusion there may prove warranted. References: Kubitzki in Kubitzki (1998a).

Hosta Trattinick 1812 (Hosta, Plantain-lily)

A genus of about 25-40 herbs, of temperate Asia, widely cultivated (since at least the 8th century), and with numerous cultivars. References: Kubitzki in Kubitzki (1998a); Utech in FNA (2002a). Key based on Utech in FNA (2002a).

1 Flowers long-tubular, to 13 cm long, white, fragrant ..... ***H. plantaginea***
1 Flowers campanulate to urceolate, 4-5.5 cm long, blue or purplish, not fragrant.
2 Leaves lanceolate to oblong, 10-17 cm long, 5-7.5 cm wide, with 5-6 lateral veins on each side of the midvein; flowers purplish violet; anthers purple ..... ***H. lancifolia***
2 Leaves ovate to cordate, the blade 20-30 cm long, 15-20 cm wide, with 7-9 lateral veins on each side of the midvein; flowers bluish purple; anthers spotted purple ..... ***H. ventricosa***

* ***Hosta lancifolia*** Engler, Narrowleaf Plantain-lily. Widely planted as a shade ornamental, rarely persistent; "native" of Japan (probably only of garden origin). [= FNA, K]
* ***Hosta plantaginea*** (Lamarck) Ascherson, Fragrant Plantain-lily. Widely planted as a shade ornamental, rarely persistent; rare, native of China. [= FNA, K]
* ***Hosta ventricosa*** (Salisbury) Stearn, Blue Plantain-lily. Widely planted as a shade ornamental; rare, native of China. [= FNA, K]

75e. THEMIDACEAE Salisbury 1866 (Brodiea Family) [in ASPARAGALES]

A family of 12 genera and about 60 species, herbs, of w. North America south to Guatemala. References: Rahm in Kubitzki (1998a).

Dichelostemma Kunth 1843

A genus of 5 species, of w. United States and Mexico. References: Pires in FNA (2002a); Rahm in Kubitzki (1998a).

* ***Dichelostemma congestum*** (Smith) Kunth. Disturbed areas; native of Pacific northwestern North America, cultivated and apparently escaped in the Piedmont of nc. GA (Jones & Coile 1988). {further investigate} [= FNA, K; = *Brodiaea congesta* Smith]

75f. HYACINTHACEAE Batsch 1786 (Hyacinth Family) [in ASPARAGALES]

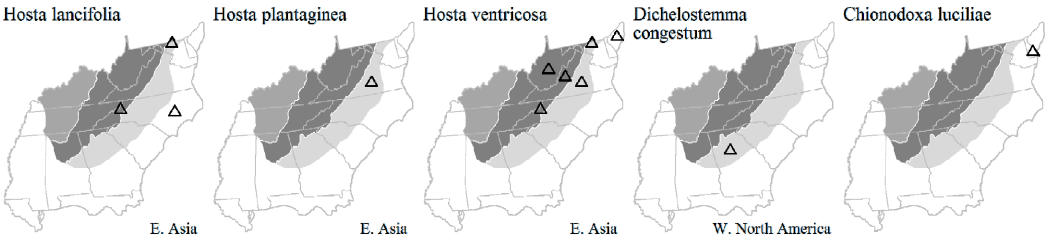
A family of about 67 genera and 900 species, herbs, nearly cosmopolitan. References: Speta in Kubitzki (1998a); Pfosser et al. (2003). [also see *AGAVACEAE*]

1 Tepals united into a perianth tube longer than the free portion; [subfamily *Hyacinthoideae*, tribe *Hyacintheae*].
2 Perianth tube <2 × as long as the lobes; corolla spreading and open at the mouth ..... ***Hyacinthus***
2 Perianth tube >2 × as long as the lobes; corolla contracted at the mouth ..... ***Muscari***
1 Tepals separate or fused only at the extreme base.
3 Tepals white, with a greenish stripe on the outer surface, separate; bracts 0-1 per flower; [subfamily *Ornithogaloideae*] ..... ***Ornithogalum***
3 Tepals blue (less commonly white or pink), separate or fused at the extreme base; bracts **either** 0-1 **or** 2 per flower; [subfamily *Hyacinthoideae*, tribe *Hyacintheae*].
4 Bracts 2 subtending each flower ..... ***Hyacinthoides***
4 Bracts 0-1 subtending each flower
5 Tepals connate basally for more than 1/10 of their length ..... ***Chionodoxa***
5 Tepals separate ..... ***Scilla***

Chionodoxa Boissier 1844 (Glory-of-the-snow)

A genus of 6 species, bulbous herbs, of e. Mediterranean. References: McNeill in FNA (2002a).

* ***Chionodoxa luciliae*** Boissier, Glory-of-the-snow. Lawns, disturbed areas; native of w. Turkey. April-May. [= FNA, K]



Hyacinthoides Heister ex Fabricius 1759 (Bluebell)

A genus of ca. 10 species, herbs, of se. Europe and n. Africa. The narrow circumscription of *Scilla* (excluding *Hyacinthoides*) is supported by molecular phylogenetic studies (Pfosser et al. 2003). References: Stace (2010)=Z; McNeill in FNA (2002a); Grundmann et al. (2010)=Y; Speta in Kubitzki (1998a). Key based on Stace (2010).

1 Racemes erect; perianth campanulate; anthers blue ..... ***H. hispanica***
1 Racemes pendant at apex; perianth tubular; anthers cream ..... ***H. nonscripta***

* ***Hyacinthoides hispanica*** (P. Miller) Rothmaler, Spanish Bluebell. Persistent after cultivation; native of Europe. [= FNA, K, Y, Z; = *Endymion hispanicus* (P. Miller) Chouard]
* ***Hyacinthoides nonscripta*** (Linnaeus) Chouard ex Rothmaler, English Bluebell. Persistent after cultivation; native of Europe. [= K, Z; = *Scilla non-scripta* (Linnaeus) Hoffmannsegg & Link – C, G; = *Scilla nonscripta* (Linnaeus) Hoffmannsegg & Link – F; = *Hyacinthoides non-scripta* – FNA, Y, orthographic variant; = *Endymion nonscripta* (Linnaeus) Garcke]

Hyacinthus Linnaeus 1753 (Hyacinth)

A genus of 3 species, herbs, of w. Asia. References: Stace (2010)=Z; Speta in Kubitzki (1998a).

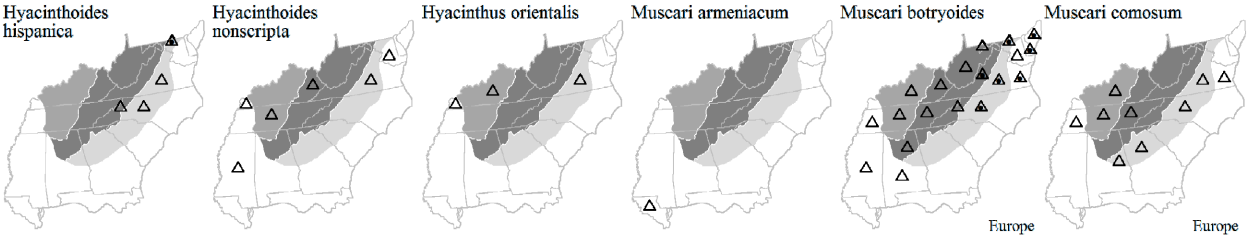
* ***Hyacinthus orientalis*** Linnaeus, Hyacinth. Persistent after cultivation; native of w. Asia. [= K, Z]

Muscari P. Miller 1754 (Grape-hyacinth)

A genus of about 50 species, herbs, of Europe, Mediterranean areas, and w. Asia. References: Stace (2010)=Z; Straley & Utech in FNA (2002a); Speta in Kubitzki (1998a).

1 Raceme 10-20 cm long; pedicels of the terminal flowers > 5 mm long; flowers brown (the lower and fertile) and blue (the upper and sterile); leaves flat, mostly 8-20 mm wide ..... ***M. comosum***
1 Raceme 1-5 cm long in flower (somewhat longer in fruit); pedicels < 5 mm long; flowers all blue to blue-black; leaves flat, channeled, or terete, mostly 1-8 mm wide.
  2 Leaves flat or channeled, 3-8 mm wide; corolla nearly spherical, the lobes strongly recurved ..... ***M. botryoides***
  2 Leaves nearly terete, 1-3 mm wide; corolla ellipsoid-ovoid, distinctly longer than wide, the lobes erect.
    3 Perianth of lower (fertile) flowers bright blue ..... ***M. armeniacum***
    3 Perianth of lower (fertile) flowers deep blackish-blue or -purple ..... ***M. neglectum***

* ***Muscari armeniacum*** Leichtlin ex Baker, Garden Grape-hyacinth, Armenian Grape-hyacinth. Cultivated as an ornamental, persistent and naturalized in lawns, old fields, suburban woodlands, and disturbed areas; native of Mediterranean e. Europe and w. Asia. March-April; May-June. [= FNA, K, Z]
* ***Muscari botryoides*** (Linnaeus) P. Miller, Compact Grape-hyacinth. Cultivated as an ornamental, persistent and naturalized in lawns, old fields, suburban woodlands, and disturbed areas; native of Europe. March-April; May-June. [= RAB, C, F, FNA, G, K, S, WV, Z]
* ***Muscari comosum*** (Linnaeus) P. Miller, Tassel Grape-hyacinth. Cultivated as an ornamental, persistent and naturalized in lawns, old fields, suburban woodlands, and disturbed areas; native of Europe. March-April; May-June. [= C, F, FNA, G, K, Z]



* ***Muscari neglectum*** Gussoni ex Tenore, Grape-hyacinth. Cultivated as an ornamental, persistent and naturalized in lawns, old fields, suburban woodlands, and disturbed areas; native of Europe. March-April; May-June. [= FNA, K, WH, Z; = *M. racemosum* (Linnaeus) Lamarck & A.P. de Candolle – RAB, C, F, G, S, WV; *? M. atlanticum* Boissier & Reuter – W]

Ornithogalum Linnaeus 1753 (Star-of-Bethlehem)

A genus of about 50 species, herbs, of Mediterranean s. Europe, n. Africa, east to w. Asia. References: Straley & Utech in FNA (2002a); Stace (2010)=Z; Speta in Kubitzki (1998a).

1 Lower pedicels < 1 cm long, about as long as the upper pedicels (and shorter than the perianth segments); leaves mostly 8-15 mm wide; scape 2-5 dm tall ..... ***O. nutans***
1 Lowest pedicels 2-6 cm long, longer than the upper pedicels (and longer than the perianth segments); leaves mostly 2-5 mm wide; scape 1-3 dm tall ..... ***O. umbellatum***

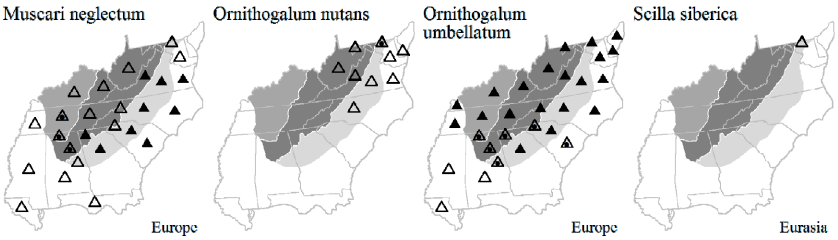
* ***Ornithogalum nutans*** Linnaeus, Drooping Star-of-Bethlehem. Lawns and suburban woodlands, commonly cultivated; native of w. Asia. March-April. [= RAB, C, F, FNA, G, K, WV, Z]

* ***Ornithogalum umbellatum*** Linnaeus, Star-of-Bethlehem, Snowflake, Nap-at-noon. Lawns, old fields, bottomlands, forests, commonly cultivated; native of Europe. March-May. [= RAB, C, F, FNA, G, K, S, W, WV; > *O. umbellatum* ssp. *umbellatum* – Z; > *O. umbellatum* ssp. *campestre* Rouy – Z]

Scilla Linnaeus 1753 (Squill)

A genus of ca. 50 species, of Eurasia and s. Africa. References: McNeill in FNA (2002a); Stace (2010)=Z.

* ***Scilla siberica*** Haworth, Siberian Squill. Suburban woodlands; native of Russia. [= FNA, K, Z]



76. ARECACEAE Schultz 1832 *or* ***PALMAE*** de Jussieu 1789 (Palm Family) [in ARECALES]

A family of about 190 genera and 2000 species, trees and shrubs, of tropical and subtropical regions of both hemispheres. Cold-hardy palms in other genera are sometimes planted in thje southern parts of our area, particularly near the coast. References: Zona in FNA (2000); Dransfield & Uhl in Kubitzki (1998b).

1 Leaves pinnate (with a well-developed central axis, the leaf blade much longer than wide); [introduced species]; [subfamily *Arecoideae*, tribe *Cocoeae*].
  2 Petiole with spines; leaflets 44-80 per leaf side, glaucous; fruit 1.8-3.5 cm long ..... ***Butia***
  2 Petiole unarmed; leaflets 75-100 per leaf side, green; fruit 20-30 cm long ..... ***Cocos***
1 Leaves palmate or costapalmate (lacking a central axis or with a short central axis, the leaf blade about as long as wide; [native species]; [subfamily *Coryphoideae*, tribe *Corypheae*].
  3 Petioles armed with sharp recurved teeth; [subtribe *Livistoninae*]
    4 Petiolar spines > 2 mm long; tree (trunk erect) ..... ***Livistona***
    4 Petiolar spines 0.5-2 mm long; shrub (trunk prostate or leaning) ..... ***Serenoa***
  3 Petioles smooth, unarmed (leaf sheaths with long needle-like spines in *Rhapidophyllum*).
    5 Petioles and lower leaf surfaces more or less silvery pubescent; leaf sheaths bearing long (10-50 cm) needle-like spines; [subtribe *Thrinacinae*] ..... ***Rhapidophyllum***
    5 Petioles and lower leaf surfaces green and glabrous; leaf sheaths without spines; [subtribe *Sabalinae*] ..... ***Sabal***

Butia (Beccari) Beccari 1916 (Butia)

A genus of about 8 species, trees, native of subtropical regions of South America. References: Dransfield & Uhl in Kubitzki (1998b).

* ***Butia capitata*** (Martius) Beccari, Brazilian Butia, South American Jelly Palm, Pindo Palm. Widely planted in the outer Coastal Plain of se. NC, e. SC, e. GA, and FL; native of s. Brazil and Uruguay. It persists and can appear naturalized in apparently semi-natural situations.

Cocos Linnaeus 1753 (Coconut Palm)

A monotypic genus, the single species now pantropical. References: Zona in FNA (2000).

* ***Cocos nucifera*** Linnaeus, Coconut Palm. Coconut palm rarely reaches our shores as propagules (coconuts, which may germinate and live briefly), but it is not established; native region unknown, but probably tropical islands of the western Pacific (now pantropical). Photographic evidence has been supplied from as far north as Bear Island, Onslow County, NC, 11 June 1996 (Dave Owen, pers. comm. and photograph). [= FNA, K, S, WH]

Livistona R. Brown 1810 (Fan Palm)

A genus of ca. 25 species, trees, of Africa, Asia, and Australasia. References: Zona in FNA (2000); Dransfield & Uhl in Kubitzki (1998b).

* ***Livistona chinensis*** (Jacquin) R. Brown ex Martens, Chinese Fan Palm. Cultivated and persistent; native of China. [= FNA. K, WH]

Rhapidophyllum H. Wendl. & Drude ex Drude 1876 (Needle Palm)

A monotypic genus, a shrub of se. North America (Henderson, Galeano, & Bernal 1995). The closest relative to *Rhapidophyllum* is apparently *Trachycarpus* of the Himalayan region of se. Asia (Zona in FNA 2000). References: Zona in FNA (2000); Clancy & Sullivan (1990); Dransfield & Uhl in Kubitzki (1998b); Zona (1997)=Z.

Rhapidophyllum hystrix (Pursh) H. Wendl. & Drude ex Drude, Needle Palm. Moist to wet soils of small blackwater stream swamps, especially where underlain with coquina limestone ("marl"), hydric hammocks and rich, wetland-upland transitions. Se. SC (Beaufort and Jasper counties) south to c. peninsular FL, and west to s. MS. Becoming somewhat popular as a hardy palm that can be grown in the Southeast, well north of its natural range. [= FNA, GW, K, S, WH, Z]

Sabal Adanson 1763 (Palmetto)

Sabal has 16 species, primarily distributed around the Caribbean Sea. The other species of se. United States are *S. miamiensis* Zona, endemic of s. FL pine rocklands, and *S. mexicana* Martius, of the s. TX coast (Henderson, Galeano, & Bernal 1995). References: Zona in FNA (2000); Zona (1997)=Z; Zona (1990)=Y; Dransfield & Uhl in Kubitzki (1998b).

Identification notes: The hastula is the midrib of the leaf, as seen on the **upper** (adaxial) surface.

1 Tree, with erect trunk (though young plants appear as trunkless shrubs, similar in habit to *S. minor*); leaves 15-30 per plant; hastula 5.3-18 cm long, acute to acuminate; margins of leaf segments with filamentose fibrils; leaf segment apices 2-cleft ..... ***S. palmetto***

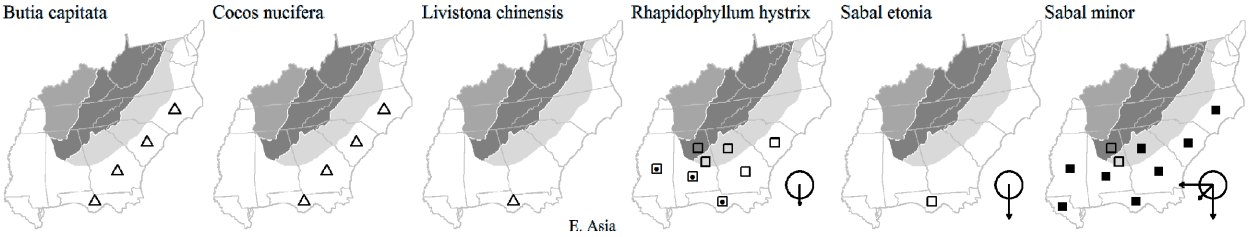
1 Shrub, with subterranean, rhizomatous "trunk" (very rarely emerging as much as 1 meter from the ground); leaves 4-10 per plant; hastula 0.8-4.7 cm long, obtuse to acute; margins of leaf segments with or without filamentose fibrils; leaf segment apices 2-cleft (*S. etonia*) or entire (*S. minor*).

2 Margins of leaf segments with filamentose fibrils; hastula acute; fruits 9.0-15.4 mm in diameter; segment apices 2-cleft; [of dry sandy habitats] ..... ***S. etonia***

2 Margins of leaf segments without filamentose fibrils; hastula obtuse; fruits 6.4-9.7 mm in diameter; segment apices generally entire; [of moist to wet habitats] ..... ***S. minor***

Sabal etonia Swingle ex Nash, Scrub Palmetto. Florida scrub. Late May-July. Endemic to FL (Clay County, FL south to Miami-Dade County, FL, primarily on the Lake Wales Ridge but also on coastal and intermediate ridges). See Zona & Judd (1986) for extensive information about the ecology and distribution of this species. [= FNA, K, S, WH, Y, Z]

Sabal minor (Jacquin) Persoon, Dwarf Palmetto. Swamps, maritime forests, low moist woods, especially in calcareous soils developed from shell limestone (marl). May-July; September-November. Ne. NC (Currituck County) south to c. peninsular FL, west to e. TX, c. TX, se. OK, and s. AR; disjunct in Nuevo León (Goldman 1999). This palm reaches its northern limit at Monkey Island, Currituck County, NC (L. Musselman, J. Boggan, pers. comm., 2006). No other New World palm has a native range extending so far north. [= RAB, FNA, GW, K, WH, Z; > *S. minor* – S; > *S. deeringiana* Small – S]



Sabal palmetto (Walter) Loddiges ex J.A. & J.H. Schultes, Cabbage Palmetto. Maritime forests, marsh edges, and other near-coastal communities. July; October-November. Native from se. NC south to s. FL, west to w. Panhandle FL, and in the West Indies in Cuba and the Bahamas; planted beyond that range, especially on the Gulf Coast. This palm is the state tree of South Carolina and is common and conspicuous (both as a native tree and in plantings) along the South Carolina coast; it currently reaches its northern limit as a native species in Brunswick County, NC, where it is a conspicuous part of the forest on Smith Island complex (Bald Head Island, Middle Island, Bluff Island). It is planted elsewhere (and further north) on the coast. Periodic disturbance by hurricanes helps maintain populations of *Sabal palmetto*, which survives winds and flooding that topple or kill *Quercus virginiana*. Curtis (1883) reports that "Cape Hatteras is, or was, the northern limit of this Palm... It is to be deeply regretted, however, that a reckless indifference to the future, which has been charged as a characteristic of Americans, is likely to efface, at no very distant time, every vestige of this interesting ornament of our coast. The inner portion of the young plant is very tender and palatable, somewhat resembling the Artichoke and Cabbage in taste (hence its name of *Cabbage Tree*), and is often taken for pickling, and the stock is ruined by the process. Thus for a pound or two of pickles, no better either than many other kinds, the growth of half a century is destroyed in a moment, and posterity left to the wretched inheritance of vain mourning for the loss of the greatest beauty of our maritime forest." [= RAB, FNA, GW, K, S, WH, Z]

Serenoa Hooker f. 1828 (Saw Palmetto)

Serenoa is monotypic shrub (Henderson, Galeano, & Bernal 1995). *Serenoa* is most closely related to *Acoelorraphe*, of the West Indies, including s. FL (Zona in FNA 2000). References: Zona in FNA (2000); Zona (1997)=Z; Dransfield & Uhl in Kubitzki (1998b).

Serenoa repens (Bartram) Small, Saw Palmetto. Pine flatwoods and maritime forests. May-July; October-November. Se. SC (in maritime forests in Charleston and Colleton counties, and in spodosolic flatwoods in Beaufort and Jasper counties) south to s. FL and west to e. LA. *Serenoa* forms extensive clonal patches, connected by underground rhizomes, and is a dominant plant in many parts of FL, in pine flatwoods or scrub. [= RAB, FNA, GW, K, S, WH]

78. COMMELINACEAE R. Brown 1810 (Spiderwort Family) [in COMMELINALES]

A family of about 41 genera and 650 species, herbs, of tropical and warm temperate regions of both hemispheres. References: Faden in FNA (2000); Faden in Kubitzki (1998b); Tucker (1989).

1 Spathes absent; inflorescence open and repeatedly branched; [tribe *Tradescantieae*] ..... ***Gibasis***
1 Spathes present, single or paired; inflorescence compact, unbranched.
  2 Spathes paired, terminating the stem, resembling foliage leaves in size, shape, texture, and coloration; [tribe *Tradescantieae*] ..... ***Tradescantia***
  2 Spathes single (or paired in *Callisia*), either terminal or axillary, differing from the foliage leaves (in *Commelina* folded, heart-shaped when spread, and usually pale-green, in *Cuthbertia* and *Murdannia* scale-like, scarious, and inconspicuous, sometimes hidden by foliage leaves in *Murdannia*).
    3 Spathe folded, heart-shaped when unfolded, usually pale-green, closely subtending and surrounding the flower pedicels; petals unequal, the 2 upper petals larger and usually more deeply colored than the lower petal (which is sometimes absent); [tribe *Commelineae*] ..... ***Commelina***
    3 Spathe scale-like, scarious, and inconspicuous, not closely subtending and surrounding the flower pedicels; petals equal, in both size and coloration.
      4 Leaves linear, > 20× as long as wide; petals bright pink (rarely white); [tribe *Tradescantieae*] ..... ***Cuthbertia***
      4 Leaves lanceolate, < 20× as long as wide; petals white, pink, purplish, or bluish.
        5 Fertile stamens 3, alternating with 3 staminodia; petals pink to purplish or bluish; [tribe *Commelineae*] ..... ***Murdannia***
        5 Fertile stamens 0-6, all fertile; petals white; [tribe *Tradescantieae*] ..... ***Callisia***

Callisia Loefling

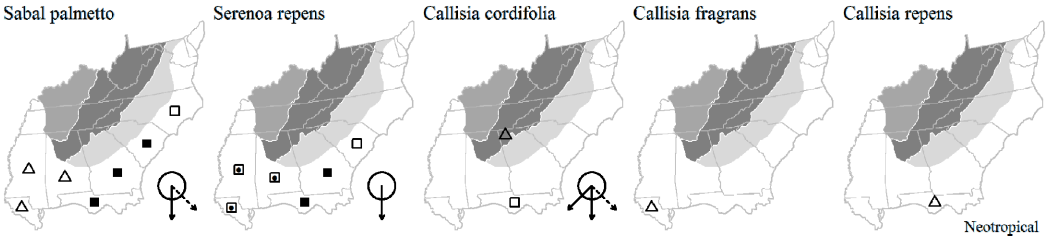
A genus of ca. 15-18 species, herbs, of tropical America. References: Faden in FNA (2000); Tucker (1989)=Z.

1 Leaves 15-30 cm long, 2.5-5 cm wide; stems ascending ..... ***C. fragrans***
1 Leaves 1-3.5 cm long, 0.5-1.4 cm wide; stems creeping.
  2 Inflorescences pedunculate; flowers on pedicels; capsule with 3 locules ..... ***C. cordifolia***
  2 Inflorescences sessile; flowers sessile or nearly so; capsule with 2 locules ..... ***C. repens***

Callisia cordifolia (Swartz) E.S. Anderson & Woodson. Disturbed area? Native from n. peninsular FL to s. FL; Mexico, the West Indies, and n. South America. Reported for nw. GA (Faden in FNA 2000). [= FNA, K; *? Tradescantella floridana* (S. Watson) Small – S; = *Tradescantia cordifolia* Swartz]

* ***Callisia fragrans*** (Lindley) Woodson, Basketflower. Disturbed areas; native of Mexico. February. [= FNA, K]

* ***Callisia repens*** (Jacquin) Linnaeus. Disturbed areas; native of tropical America. [= FNA, K, WH]



Commelina Linnaeus 1753 (Dayflower)

A genus of about 170 species, herbs, cosmopolitan. References: Faden in FNA (2000); Tucker (1989)=Z; Faden (1993)=Y; Brashier (1966)=X; Faden in Kubitzki (1998b). The key is adapted in part from X, Y, and Z.

1 Spathes with margins free to the base; [introduced species, usually in weedy habitats].
  2 Spathes generally whitish or pale green toward the peduncle, with contrasting dark green veins; middle petal white or paler than the others; capsules with 2 locules (the third aborting); seeds rugose foveate-reticulate ..... ***C. communis***
  2 Spathes lacking contrasting veins; middle petal about the same color as the others; capsules with 3 locules; seeds reticulate or smooth to faintly alveolate.
    3 Spathes not at all to slightly falcate (the lower margin straight or very nearly so); upper cyme usually vestigial (rarely well-developed and 1-flowered); seeds smooth to faintly alveolate; peduncles of the spathes with hairs to 0.5 mm long ..... ***C. caroliniana***
    3 Spathes usually distinctly falcate (the lower margin curved); upper cyme in larger spathes usually well-developed and 1-several-flowered; seeds deeply reticulate; peduncles of the spathes with hairs to 0.1 mm long ..... ***C. diffusa***
1 Spathes with margins fused basally; [native species, usually in natural habitats, **or** introduced and weedy].
  4 Flowers peach-colored ..... ***C. gambiae***
  4 Flowers white and/or bluish.
    5 Leaf sheaths ciliate with coarse reddish-brown hairs, the sheath not auriculate; middle petal blue, lilac, or lavender; [mostly of moist soils].
      6 Annual from fibrous roots, the stem decumbent; leaf blades broadly elliptic-ovate, 2-9 cm long; leaf margin and upper surface pubescent; [alien, weedy] ..... ***C. benghalensis***
      6 Perennial from horizontal rhizomes, often forming clonal patches of erect stems; leaf blades lance-oblong, 6-20 cm long; leaf margin and upper surface scabrous; [native, mostly of moist floodplain forests] ..... ***C. virginica***
    5 Leaf sheaths ciliate with white hairs, the sheath prolonged upward into auricles; middle petal white; plant perennial from thickened, fibrous roots, not forming clonal patches; [mostly of dry, sandy or rocky soil].
      7 Larger leaves 4-10 (-13) cm long, 0.4-1.4 cm wide; spathes 1-2 (-2.5) cm long; [primarily of the Coastal Plain, especially on sandhills and dunes] ..... ***C. erecta* var. *angustifolia***
      7 Larger leaves (6-) 10-15 cm long, (1.1-) 1.5-3.5 cm wide; spathes (2.0) 2.5-3.6 cm long; [primarily of the Piedmont and Mountains] ..... ***C. erecta* var. *erecta***

* ***Commelina benghalensis*** Linnaeus, Tropical Spiderwort, Bengal Dayflower. Fields; native of tropical Asia and becoming a serious weed. This annual, pantropical weed is well established in FL and s. GA (Faden 1993). Spot infestations have been reported in NC (Wayne County), SC (Edgefield County), and MS as well. "This annual species can be recognized by: its funnelform spathes that are often clustered; relatively broad leaves that frequently have red hairs at the summit of the sheath; and cleistogamous flowers that are borne at the base of the plant and are usually subterranean (in addition to normal, aerial, chasmogamous flowers)" (Faden 1993). [= FNA, K, Y]

* ***Commelina caroliniana*** Walter, Indian Dayflower. Moist disturbed areas; native of India and Bangladesh. June-October. Faden (1989, 1993) discusses in detail the taxonomy and history of this species. It was apparently introduced to our area early, probably as a weed in rice. [= RAB, C, FNA, G, K, S, Y; < *C. diffusa* – GW, X, Z; > *C. hasskarlii* C. B. Clarke (the earliest name applied to the species in India)]

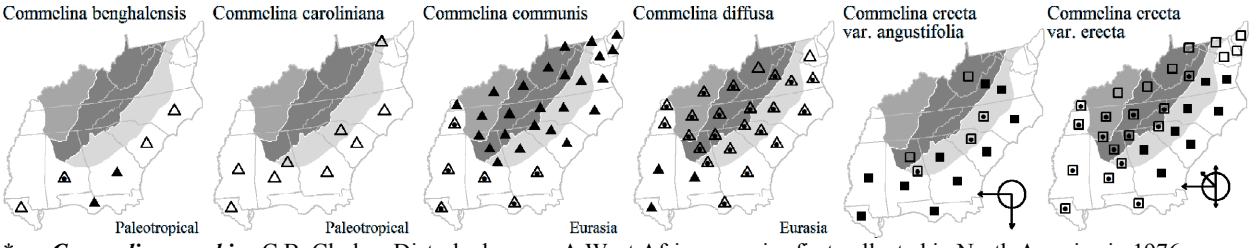
* ***Commelina communis*** Linnaeus, Common Dayflower. Gardens, bottomlands, disturbed ground; native of the Old World. May-October. Var. *communis* and var. *ludens* are sometimes distinguished (see synonymy): var. *communis* has flowers with larger petals pale blue and sterile anthers completely yellow, var. *ludens* has larger petals intense violet blue and sterile anthers withy a brownish-purple spot. [= RAB, C, FNA, GW, S, W, X, Y; > *C. communis* Linnaeus var. *ludens* (Miquel) C.B. Clarke – F, G, K, WV, Z; > *C. communis* var. *communis* – F, G, K, WV, Z]

* ***Commelina diffusa*** Burmann f., Creeping Dayflower. Roadsides, fields, disturbed ground; native of the Old World. June-October. [= RAB, C, F, G, W; < *C. diffusa* – GW, X, Z (also see *C. caroliniana*); = *C. longicaulis* Jacquin – S; = *C. diffusa* var. *diffusa* – FNA, K, Y]

Commelina erecta Linnaeus *var.* ***angustifolia*** (Michaux) Fernald, Sand Dayflower. Dunes and dry sand flats on barrier islands, sandhills, other dry sandy sites, shale barrens, other dry rocky sites. June-October. E. NC south to s. FL, west to TX, and north and west in the interior to IA, nw. NE, CO, and NM. Contrary to the specific epithet, *C. erecta* var. *angustifolia* is a

trailing plant, the stems sometimes as long as 1.3 m. The taxonomy and distribution of the two varieties here recognized need further study. [= C, F, FNA, G, K, WV, X; < *C. erecta* – RAB, W, Y, Z; > *C. angustifolia* Michaux – S; > *C. crispa* Wooton – S]

Commelina erecta Linnaeus *var.* ***erecta***, Erect Dayflower. Dry openings and woodlands, especially in thin soil around rock outcrops, streambanks, riverbanks, mesic forests. June-October. PA west to MO and e. KS, south to FL and TX. [= C, F, FNA, G, K, X; < *C. erecta* – RAB, W, Y, Z; = *C. erecta* – S]



* ***Commelina gambiae*** C.B. Clarke. Disturbed areas. A West African species first collected in North America in 1976 (Manatee County, FL), is immediately distinguishable from our species by its peach-colored flowers and fused spathes. Faden (1993) reports that it "appears to be spreading rapidly," but whether it can spread significantly northward from peninsular FL is questionable. [= FNA; = *Commelina nigritana* Bentham var. *gambiae* (C.B. Clarke) Brenan – K, Y]

Commelina virginica Linnaeus, Virginia Dayflower. Bottomlands, swamp forests, other moist to wet forests and forest edges. July-October. NJ west to KS and OK, south to FL and TX. Our most robust species of *Commelina.* [= RAB, C, F, FNA, G, GW, K, S, W, WV, X, Y, Z]

Cuthbertia Small 1903 (Roseling)

A genus of 3 species, herbs, of se. North America. There seems ample reason for recognizing *Cuthbertia* as distinct from *Tradescantia*, based on the single spathes (vs. paired), glabrous filaments (vs. hairy), differently shaped anther connectives, etc. Hunt (1983, 1986) has treated *Cuthbertia* as a section of *Callisia* Loefling, a decision followed with little additional comment or discussion by Tucker (1989). While this course may be warranted, the authors advocating it have presented little evidence to support it. Hunt (1986), in discussing a number of small tropical genera which he also reduces to sections of *Callisia*, states "this leaves two alternatives: to recognize numerous (perhaps 10) genera of 1-2 species, or to experiment with an amplification and sectionalization of *Callisia*, which I find the lesser of the two evils." He mentions that "the succulent habit ... is a principal unifying feature of the enlarged genus as a whole, reflecting the concentration of its species in tropical seasonal habitats, often on rocks." *Cuthbertia* is endemic to se. North America (a separate and more northerly distribution than the remainder of a broad *Callisia*), is only slightly succulent, occurs primarily in sandy habitats, and has a different base chromosome number (x=6) than some components of a broad *Callisia*. Until and unless a more compelling case is presented for the inclusion of *Cuthbertia* in *Callisia*, I prefer a more conservative and traditional maintenance of *Cuthbertia*, which is also more in line with the philosophy on the circumscription of genera. References: Faden in FNA (2000); Tucker (1989)=Z; Giles (1942); Giles (1943); Lakela (1972); Faden in Kubitzki (1998b).

1 Leaves loosely spreading, the leaf blades 4-15 mm wide (as wide as or wider than the opened, flattened sheaths) ..... ***C. rosea***
1 Leaves erect or ascending, the leaf blades 1-5 mm wide (narrower than the opened, flattened sheaths)
  2 Plants cespitose; roots glabrous to sparsely puberulent; inflorescence bracts scarious and small or to 14 mm long and green; petals 8-10 mm long; [of se. VA south to c. FL peninsula] ..... ***C. graminea***
  2 Plants not cespitose; roots persistently densely woolly; inflorescence bracts 1-3 (-5) mm long, scarious; petals 9-13 mm long; [of the FL peninsula, disjunct in Gulf County in the FL Panhandle] ..... ***C. ornata***

Cuthbertia graminea Small, Grassleaf Roseling. Sandhills. May-July. *Cuthbertia graminea* includes 3 morphologically distinguishable cytological races, occupying different (but partially overlapping) ranges (Giles 1942, Giles 1943, Tucker 1989). The predominant race is tetraploid, occupying the outer Coastal Plain of VA, NC, and SC, middle Coastal Plain of NC and SC, fall-line sandhills of SC, and south into FL. The diploid race is endemic to the fall-line sandhills of sc. NC and nc. SC, a distribution similar to those of *Pyxidanthera brevifolia*, *Liatris cokeri*, and *Lycopus cokeri*. Rare hexaploids have been found at scattered sites in SC and FL. The tetraploid race averages about 25% larger than the diploid in most vegetative and floral characters, and is reported to exhibit a greater ecological amplitude (Giles 1942, 1943). [= S; = *Tradescantia rosea* Ventenat var. *graminea* (Small) E.S. Anderson & Woodson – RAB, C, F, G; = *Callisia graminea* (Small) G. Tucker – FNA, K, WH, Z]

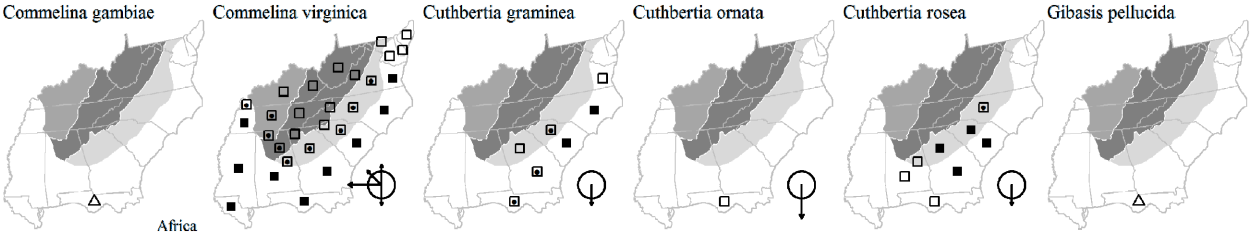
Cuthbertia ornata Small, Florida Roseling. Sandhills, scrub, dunes. FL peninsula; disjunct in Gulf County in the FL Panhandle. [= S; = *Callisia ornata* (Small) G. Tucker – FNA, K, WH, Z; = *Tradescantia rosea* Ventenat var. *ornata* (Small) E.S. Anderson & Woodson]

Cuthbertia rosea (Ventenat) Small, Common Roseling. Sandhills, other dry woodlands. May-July. MD south to peninsular FL, west to s. AL. [= S; = *Tradescantia rosea* Ventenat var. *rosea* – RAB; = *Callisia rosea* (Ventenat) D.R. Hunt – FNA, K, WH, Z]

Gibasis Rafinesque 1837 (Bridal-veil)

A genus of 11 species, annual and perennial herbs, of the American tropics. References: Faden in FNA (2000); Faden in Kubitzki (1998b).

* ***Gibasis pellucida*** (M. Martens & Galetti) D.R. Hunt, Tahitian Bridal-veil. Disturbed areas; native of Mexico. April-October. [= FNA, WH; = *G. schiedeana* (Kunth) D.R. Hunt]



Murdannia Royle 1839 (Murdannia)

A genus of about 50 species, herbs, of tropical and warm temperate regions. References: Faden in FNA (2000); Tucker (1989)=Z; Faden in Kubitzki (1998b).

1 Flowers solitary or in 2-4-flowered racemes borne in the upper leaf axils; capsules 8-10 mm long; seeds ca. 3 mm long; pedicels much longer than the capsule ..... ***M. keisak***
1 Flowers in stalked cymose racemes borne terminally or the uppermost leaf axil; capsules 4-5 mm long; seeds 1.0-1.5 mm long; pedicels about as long as the capsule ..... ***M. nudiflora***

* ***Murdannia keisak*** (Hasskarl) Handel-Mazzetti. Stream banks, canals, ditches, marshes, swamp forests, wet disturbed places; native of Asia, now widespread in the se. United States. September-October. [= C, FNA, G, GW, K, W, Z; = *Aneilema keisak* Hasskarl – RAB, F]

* ***Murdannia nudiflora*** (Linnaeus) Brenan. Moist sands, ditches, wet disturbed places; native of Asia, now widespread in the tropics and subtropics of both hemispheres. May-October. This species apparently arrived in the se. United States earlier than *M. keisak* (S, for instance, treats this species and not *M. keisak*), but is distinctly less common. [= FNA, GW, K, Z; = *Aneilema nudiflorum* (Linnaeus) Sweet – RAB, S]

Tradescantia Linnaeus 1753 (Spiderwort)

A genus of about 70 species, herbs, of the New World. References: Faden in FNA (2000); Anderson & Woodson (1935)=Y; Tucker (1989)=Z; Faden in Kubitzki (1998b). [also see *Callisia* and *Cuthbertia*]

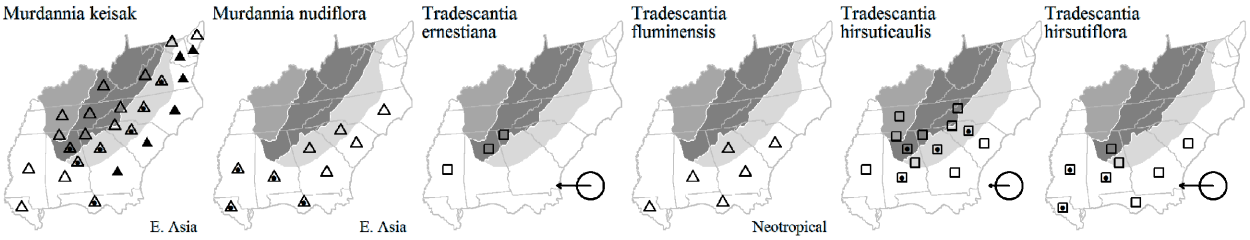
1 Leaves purple; flowers nearly sessile; petals clawed, the claws fused basally; stamens epipetalous ..... ***T. pallida***
1 Leaves green; flowers distinctly pedicelled; petals neither clawed nor connate; stamens not adnate to the petals.
2 Plant sprawling, rooting at the nodes; leaves 2.5-5 cm long, < 4× as long as wide; [exotic] ..... ***T. fluminensis***
2 Plant erect or ascending, not rooting at the nodes; leaves > 4 cm long, > 5× as long as wide; [native].
3 Leaf blades of the upper stem constricted at their bases to a narrower subpetiolar sheath, the opened sheath narrower than the leaf blade; leaf blades 6-27 cm long, 1.0-5.0 cm wide, mostly < 10× as long as wide; stomates much more abundant on the lower leaf surface than on the upper, giving the lower surface a much paler color.
4 Pedicels 2.0-3.2 cm long; sepals 9-16 mm long ..... ***T. ernestiana***
4 Pedicels 1.0-1.7 cm long; sepals 4-10 mm long ..... ***T. subaspera***
3 Leaf blades of the upper stem not constricted to a subpetiolar sheath, the opened sheath about as wide or wider than the leaf blade; leaf blades 11-45 cm long, 0.4-2.0 (-4.5) cm wide, mostly > 10× as long as wide; stomates slightly more abundant on the lower leaf surface than on the upper, or about equally distributed on the two surfaces, the lower surface slightly to not at all paler than the upper.
5 Sepals, pedicels, and ovary pubescent with glandular hairs or a mixture of glandular and eglandular hairs; leaves slightly to densely puberulent or pubescent.
6 Leaves dull green, densely pilose (rarely glabrate); sepals, pedicels, and ovary pubescent with a mixture of glandular and eglandular hairs; pedicels 2.0-3.5 cm long ..... ***T. hirsuticaulis***
6 Leaves glaucous to subglaucous, puberulent; sepals, pedicels, and ovary puberulent with glandular hairs only; pedicels 1.2-2.5 cm long ..... ***T. roseolens***
5 Sepals, pedicels, and ovary glabrous or pubescent with eglandular hairs only (use 10× magnification); leaves glabrous or pilose at the junction of the blade and the sheath (or pilose throughout in *T. hirsutiflora*).
7 Pedicels pubescent; sepals eglandular-villous; leaves green; sepals green, inflated-turgid (*T. virginiana*) or not (*T. hirsutiflora*).
8 Stems usually hirsute or pilose throughout; roots 1.0-1.5 (-2.0) mm thick; sepals not inflated-turgid ..... ***T. hirsutiflora***
8 Stems glabrous, or sparsely puberulent on the upper stem only; roots (1.5-) 2.0-4.0 mm thick; sepals usually inflated-turgid ..... ***T. virginiana***
7 Pedicels glabrous; sepals glabrous or the tip with a tuft of eglandular hairs; leaves glaucous or green; sepals glaucous (or rarely also suffused with purple), not inflated-turgid.
9 Plants distinctly glaucous; leaves 5-45 cm long, arcing, at an acute angle to the stem ..... ***T. ohiensis***
9 Plants green or slightly glaucous; leaves 4-11 cm long, straight, at nearly right angles to the stem ..... ***T. paludosa***

Tradescantia ernestiana E.S. Anderson & Woodson. Dry woodlands. Primarily Ozarkian (AR, MO, OK, disjunct east to nw. GA and ne. AL, and west to n. TX (Faden in FNA 2000). [= FNA, K, Y, Z; < *T. pilosa* J.G.C. Lemaire – S]

* ***Tradescantia fluminensis*** da Conceição Vellozo, Wandering Jew. Disturbed areas, lawns, vacant lots, moist suburban woods, along streams; native of tropical America. Reported for Beaufort Co. SC (Daniel C. Payne 2009, pers. comm.). [= FNA, K, WH, Z]

Tradescantia hirsuticaulis Small, Hairy Spiderwort. Dry rocky woodlands, and rock outcrops (especially granitic flatrocks and domes). April-June. W. NC and wc. TN south to sc. SC, s. GA, s. AL, and sc. MS; disjunct in AR, e. OK, and nw. LA. There is some question about the validity of this species. [= RAB, FNA, K, W, Y, Z]

Tradescantia hirsutiflora Bush. Sandhills, dry hammocks. C. SC (Richland County), s. and e. GA and FL Panhandle, west to TX. Reported for SC (Richland Co.) (P. McMillan 2003). [= FNA, K, WH, Y, Z; >< *T. hirsuticaulis* – S, misapplied]



Tradescantia ohiensis Rafinesque, Smooth Spiderwort. Woodlands and forests, alluvial bottoms, disturbed areas. April-July. MA west to MN, south to c. peninsular FL and TX, some of that range the result of naturalization from cultivation. [= RAB, C, F, FNA, G, K, W, WH, WV, Z; ? *T. reflexa* Rafinesque – S; ? *T. canaliculata* Rafinesque – Y]

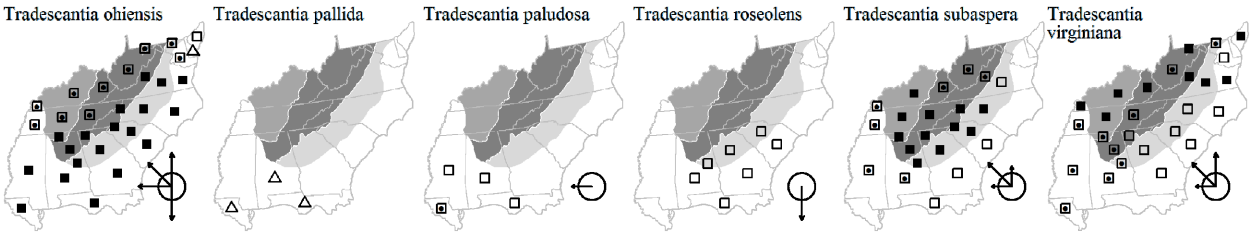
* ***Tradescantia pallida*** (Rose) D.R. Hunt, Purplequeen, Purpleheart, Wandering Jew. Disturbed areas; native of Mexico. [= FNA, K, WH]

Tradescantia paludosa E.S. Anderson & Woodson. Swamps and bottomlands. March-May. Coastal Plain of AL and FL (?) west to TX and AR. [= FNA, K, Y, Z; = *T. ohiensis* Rafinesque var. *paludosa* (E.S. Anderson & Woodson) D.T. MacRoberts]

Tradescantia roseolens Small, Sandhill Spiderwort. Dry sandy woodlands. May-June. SC south through GA to c. peninsular FL, west to AL. [= RAB, FNA, K, WH, Y, Z; = *T. longifolia* Small – S]

Tradescantia subaspera Ker-Gawler, Wide-leaved Spiderwort. Dry to mesic woodlands and forests, hammocks. June-July. Nc. NC, w. VA, WV, OH, IN, IL, and MO, south to NC, SC, sw. GA, Panhandle FL, and AL. Two questionable varieties are sometimes recognized. Var. *subaspera* may be distinguished by the stem conspicuously zigzag above, except on depauperate or juvenile plants (vs. the stems straight or only slightly zigzag), uppermost lateral cymes sessile or short-pedunculate (vs. pedunculate throughout), uppermost internodes very reduced, crowding the upper leaves (vs. internodes less reduced), leaves much broader than the sheath (vs. only slightly broader), and its generally greater size than var. *montana*. *T. subaspera* var. *montana* ranges from sw. VA and c. WV south to nw. SC, n. GA, and se. TN, with disjunct occurrences in c. AL and Panhandle FL. Var. *subaspera* ranges from WV west to n. IL, south to se. TN, ne. AR, and s. MO, with disjunct occurrences in NC. [= RAB, FNA, W; > *T. subaspera* Ker-Gawler var. *montana* (Shuttleworth ex Britton) E.S. Anderson & Woodson – C, F, G, K, WV, Y, Z; > *T. subaspera* var. *subaspera* – C, F, G, K, WV, Y, Z; < *T. pilosa* J.G.C. Lemaire – S]

Tradescantia virginiana Linnaeus, Virginia Spiderwort. Nutrient-rich forests and woodlands. April-July. ME west to MI and WI, south to n. GA, MO, and AR. Very variable in flower color, including deep blue, purple, pink, light pink, and pure white. [= RAB, C, F, FNA, G, K, S, W, WV, Y, Z; ? *T. brevicaulis* Rafinesque – S]



80. PONTEDERIACEAE Kunth 1816 (Pickerelweed Family) [in COMMELINALES]

A family of about 9 genera and 33 species, primarily of the tropics, but with some temperate representatives. References: Rosatti (1987a); Cook in Kubitzki (1998b); Horn in FNA (2002a).

1 Inflorescence with >50 flowers; fruit 1-seeded, indehiscent; leaves lanceolate to ovate, 1.5-10× as long as wide, the base cordate, truncate, or cuneate ..... ***Pontederia***

1 Inflorescence with <30 flowers; fruit 10-200-seeded, capsular; leaves **either** reniform, 0.5-1.5× as long as wide, the base cordate or rounded, **or** narrowly linear, 20-50× as long as wide, the base attenuate.

2 Leaves coriaceous; petioles expanded into air-filled floats or not; perianth lobes 1.3-3.7 cm long ..... ***Eichhornia***

2 Leaves membraneous; petioles never expanded into air-filled floats; perianth lobes 0.4-1.0 cm long..... ***Heteranthera***

Eichhornia Kunth 1842 (Water Hyacinth)

A genus of 7-8 species, native of tropical America and Africa, but now introduced widely in warm regions. References: Cook in Kubitzki (1998b); Horn in FNA (2002a).

1 Plants rooted; stems elongate, with leaves spaced and alternate; petioles not inflated ..... ***E. azurea***
1 Plants floating (or stranded by dropping water levels); stems short, with leaves in a rosette with very short internodes; petioles inflated ..... ***E. crassipes***

* ***Eichhornia azurea*** (Swartz) Kunth, Rooted Water-hyacinth. Ditches, rivers; native of tropical America. June-October. [= FNA, K, WH]

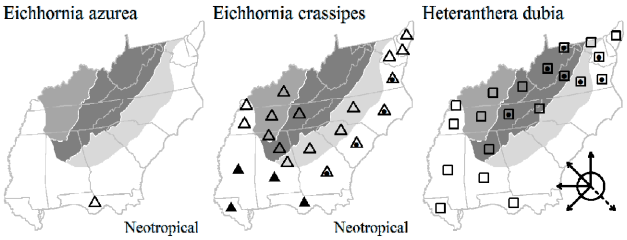
* ***Eichhornia crassipes*** (Martius) Solms-Laub, Water Hyacinth. Ponds, ditches, sluggish water, native of tropical America. June-September. *E. crassipes* is "generally considered the world's most serious aquatic weed" (Rosatti 1987). Originally native to tropical South America, *E. crassipes* is now a widespread naturalized weed throughout the tropics and subtropics. In the northern part our area, water hyacinth is rare, probably not long persisting. Further south, it can be an aggressive aquatic weed. [= RAB, C, F, FNA, G, GW, K; = *Piaropus crassipes* (Martius) Rafinesque – S]

Heteranthera Ruiz & Pavón 1794 (Mud-plantain)

A genus of 10-12 species, of tropical and temperate America and tropical Africa. References: Cook in Kubitzki (1998b); Horn (1998)=Z; Horn in FNA (2002a). Key based in part on FNA.

1 Leaves narrowly linear, 20-50× as long as wide, the base attenuate; flowers solitary, the corolla yellow; stamens and anthers all alike ..... ***H. dubia***
1 Leaves reniform, 0.5-1.5× as long as wide, the base cordate; flowers 1-several, the corolla white or pale blue; stamens and anthers dimorphic.
  2 Spathe with 2-several flowers; perianth tube 3-12 mm long.
    3 Anthers and filaments with dark purple hairs; internode below the spathe < 1 cm long; spike with (3-) 7-16 flowers, typically elongating well out of the spathe ..... ***H. multiflora***
    3 Anthers and filaments with white hairs; internode below the spathe > 1 cm long; spike with 2-8 flowers, typically mostly included within the spathe ..... ***H. reniformis***
  2 Spathe with solitary flower; perianth tube 11-45 mm long.
    4 Vegetative stems elongating only in water deeper than 5 cm; blades of petiolate leaves oblong to ovate, the base truncate to cuneate; perianth tube 15-45 mm long ..... ***H. limosa***
    4 Vegetative stems commonly elongating; blades of petiolate leaves round to oblong, the base cordate to truncate; perianth tube 11-29 mm long ..... ***H. rotundifolia***

Heteranthera dubia (Jacquin) MacMillan, Water Stargrass. Streams, rivers. Late July-October. QC west to WA, south to Cuba and Central America, but rare or absent in much of the se. United States. The attribution of this species to SC is in error (as by Kartesz 1999), based on a misidentified specimen (C. Horn, pers. comm.). [= RAB, F, FNA, GW, K, W, WV; = *Zosterella dubia* (Jacquin) Small – C, G, S]



Heteranthera limosa (Swartz) Willdenow. Wet ditches, other wet areas. KY, MN, SD, and CO, south to AL, MS, LA, TX, and AZ; Mexico, Central and South America, West Indies. East to TN, KY, AL (Diamond & Woods 2009), and FL (Kartesz 1999); it is attributed to VA in Small (1933), but the documentation is not known. [= FNA, C, F, G, K, S, Z]

Heteranthera multiflora (Grisebach) Horn. In shallow, stagnant water in floodplains, or emersed on mud. June-October. IL west to NE, south to MS; also on the Atlantic Coastal Plain from NJ south through PA to ne. NC; also in South America (Brazil, Paraguay, Argentina, and Venezuela). [= C, FNA, K, Z]

Heteranthera reniformis Ruíz & Pavón. In shallow, stagnant water in floodplains, or emersed on mud. June-October. CT west to NE, south to FL and TX and into South America. First reported for South Carolina by Hill & Horn (1997). [= RAB, C, F, FNA, G, GW, K, S, W, WV, Z]

Heteranthera rotundifolia (Kunth) Grisebach. Ponds. Midwestern, as a rare disjunct east to c. KY (Larue County) (Medley 1993); Central and South America, West Indies. [= FNA, C, K, Z]

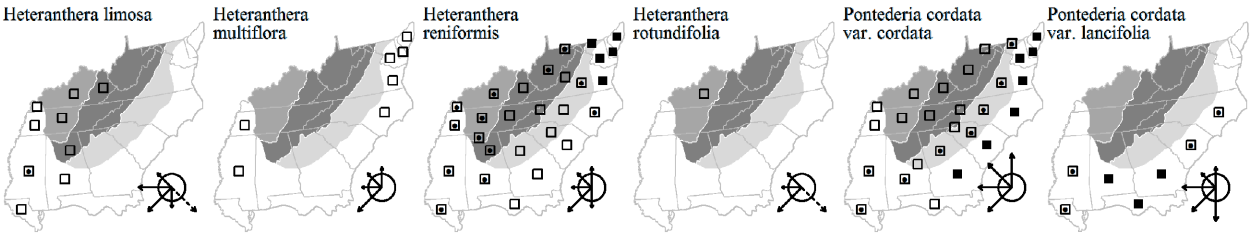
Pontederia Linnaeus 1753 (Pickerelweed)

A genus of 3-6 species, from North America to South America. References: Lowden (1973)=Z; Cook in Kubitzki (1998b); Horn in FNA (2002a).

1 Floral tube villous when young, essentially glabrous to sparsely glandular in maturity; leaves primarily ovate to triangular-lanceolate, 2.2-21 cm wide, the base generally cordate or truncate (rarely cuneate) ..... ***P. cordata*** *var.* ***cordata***
1 Floral tube persistently pubescent with short glandular hairs; leaves lanceolate, 0.4-8.3 cm wide, the base generally cuneate to truncate ..... ***P. cordata*** *var.* ***lancifolia***

Pontederia cordata Linnaeus *var.* ***cordata***, Heartleaf Pickerelweed. Marshes, pond-shores, lake-shores. May-October. NS west to MN, south to FL and TX; Belize; s. Brazil, Argentina, Paraguay, and Uruguay. The recognition of infraspecific taxa in *Pontederia cordata* is controversial and requires additional study. *P. cordata* exhibits tristyly, an interesting breeding system. Each plant has one of 3 types of flowers: (a) a short style, 3 medium and 3 long stamens, (b) a medium style, 3 short and 3 long stamens, or (c) a long style, 3 short and 3 medium stamens. [= GW, Z; < *P. cordata* – RAB, C, FNA, K, W; = *P. cordata* – F, G, S, WV]

Pontederia cordata Linnaeus *var.* ***lancifolia*** (Muhlenberg ex Elliott) Torrey, Lanceleaf Pickerelweed. Marshes, pond-shores, lake-shores. May-October. S. MA (alleged to occur as far north as ME, but these reports may be entirely based on misidentifications of var. *cordata*) to s. FL, west to e. TX, mostly on the Coastal Plain, with a few records around the Great Lakes; Cuba; s. Brazil, Argentina, Paraguay, and Uruguay. A third variety of *P. cordata*, var. *ovalis* (Martens in Roemer & Schultes) Solms in A.P. de Candolle, is restricted to South America. [= GW, Z; < *P. cordata* – RAB, C, FNA, K, W; = *P. lanceolata* Nuttall – F, G, S]



81. HAEMODORACEAE R. Brown 1810 (Bloodwort Family) [in COMMELINALES]

A family of about 14 genera and 100 species, herbs, of semicosmopolitan distribution, but centered in Australia. The Haemodoraceae is primarily a family of the Southern Hemisphere; *Lachnanthes* is the only member native to e. North America. *Lophiola* has often been treated in the Haemodoraceae; recent evidence, however, indicate that it is better placed in the Nartheciaceae (or Liliaceae *sensu lato*); see *Lophiola* (Nartheciaceae) for additional details. References: Robertson (1976)=Z; Simpson in Kubitzki (1998b); Robertson in FNA (2002a). [also see *MELANTHIACEAE*]

Lachnanthes Elliott 1816 (Redroot)

A monotypic genus, an herb, of se. North America and the West Indies. References: Simpson in Kubitzki (1998b); Robertson in FNA (2002a); Gandhi (1999)=Y; Robertson (1976)=Z.

Identification notes: A very distinctive plant when in flower, with its densely woolly inflorescence and flowers. When not in flower, recognizable by its equitant (iris-like) base and bright red roots.

Lachnanthes caroliniana (Lamarck) Dandy, Redroot. Wet savannas, pocosin edges, shores of Coastal Plain depression ponds (and similar ponds in the mountains of Virginia), ditches, wet disturbed ground. June-early September; September-November. The range is almost strictly on the Coastal Plain, and rather disjunct: s. NS, from MA to DE, from se. VA south to s. FL and west to LA, with inland disjunctions in w. VA and sc. TN (Coffee County); Cuba. The correct spelling of the specific epithet has been disputed; the original spelling was "*caroliana*," but Gandhi (1999) argues convincingly that this is a correctable typographic error. [= RAB, C, FNA, GW, W, Y; = *Lachnanthes caroliana* – K, WH, Z, orthographic variant (correctable typographic error); = *L. tinctoria* (J.F. Gmelin) Elliott – F, G; = *Gyrotheca tinctoria* (J.F. Gmelin) Salisbury – S]

86. CANNACEAE A.L. de Jussieu 1789 (Canna Family) [in ZINGIBERALES]

A family of a single genus, herbs, of tropical and warm temperate America. References: Kress & Prince in FNA (2000); Kubitzki in Kubitzki (1998b).

Canna Linnaeus 1753 (Canna)

A genus of about 10-25 species, of tropical and warm temperate America. References: Kress & Prince in FNA (2000); Kubitzki in Kubitzki (1998b).

Identification notes: The petals are generally sepaloid (sometimes brightly colored); the showy, colored portions of the flower are the staminodes.

1 Flowers not tubular at the base (or with a short tube to 2 cm long); petals erect; [alien, cultivated and persistent]..... ***C. ×generalis***
1 Flowers tubular at the base; petals reflexed; [native or cultivated].
  2 Flowers yellow; capsule 5-6 cm long, ellipsoid (longer than broad); leaves glaucous; [native]..... ***C. flaccida***
  2 Flowers red, orange, or mixed red-and-yellow; capsule 1.5-3 cm long, globose or subglobose (about as long as broad); leaves green; [alien, cultivated and persistent] ..... ***C. indica***

Canna flaccida Salisbury, Golden Canna, Yellow Canna. Wet pine savannas, marshes, ditches. May-early July; July-August. E. SC south to FL, west to TX, and south into Central America. [= RAB, FNA, K, S]

* ***Canna ×generalis*** L.H. Bailey (pro sp.) [= *C. glauca* × *indica*], Common Garden Canna. Cultivated and persisting; native of tropical America. June-September; August-October. [= RAB, FNA, K]

* ***Canna indica*** Linnaeus, Indian-shot, Platanillo. Cultivated and persisting; native of tropical America. June-September; August-October. [= FNA, GW, K, S]

87. MARANTACEAE Petersen in Engler & Prantl 1888 (Arrowroot Family) [in ZINGIBERALES]

A family of about 31 genera and 550 species, herbs and vines, nearly pantropical (absent from Australia), and rarely extending ino subtropical and warm temperate regions. References: Kennedy in FNA (2000); Andersson in Kubitzki (1998b).

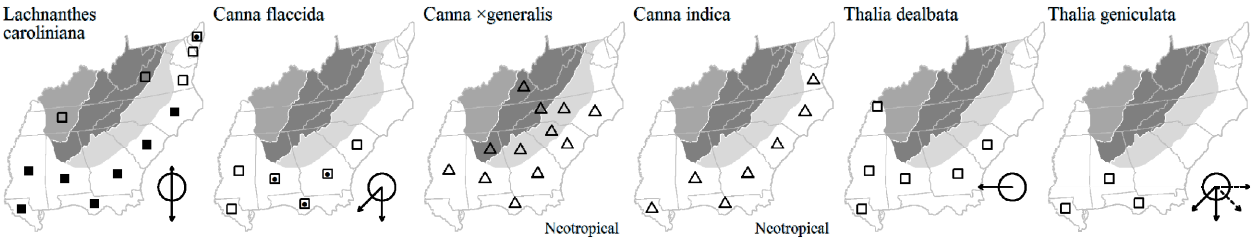
Thalia Linnaeus 1753 (Thalia)

A genus of 6-7 species, in subtropical and tropical America. References: Kennedy in FNA (2000); Andersson in Kubitzki (1998b).

1 Flowers crowded on the rachis, the zigzag internodes 2-3 mm long; leaves pilose at the base on the upper surface; bracts of the inflorecence white-pruinose ..... ***T. dealbata***
1 Flowers separated on the rachis, the zigzag internodes 5-10 mm long; leaves glabrous at the base on the upper surface; bracts of the inflorescence green or purple, not pruinose ..... ***T. geniculata***

Thalia dealbata Fraser ex Roscoe, Powdery Thalia, Powdery Alligator-flag. Swamp forests, wet ditches, brackish marshes. May-September; June-October. Ne. SC south to GA, west to TX and OK, north in the Mississippi Embayment to w. KY, s. IL, and se. MO. [= RAB, FNA, GW, K, S]

Thalia geniculata Linnaeus, Lilies, Bent Thalia, Bent Alligator-flag. Ponds, sloughs, marshes. AL, FL, LA, south through Central and South America; West Indies; w. Africa. [= FNA, GW, K, S, WH]



89. ZINGIBERACEAE Martynov 1820 (Ginger Family) [in ZINGIBERALES]

A family of about 50 genera and 1200 species, herbs, of tropical and subtropical areas, especially se. Asia.

1 Inflorescence terminal on short stems with scale leaves, distinct from the main leafy stems ..... ***Curcuma***
1 Inflorescence terminal on long stems with normal, well-developed leaves ..... ***Hedychium***

Curcuma Linnaeus 1753 (Hidden Lily)

A genus of about 80 species, rhizomatous herbs, native of the Old World tropics.

* ***Curcuma zedoaria*** (Bergius) Roscoe, Zedoary, White Turmeric. Disturbed areas; native of se. Asia. [= K, WH]

Hedychium J. König 1783 (Ginger-lily)

A genus of about 40 species, rhizomatous herbs, native of the Old World tropics.

Hedychium coronarium J. König, White Ginger-lily. Disturbed areas, commonly cultivated, rarely persisting and spreading; native of India. [= K, WH]

91. TYPHACEAE A.L. de Jussieu 1789 (Cattail Family) [in POALES]

A family of 2 genera with 16-30 species, wetland herbs, cosmopolitan. References: Kaul in FNA (2000); Smith in FNA (2000); Thieret & Luken (1996); Kubitzki in Kubitzki (1998b). [including *SPARGANIACEAE*]

1 Inflorescences headlike, globular ..... ***Sparganium***
1 Inflorescences spikelike, cylindrical ..... ***Typha***

Sparganium Linnaeus 1753 (Bur-reed)

A genus of about 14 species, wetland and aquatic herbs, primarily circumboreal in arctic and temperate regions, but also in the tropics of Asia, and temperate Australia. References: Kaul in FNA (2000); Thieret (1982)=Z; Beal (1960)=Y; Crow & Hellquist (2000b)=X; Kubitzki in Kubitzki (1998b).

1 Stigmas 2; fruits truncate at apex, obpyramidal, very abruptly beaked, 4-8 mm broad ..... ***S. eurycarpum***
1 Stigmas 1; fruits rounded or acuminate to a beak at the apex, elliptic, fusiform, or obovate, 1-3 (-4) mm broad.
2 Pistillate heads (primarily those upward) supra-axillary (borne distinctly above the axils of the subtending leaf-like bracts); tepals lacking subapical dark spot ..... ***S. emersum***
2 Pistillate heads (all) axillary (borne in the axils of the subtending leaf-like bracts) or several on axillary branches which lack leaf-like bracts; tepals with prominent subapical dark spot.
3 Mature fruits dull, finely pitted, the body 3-5 mm long; fruiting heads 1.5-2.5 cm in diameter; branches of the inflorescence with (0-) 1-3 pistillate heads (in addition to staminate heads); stigma 0.8-1.9 (-2.8 in the Coastal Plain) mm long ..... ***S. americanum***
3 Mature fruits shiny, smooth, the body 5.5-7 mm long; fruiting heads 2.5-3.5 cm in diameter; branches of the inflorescence with 0 (-1) pistillate heads (in addition to staminate heads); stigma 1.5-3 mm long ..... ***S. androcladum***

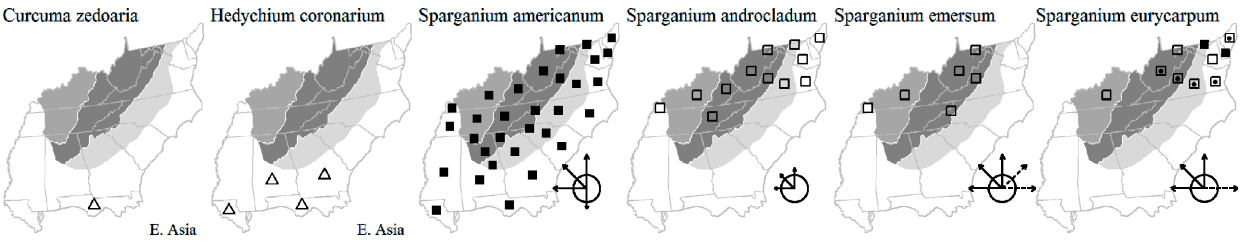
Sparganium americanum Nuttall, American Bur-reed. Streams, marshes, ponds, pools, often submerged. May-September. NL (Newfoundland) west to MN, south to c. peninsular FL and c. TX. Beal (1960) discusses the interesting variation in *S. americanum*, perhaps worthy of taxonomic recognition. The "Appalachian Race" has stigmas 0.6-0.9 mm long, inflorescence branches 0-3, and relatively narrow leaves; in our area it is montane in distribution, and in general is Appalachian, Ozarkian, and northern. The "Coastal Race" has stigmas 1.5-2.8 mm long, 2-5 inflorescence branches, and relatively wide leaves; in our area it is primarily of the Coastal Plain, disjunct to the mountains of NC and SC south of the Asheville Basin (like many Coastal Plain taxa), and in general is nearly limited to the Coastal Plain, ranging from MA south to FL, west to e. TX, and north in the interior to sc. TN, s. IN, and s. MO. The "Ubiquitous Race" is intermediate, with stigmas 1.0-1.4 m long; it occurs throughout the range of the species. The pattern is suggestive of imperfect evolutionary separation of two taxa. [= RAB, C, F, FNA, G, GW, K, S, W, WH, WV, X, Y, Z]

Sparganium androcladum (Engelmann) Morong. Marshes, shores. May-September. ME and QC west to MN, south to se. VA, s. WV, e. TN, s. MO, and ne. OK. [= C, F, FNA, G, K, W, WV, X, Y, Z]

Sparganium angustifolium Michaux, Narrow-leaved Bur-reed. South to n. NJ and n. PA; attributed to VA and WV by Kartesz (1999), apparently erroneously. [= C, FNA, K, X] {rejected; not keyed; synonymy incomplete}

Sparganium emersum Rehmann, Greenfruit Bur-reed. Bogs, stream margins. May-September. NL (Newfoundland) and c. QC west to s. AB and WA, south to w. NC, IN, IA, CO, and CA; Eurasia. [= FNA, X; > *S. chlorocarpum* Rydberg – RAB, C, F, G, W, WV, Y, Z; > *S. chlorocarpum* var. *acaule* (Beeby) Fernald – F; *? S. angustifolium* Michaux – K, misapplied; > *S. acaule* (Beeby) Rydberg; > *S. emersum* var. *acaule* (Beeby) A. Haines]

Sparganium eurycarpum Engelmann ex A. Gray, Giant Bur-reed. Marshes, shores. NS west to BC, south to w. VA, n. WV, IN, OK, CA and Baja California; e. Asia. Its attribution to more southern localities in some older sources (such as FL according to Small) is believed to be in error. [= C, F, FNA, G, K, S, W, WV, X; = *S. erectum* Linnaeus ssp. *stoloniferum* (Graebner) C.D.K. Cook & M.S. Nicholls]



Typha Linnaeus 1753 (Cattail)

A genus of 8-13 species, wetland herbs, cosmopolitan. References: Ward (2007a)=Z; Smith in FNA (2000); Kubitzki in Kubitzki (1998b). Key adapted from FNA.

1 Pistillate bracteoles absent, or if present then narrower than stigmas and generally not evident at spike surface; stigmas ovate to lanceolate, persistent on mature spikes; pistillate spikes green in flower when fresh, in fruit mostly 19-36 mm thick; carpodia concealed among pistil hairs; compound pedicels on denuded axis 0.6-3.5 mm; staminate scales colorless to brown.
2 Pistillate bracteoles absent; stigmas ovate to ovate-lanceolate, often blackish when dry; {add} ..... ***T. latifolia***
2 Pistillate bracteoles present (but generally evident only at 20-30× after removal from spike, resembling perigonial hairs, with brown, enlarged tips narrower than stigmas); stigmas lanceolate, brown when dry; pistillate spikes usually separated from staminate spikes by gap,

in fruit mostly 19-25 mm thick; compound pedicels on denuded axis 0.6-2 mm; seeds absent or few; staminate scales brownish; pollen a mixture of tetrads, triads, dyads, and single grains, sometimes mostly single grains.

3 Mucilage glands absent from blade; pistillate spikes after flowering medium to dark brown, rarely bright orange-brown..... ***T ×glauca [T. angustifolia × latifolia]***

3 Mucilage glands usually present on adaxial surface of blade near sheath summit; pistillate spikes after flowering bright orange-brown ... ***T. domingensis × latifolia***

1 Pistillate bracteoles present, many as wide as or wider than stigmas, evident at spike surface; stigmas linear (to narrowly lanceolate), sometimes deciduous and thus absent from mature spikes; pistillate spikes brown at all stages (or whitish when flowering and fresh) (*T. angustifolia* sometimes greenish in fruit when fresh), in fruit mostly 13-25 mm thick; carpodia often evident at spike surface among pistil-hair tips; compound pedicels on denuded axis 0.5-0.9 mm; staminate scales brown or straw-colored.

4 Mucilage glands absent from adaxial surface of blade and generally from central part of sheath near sheath summit; pistillate bracteole tips darker than (or as dark as) stigmas, very dark to medium brown, rounded (to acute), in mature spikes about equaling pistil hairs; pistil-hair tips medium brown, distinctly enlarged at 10-20× magnification; pistillate spikes medium to dark brown; leaf sheath summits with membranous auricles (often disintegrating late in season) ..... ***T. angustifolia***

4 Mucilage glands present on adaxial surface of all of sheath and usually about 1-10 cm of adjacent blade; pistillate bracteole tips much paler than to about same color as stigmas, straw-colored to light brown, mostly acute to acuminate, in mature spikes exceeding pistil hairs; pistil-hair tips colorless to usually orangish (or slightly brownish in hybrids), not evidently enlarged, or often with 1 subapical, orange, swollen cell evident at 20-30×; pistillate spikes bright cinnamon- to orange- or medium brown; leaf sheath summits tapered to blade or sometimes with membranous auricles.

5 Pistillate bracteole blades much paler than to nearly same color as stigmas, straw-colored to mostly bright orange-brown, usually many acuminate; pistillate spikes usually bright cinnamon- to orange-brown; mucilage glands numerous on proximal 1-10 cm of leaf blade .... ***T. domingensis***

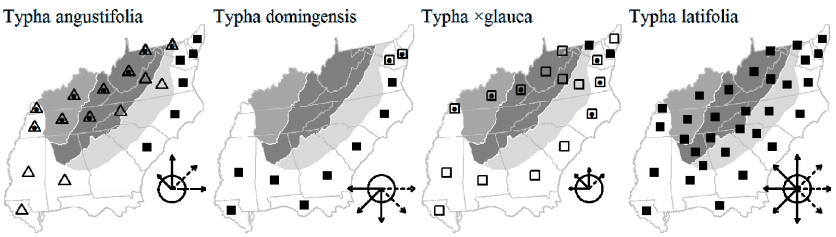
5 Pistillate bracteole blades usually about same color as stigmas, light- to medium brown, usually acute; pistillate spikes usually medium brown; mucilage glands often few or absent from leaf blade..... ***T. angustifolia × domingensis***

Typha angustifolia Linnaeus, Narrowleaf Cattail. Brackish to fresh waters of marshes and swamps, usually tidal, and also inland in non-tidal wetlands (where probably only introduced). May-July; June-November. NS west to ND, south to SC, FL (?), LA, and TX (?); Eurasia. Stuckey & Salamon (1987) consider *T. angustifolia* an invasive alien in North America, but later studies suggest that it was native at least in coastal areas of ne. and Mid-Atlantic North America, and has expanded its range westwards in recent decades (Shih & Finkelstein 2008). [= C, F, FNA, G, GW, K, RAB, W, WH, WV, Z; < *T. angustifolia* – S (also see *T. domingensis*)]

Typha domingensis Persoon, Southern Cattail. Brackish to nearly fresh waters of marshes and swamps, usually tidal. June-July; July-November. DE south to s. FL, west to TX; north inland to NE and UT; and south into tropical America; Eurasia; Africa; Oceania. [= C, F, FNA, G, GW, K, RAB, Z; < *T. angustifolia* – S]

Typha ×glauca Godron (pro sp.) [*angustifolia* × *latifolia*], Hybrid Cattail. Fresh to brackish waters of lakes, ponds, and rivers. May-July; June-November. Both C and K apply this name to two different hybrids: *T. angustifolia* × *latifolia* and *T. domingensis* × *latifolia*. The name properly applies to *T. angustifolia* × *latifolia* (Smith in FNA 2000). [= GW, Z; = *T. glauca* Godron – RAB, F; < *T. ×glauca* – C, K]

Typha latifolia Linnaeus, Common Cattail. Fresh waters of ponds, lakes, ditches, marshes, including in tidal freshwater marshes. May-July; June-November. NL (Newfoundland) west to AK, south to FL, TX, CA, and Mexico; Central America; South America; Eurasia. [= C, F, FNA, G, GW, K, RAB, S, W, WH, WV, Z]



92. BROMELIACEAE A.L. de Jussieu 1789 (Bromeliad or Pineapple Family) [in POALES]

A family of about 56 genera and 2600 species, herbs, shrubs, and trees, of the New World tropics and subtropics (very rarely warm temperate). References: Luther & Brown in FNA (2000); Smith & Till in Kubitzki (1998b).

Tillandsia Linnaeus 1753 (Spanish-moss)

A genus of about 540 species, herbs, of s. North America south to s. South America. References: Luther & Brown in FNA (2000); Smith & Till in Kubitzki (1998b). Key based in part on FNA.

1 Leaves distichous; inflorescence 1-2 (-3) flowered.

2 Plants in dense, more or less spherical clusters; inflorescence scapose, exserted from the cluster; corolla violet ..... ***T. recurvata***

2 Plants in elongate, pendulous festoons; inflorescence sessile; corolla yellowish green..... ***T. usneoides***

1 Leaves spiral in a rosette; inflorescence > 3-flowered.

3 Leaves narrowly linear, 1-5 mm wide.

4 Leaves densely and coarsely lepidote, appearing gray; floral bracts rose; corolla violet ..... ***T. bartramii***

4 Leaves finely lepidote, appearing green or reddish; floral bracts green or reddish; corolla lavender ..... ***T. setacea***

3 Leaves broader, 10-35 mm wide.
5 Scape 10-35 cm long; floral bracts imbricate, covering all of the rachis, or nearly all.....***T. fasciculata*** *var.* ***densispica***
5 Scape 20-50 cm long; floral bracts widely spaced, leaving much of the rachis exposed at anthesis ..... ***T. utriculata***

Tillandsia bartramii Elliott, Bartram's Air-plant. On tree branches in bayswamps, tidal swamp forests, and mesic hardwood bluffs. E. GA south through FL; disjunct in Tamaulipas. In five counties in e. GA, as far north as Liberty County (Jones & Coile 1988), and reported for SC as extirpated (Kartesz 1999). [= FNA, K, WH; *? T. myriophylla* Small – S]

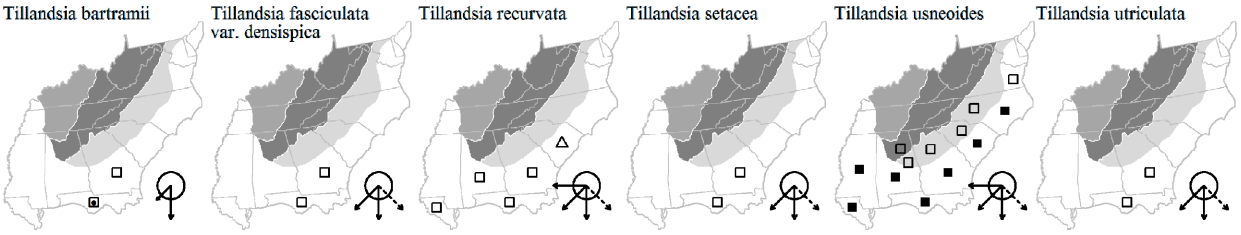
Tillandsia fasciculata Swartz *var.* ***densispica*** Mez, Quill-leaf Airplant. Branches of trees, especially evergreen oaks. Se. GA south through FL, and in the West Indies, Mexico, and Central America. [= FNA, K, WH; < *T. fasciculata* – S]

Tillandsia recurvata (Linnaeus) Linnaeus, Ball-moss, Bunch-moss. On tree branches in maritime forests. Se. GA (Duncan 1985) south to s. FL; LA to AZ and south through Mexico, Central America , and South America; West Indies. Introduced in e. SC (Beaufort, Jasper, Charleston, Georgetown counties) via landscaping plants (Gramling 2010; P. McMillan, pers. comm. 2005). Outside of our area, this species also occurs on rock cliffs and is frequent on powerlines. [= FNA, K, WH; = *Diaphoranthema recurvata* (Linnaeus) Beer – S]

Tillandsia setacea Swartz, Wild-pine, Pine-needle Airplant. In tree branches, especially on hardwoods, in mesic bluff forests. Se. GA south to s. FL; West Indies; Mexico and Central America. [= FNA, K; = *T. tenuifolia* Linnaeus – S, misapplied]

Tillandsia usneoides (Linnaeus) Linnaeus, Spanish-moss. Branches of trees, especially in swamps, but elsewhere where air humidity is high enough, often even in dry forests (near Wilmington, NC *Tillandsia* is abundant on *Quercus laevis* in an extensive dry sandhill area which receives frequent fog from the Cape Fear, Brunswick, and Northeast Cape Fear rivers). April-June. S. MD (historically), se. VA south to s. FL, west to TX and Mexico; Central and South America, West Indies. *T. usneoides* is the only member of a very large genus to occur north of s. GA. The epithet *'usneoides'* refers to its resemblance to the common lichen *Usnea*. [= RAB, C, F, FNA, G, K, WH; = *Dendropogon usneoides* (Linnaeus) Rafinesque – S]

Tillandsia utriculata Linnaeus, Giant Wild-pine. On tree branches in hammocks qnd cypress swamps. FL (and GA?); West Indies, Mexico, Central America, South America. Reported for GA by Kartesz (1999), but not by Luther & Brown in FNA (2000). [= FNA, K, S, WH]



94. XYRIDACEAE C. Agardh 1823 (Yellow-eyed Grass Family) [in POALES]

A family of 5 genera and about 325-350 species, nearly cosmopolitan (most diverse in tropical and subtropical regions, and especially South America). References: Kral in FNA (2000); Kral in Kubitzki (1998b).

Xyris Linnaeus 1753 (Yellow-eyed Grass)

A genus of about 300 species, nearly cosmopolitan (most diverse in tropical and subtropical regions, and especially South America). This "technical" genus is known well by only a few botanists, and additional undescribed taxa are possible. References: Kral in FNA (2000); Ward (2007b)=V; Bridges & Orzell (2003)=X; Kral (1966a)=Z; Kral (1983b, 1999); Kral in Kubitzki (1998b). Key adapted from X, GW, and Z.

Identification notes: In vegetative condition, *Xyris* is often confused with other monocots with equitant leaves, such as *Iris* spp. (Iridaceae), *Lachnanthes caroliniana* (Haemodoraceae), and *Tofieldia* spp. (Tofieldiaceae).

1 Keel of the lateral sepals shortly ciliate-scabrid (or sometimes entire in *X. brevifolia*, and then the bract tips purplish-tinged).
2 Plants small, usually < 30 cm tall; principal leaves usually < 10 cm long; mature spikes < 1 cm long when mature.
3 Leaves filiform, with expanded brownish lustrous bases, usually exceeding the sheath of the scape; [plants of s. AL and the FL Panhandle] .....***X. isoetifolia***
3 Leaves linear, the bases not expanded, shorter than, equaling, or slightly exceeding the sheath of the scape; [plants collectively more widespread].
4 Keel of the lateral sepals straight to slightly curved, remotely ciliate or entire; spikes broadly ovoid to subglobose, the bracts loose, bicolored, the distal portions maroon or purplish and often with erose margins.....***X. brevifolia***
4 Keel of the lateral sepals strongly curved, densely ciliate; spikes lance-ovoid to ovoid, the bracts entire, not purple-tinged, and lacking erose borders.
5 Plants perennial; leaves ascending, green with a distinct brown patch at the base; fruiting spikes ovoid, blunt, somewhat 2-edged from the strongly keeled outer bracts.....***X. drummondii***
5 Plants annual; leaves flabellate arranged, spreading to recurved against the substrate, usually maroon; fruiting spikes often elongated and acute, not 2-edged.....***X. flabelliformis***
2 Plants large, usually > 30 cm tall; principal leaves > 10 cm long; mature spikes > 1 cm long when mature.

6 Leaves ascending, twisted, strongly grooved; spikes ovoid, the bracts and lateral sepals with a small tuft of short, reddish-brown hairs; bases of leaves abruptly expanded, pinkish or purplish (dark brown in age), the outermost leaves often scale-like, the plant base therefore appearing bulbous; [of the Mountains, Piedmont, and Coastal Plain]..... ***X. torta***

6 Leaves spreading, not twisted or only slightly so; spikes narrowly ovoid, ellipsoidal, or oblong; bracts and sepals without a small apical tuft of hairs; bases of leaves whitish, tan, pink, purplish, maroon, or dark brown, the outermost leaves not scale-like, the plant base not appearing bulbous; [typically of the Coastal Plain, rarely disjunct inland].

7 Seeds lustrous, translucent, broadly ovoid; spike pale brown or tan, the scales loosely imbricate; plant bases pinkish, purplish, or tan, with dark longitudinal striations on the inner leaf bases; leaves 3-20 mm wide; petal blades obovate, 6-7 mm long, opening in early morning, usually closing by mid-day..... ***X. ambigua***

7 Seeds farinose, dark brown (*X. stricta*) or pale (*X. louisianica*) at maturity, narrowly ellipsoid to ovoid; spike dark brown, the scales tightly imbricate; plant bases maroon, purplish, dark-brown, or reddish-brown; leaves 2-5 mm wide; petal blades triangular-cuneate, 3-5 mm long, opening at mid-day.

8 Seeds pale when mature; plant bases maroon to maroon-brown, solitary or in small clumps; upper end of scape somewhat flattened, but not nearly as broad as the spike; spike narrowly ovoid to ellipsoid, slightly pointed..... ***X. louisianica***

8 Seeds dark brown when mature; plant bases dark maroon to dark brown, desnely cespitose; upper end of the scape conspicuously flattened, almost as broad as the spike; spike oblong-cylindrical, obtuse..... ***X. stricta***

1 Keel of the lateral sepals irregularly lacerate or fimbriate, or if entire then the the bract tips not purplish.

9 Leaves narrowly linear to filiform, 0.5-2.0 (-2.5) mm wide, not twisted (or scarcely so); leaf bases expanded, lustrous, hard, tan to brown, neither bulbous nor deeply set in the substrate; spikes ovoid or ellipsoid, 4-15 mm long.

10 Leaves filiform, terete or elliptic in cross-section, 0.5-1.0 mm wide, without a paler, hardened margin; scape as broad as or broader than the leaf blades; scales smooth-edged to denticulate, not curled away from the head, the head thus appearing smooth; staminodia beardless..... ***X. baldwiniana***

10 Leaves linear, flattened in cross-section, 1-2 (-2.5) mm wide, with a pale, hardened margin; scape usually narrower than the leaf blades; scales ragged-lacerate, the tips curling away from the head, giving it a ragged appearance; staminodia bearded..... ***X. elliottii***

9 Leaves broader, (1.5-) 2.0-25 mm wide, strongly twisted to straight, the leaf bases either not expanded, lustrous, hard, and tan to brown, or, if so, then the base also either bulbous and/or deeply seated in the substrate; spikes narrowly lanceolate, ellipsoid, to broadly ovoid, 4-40 mm long.

11 Keel of the lateral sepals long-fimbriate toward its apex, the fimbriate tip conspicuously exserted from the subtending bract (sometimes eroded and less conspicuous on older spikes).

12 Leaves strongly twisted, 2-5 mm wide; leaf bases hardened, swollen, bulbous, dark lustrous brown; scape ridges smooth; petal blades white or yellow; [of moist to dry pinelands]..... ***X. caroliniana***

12 Leaves not twisted or slightly twisted, 3-25 mm wide; leaf bases **either** soft, not swollen, not bulbous, and pale green (*X. fimbriata*) **or** somewhat hardened and bulbous, deep red (*X. panacea*); scape ridges strongly scabrous or smooth; petal blades yellow; [of aquatic to very wet peaty, mucky, or sandy ponds, marshes, or other wetlands].

13 Leaves 5-25 mm wide; scape ridges well-developed, strongly scabrous; flowers open 1:00-3:00 p.m. EDT; [widespread]..... ***X. fimbriata***

13 Leaves 3-5 (-8) mm wide; scape ridges poorly-developed, smooth; flowers open 11:30-4:00 p.m. EDT; [endemic to Wakulla County, FL]..... ***X. panacea***

11 Keel of the lateral sepals lacerate, or if very shortly fimbriate, then not conspicuously exserted from the subtending bract.

14 Lateral sepals longer than and exserted from the subtending bracts; scapes 5-15 dm tall.

15 Leaf blades 1-2 (-3) mm wide, 6-30 cm long; spikes 10-16 mm long; seeds 0.4-0.6 mm long; [endemic to Panhandle FL and s. AL]..... ***X. longisepala***

15 Leaf blades 5-15 mm wide; (20-) 30-50 (-60) cm long; spikes 10-20 (-25) mm long; seeds (0.6-) 0.7 (-0.8) mm long; [more widespread in our area]..... ***X. smalliana***

14 Lateral sepals shorter than the subtending bracts, and therefore hidden (except when the spikes open to shed seeds); scapes 1.5-12 dm tall.

16 Scapes flexuous, usually spirally twisted; upper portion of leaf blades conspicuously twisted; plant bases pinkish, purplish, or dark brown, bulbous or deeply set in the substrate.

17 Plant forming a rather dense tuft; scape usually < 50 cm long; spike diverging at a 10-20° angle; seed surface farinose; of ne. FL southward]..... ***X. calcicola***

17 Plant solitary or in small tufts; scape usually > 50 cm long; spike vertical; seed surface not farinose; [collectively widespread].

18 Base of plant deeply set in the substrate, without distinct outer scale leaves; leaf bases not noticeably expanded, the plant base therefore not bulbous; leaves smooth, 2-4 mm wide; petal blades ca. 3 mm long..... ***X. chapmanii***

18 Base of plant shallowly set on the substrate, often with short, black outer scale leaves; leaf bases noticeably expanded, the plant base therefore appearing bulbous; leaves either smooth and 5-10 mm wide, or scabrous and 2-10 mm wide; petal blades ca. 5 mm long.

19 Leaf and scape surfaces prominently papillose or tuberculate-scabrid; petal blades suborbicular, yellow; seeds narrowly ovoid or narrowly ellipsoidal, ca. 1.0 mm long..... ***X. scabrifolia***

19 Leaf and scape surfaces smooth (or scabrous only along margins and ridges); petal blades obovate, white or yellow; seeds ovoid or ellipsoid, 0.5-0.6 mm long.

20 Seeds translucent; leaf margins smooth; [plants of acidic sites of the Coastal Plain]..... ***X. platylepis***

20 Seeds opaque; leaf margins slightly scabrous; [plants of calcareous seeps and fens of the Ridge and Valley]..... ***X. tennesseensis***

16 Scapes usually not flexuous, usually not spirally twisted; upper portion of leaf blades not conspicuously twisted; plant bases variously colored, flabellate or equitant and set at ground level.

21 Summit of the scape distinctly flattened and broad relative to the spike; scape ridges 2-3, the 2 most prominent comprising the flattened edge of the scape.

22 The 2 principal scape ridges noticeably and abruptly flattened and winglike below the spike, their combined width (on fresh material) broader than the scape proper; fruiting spikes mostly 8-15 mm long; seeds 0.4-0.6 mm long, translucent, ovoid or ellipsoidal, about 1.5× as long as wide, with lines of very fine papillae, not farinose..... ***X. difformis***

22 The 2 principal scape ridges not abruptly flattened and winglike below the spike, their combined width < the scape proper, which is itself flattened (narrowly elliptic in cross-section); fruiting spikes mostly (10-) 20-25 mm long; seeds 0.8-1.0 mm long, dark when ripe, fusiform to narrowly elliptic, 2-3× as long as wide, with lines of very fine papillae, these however obscured by a farinose covering..... ***X. iridifolia***

21 Summit of the scape nearly terete or somewhat flattened, much narrower than the spike; scape ridges several (usually > 3), at least on the mid to lower portion of the scape.
23 Seeds farinose, very dark; surfaces of leaves tuberculate-scabrid, the leaves strongly ascending, linear, generally > 10 cm long; leaves generally dull-colored.
24 Mature spikes ovoid, sharply acute; plants solitary or in small clumps; leaves 10-30 (-50) cm long, 1.5-6.0 mm wide, dark maroon or purplish at the base ..... ***X. floridana***
24 Mature spikes ovoid to ellipsoid, acute to obtuse; plants typically in large dense tufts; leaves 20-50 cm long, 3-12 mm wide, the older ones with dark-brown to gray bases, the younger with tan bases..... ***X. serotina***
23 Seeds translucent, not farinose; surfaces of leaves smooth (or sparsely tuberculate-scabrid in *X. curtissii*, which also has leaves linear-curvate and generally < 10 cm long); leaves generally a bright yellowish-green above the base.
25 Leaves ascending to erect, 5-60 cm long, 2-5 (-15) mm wide; scapes (0.5-) 1.0-1.5 (-2.0) mm wide; mature spikes 7-15 (-25) mm long; fertile bracts 5-7 mm long; leaf bases tan to brown (very rarely pinkish); old flowers often persisting on spikes, drying blackish ..... ***X. jupicai***
25 Leaves spreading-recurved to erect, 3-10 (-13) cm long, 1-4.5 mm wide; scapes 0.4-0.6 (-0.7) mm wide; mature spikes 3-7 (-12) mm long; fertile bracts 3-5 mm long; leaf bases various; old flowers fugacious, not persisting on spikes.
26 Leaves spreading-recurved to ascending, 2-4.5 mm wide; leaf bases pinkish or purplish; spikes 3-5 (-7) mm long, often abruptly acute; seeds 0.4-0.5 mm long, yellowish-amber..... ***X. curtissii***
26 Leaves ascending to erect, 1-2 mm wide; leaf bases tan to brown; spikes 3-7 (-12) mm long, blunt; seeds 0.3-0.4 mm long, reddish-brown to brown..... ***X. species 1***

Xyris ambigua Beyrich ex Kunth. Wet savannas and flatwoods, pinelands, edges of depression ponds. June-August. Se. VA south to s. FL, west to AL and ec. TX, primarily on the Coastal Plain; also West Indies (Cuba), and Mexico south into Central America. [= RAB, C, F, FNA, G, K, W, WH, X; < *X. ambigua* – GW, S, Z (also see *X. louisianica*)]

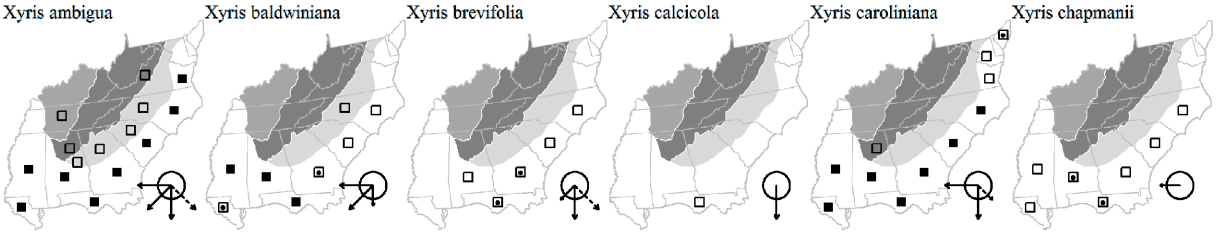
Xyris baldwiniana J.A. Schultes, Grassleaf Yellow-eyed Grass. Wet savannas, seepage bogs, sandhill seeps, wet savanna ecotones. June-July. Se. NC south to n. peninsular FL, west to s. AR and ec. TX, primarily on the Coastal Plain; also s. Mexico and Central America. [= RAB, FNA, GW, K, S, WH, X, Z]

Xyris brevifolia Michaux, Shortleaf Yellow-eyed Grass. Wet sands of pinelands, especially seasonally wet, open, white sands of spodosol longleaf pine flatwoods (Leon series soils), margins of Carolina bay sandrims. June-August. Se. NC south to s. FL, west to s. AL and w. FL; West Indies and South America. [= RAB, FNA, GW, K, S, WH, X, Z]

Xyris calcicola E.L. Bridges & Orzell, Limestone Yellow-eyed Grass. Wet calcareous savannas and flatwoods. August-November. C. and s. peninsular FL; disjunct in ne. FL (Baker County; Wunderlin & Hansen 2008). See Bridges & Orzell (2003) for detailed information. [= WH, X]

Xyris caroliniana Walter, Pineland Yellow-eyed Grass. Dry to moist pine flatwoods, moist savannas, scrub oak sandhills. June-July. Se. VA south to s. FL, west to se. TX, disjunct northward in s. NJ and in the West Indies (Cuba). White-petaled populations of *X. caroliniana* occurring in the East Gulf Coastal Plain need additional study. [= RAB, C, FNA, GW, K, WH, X, Z; > *X. flexuosa* Muhlenberg ex Elliott – F, G, S; > *X. pallescens* (C. Mohr) Small – S]

Xyris chapmanii E.L. Bridges & Orzell, Chapman's Yellow-eyed Grass. Sandhill seepage bogs in areas of copious lateral seepage in deep muck soils. Sc. NC south to Panhandle FL, west to e. TX. This taxon is abundantly distinct from *X. scabrifolia*. [= WH, X; < *X. scabrifolia* – FNA, K, Z]



Xyris curtissii Malme, Curtiss's Yellow-eyed Grass. Savannas. July-August. Se. VA south to ne. FL, FL Panhandle, and west to s. AR and ec. TX, primarily on the Coastal Plain; disjunct in s. NJ and Central America (Belize). [= RAB, G, WH; = *X. difformis* Chapman var. *curtissii* (Malme) Kral – C, FNA, GW, K, X, Z; > *X. bayardii* Fernald – F; > *X. curtissii* – F; = *X. neglecta* Small – S]

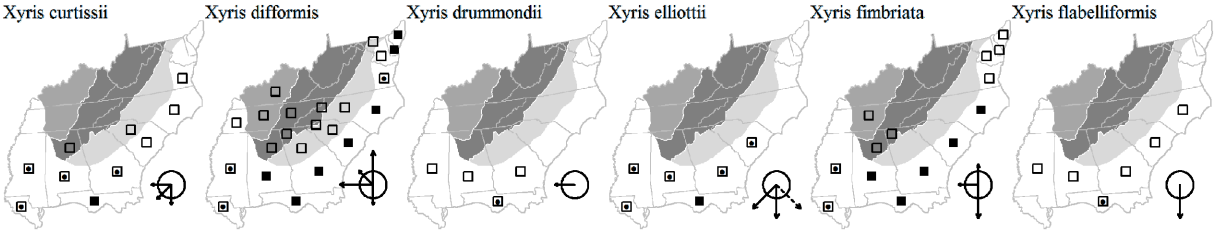
Xyris difformis Chapman. Savannas, roadside ditches, pond margins, other wet habitats. August-October. New England and s. Canada south to n. peninsular FL and ec. TX. [= X, WH; = *X. difformis* Chapman var. *difformis* – C, FNA, GW, K, Z; < *X. difformis* – RAB, F, G, S, W (also see *X. curtissii*)]

Xyris drummondii Malme, Drummond's Yellow-eyed Grass. Wet pine flatwoods, ditches. Se. GA south to ne. FL, west to Panhandle FL and s. MS. [= FNA, GW, K, WH, X, Z]

Xyris elliottii Chapman, Elliott's Yellow-eyed Grass. Margins of drawdown zones of clay-based Carolina bays, limesinks and flatwoods swales, wet savannas. May-June. E. SC south to s. FL, west to s. AL; West Indies; South America. [= RAB, FNA, GW, K, S, WH, X, Z; > *X. elliottii* var. *elliottii*; > *X. elliottii* var. *stenotera* Malme]

Xyris fimbriata Elliott, Giant Yellow-eyed Grass. In mucky or sandy soils of upland depression ponds, also along sandhill streams, impoundments and in deep muck of sandhills seepage slopes often just below the zone occupied by *Xyris chapmanii*. September-October. Se. VA south to c. peninsular FL, west (interruptedly) to se. TX; disjunct in s. NJ, DE, and c. TN. [= RAB, C, F, FNA, G, GW, K, S, WH, X, Z]

Xyris flabelliformis Chapman, Savanna Yellow-eyed Grass. Wet sands of pinelands, especially seasonally wet, open, white sands of spodosol longleaf pine flatwoods (Leon series soils), margins of Carolina bay sandrims. May-June. Se. NC south to s. FL, west to se. LA, on the Coastal Plain. [= RAB, FNA, GW, K, S, V, WH, X, Z]



Xyris floridana (Kral) E.L. Bridges & Orzell, Florida Yellow-eyed Grass. Savannas, wet pine flatwoods, ditches. August. Se. NC south to s. FL, west to se. LA; Central America. [= WH, X; = *Xyris difformis* Chapman var. *floridana* Kral – FNA, GW, K, Z]

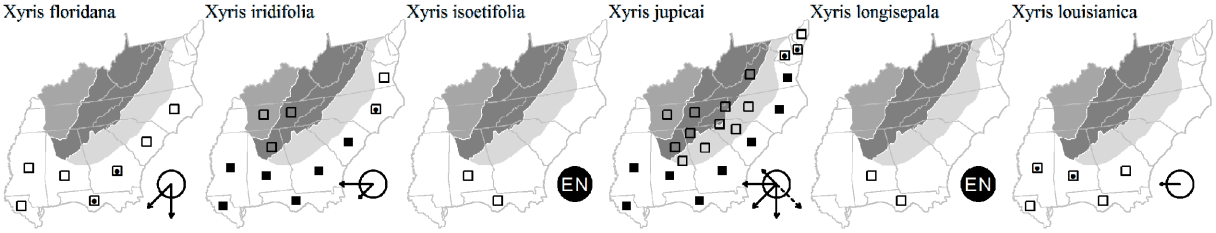
Xyris iridifolia Chapman, Irisleaf Yellow-eyed Grass. Marshes, upland pond margins, blackwater river channels, floodplain pools, other wet habitats. July-September. Se. VA south to ne. FL and FL Panhandle, west to e. TX; disjunct in c. TN and Mexico. [= RAB, C, GW, S, Z; = *X. laxifolia* Mart. var. *iridifolia* (Chapman) Kral – FNA, K, WH, X]

Xyris isoetifolia Kral. Bogs, savannas, and depression pond margins. Endemic to FL Panhandle and s. AL. [= FNA, GW, K, WH, X, Z]

Xyris jupicai L.C. Richard. Ditches, various wet habitats. July-September. NJ south to s. FL, west to TN, AR, se. OK (Singhurst, Bridges, & Holmes 2007), and TX; Mexico, Central America, South America, West Indies. Sometimes weedy and considered by some to be adventive from further south. At least some populations in our area are native and may additionally be worthy of taxonomic recognition as distinct from "true" *X. jupicai* (P. McMillan, pers. comm., 2003). [= RAB, C, FNA, GW, K, W, WH, X, Z; = *X. caroliniana* – F, misapplied; > *X. elata* Chapman – G, S; > *X. communis* Kunth – S; > *X. caroliniana* – G, S, misapplied]

Xyris longisepala Kral. Depression pond margins. Endemic to FL Panhandle and s. AL. [= FNA, GW, K, WH, X, Z]

Xyris louisianica E.L. Bridges & Orzell. Pine savannas, bogs, ditches and disturbed areas. FL Panhandle and GA west to se. TX. [= K, WH, X; = *X. stricta* Chapman var. *obscura* Kral – FNA; < *X. ambigua* – GW, S, Z]



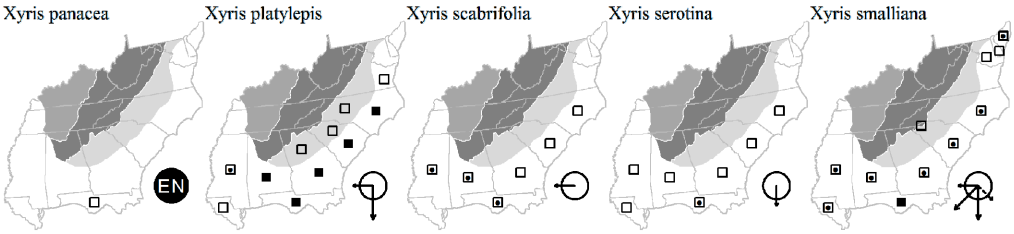
Xyris panacea L.C. Anderson & Kral, St. Marks Yellow-eyed Grass. Mucky depression ponds. Late June-early October. Endemic to FL Panhandle (Wakulla County). See Anderson & Kral (2008) for additional details.

Xyris platylepis Chapman. Sandhill seeps, savannas, ditches. July-September. Se. VA south to s. FL, west to se. LA; disjunct in sw. LA and se. TX. [= RAB, C, F, FNA, G, GW, K, S, WH, X, Z]

Xyris scabrifolia R.M. Harper, Roughleaf Yellow-eyed Grass. Sandhill seepage bogs and wet pine savannas. Sc. and se. NC south to Panhandle FL, west to s. AL and s. MS; disjunct in sw. LA-se. TX. *X. chapmanii* is a taxon distinct from *X. scabrifolia*. [= GW, S, WH, X; < *X. scabrifolia* – FNA, K, Z (also see *X. chapmanii*)]

Xyris serotina Chapman. Depression meadows, ultisol savannas (Lynchburg/Rains complex or Eulonia/Oketee), ditches. September. Se. NC south to c. peninsular FL, west to s. MS, in the Coastal Plain. [= RAB, FNA, GW, K, S, WH, X, Z]

Xyris smalliana Nash, Small's Yellow-eyed Grass. Pond margins, ditches. July-August. S. ME south to s. FL, west to s. MS; disjunct to se. TX; s. Mexico south into Central America; West Indies (Cuba). [= RAB, C, FNA, GW, K, S, W, WH, X, Z; > *X. congdonii* Small – F; > *X. smalliana* – F; > *X. smalliana* var. *smalliana* – G; > *X. smalliana* var. *olneyi* (Wood) Gleason – G]



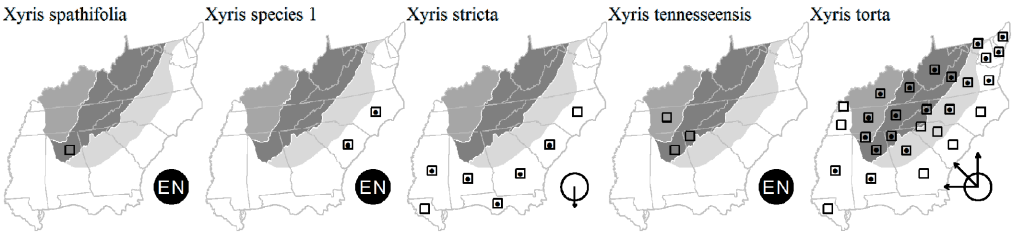
Xyris spathifolia Kral & Moffett, Ketona Yellow-eyed Grass. Seeps over dolomite. See Kral & Moffett (2009) for additional information. {not yet keyed}

Xyris species 1. Wet savannas and pond margins. July-September. Currently known only from Sandhills Region and inner Coastal Plain of NC and SC, and outer Coastal Plain of NC.

Xyris stricta Chapman. Depression ponds, depression meadows, borrow pits, ultisol savannas and ditches. July-September. SC south to ne. FL and Panhandle FL, west to s. MS and se. LA. Reported for our area by Kral (1966b). P. McMillan (pers. comm.) reports this species from a number of locations in the outer Coastal Plain of NC and SC. [= GW, K, S, WH, X, Z; = *X. stricta* var. *stricta* – FNA]

Xyris tennesseensis Kral, Tennessee Yellow-eyed Grass. Seepy, fenlike areas over limestone. TN, AL, and nw. GA (Jones & Coile 1988). See Kral (1978b). [= FNA, K]

Xyris torta J.M. Smith, Mountain Yellow-eyed Grass. Mountain bogs, marshes, ditches. June-August. NH west to WI, south to e. VA, e. NC, w. SC, c. GA, LA, OK, and TX. This is our only species of *Xyris* not strongly associated with the Coastal Plain. [= RAB, C, FNA, GW, K, S, W, WV, Z; > *X. torta* var. *macropoda* Fernald – F, G; > *X. torta* var. *torta* – F, G]



95. ERIOCAULACEAE Palisot de Beauvois 1828 (Pipewort Family) [in POALES]

A family of about 10 genera and 1100 species, of tropical and warm temperate regions (few in cold temperate regions), especially America, and most diverse in n. South America. References: Kral in FNA (2000); Kral (1966c)=Z; Stützel in Kubitzki (1998b).

1 Scape glabrous, 10-110 cm tall at maturity; roots thickened, septate (not requiring magnification), unbranched; leaves with obvious air spaces; petals 2, fused below; stamens (3-) usually 4 (-6), the anthers black at maturity ..... ***Eriocaulon***
1 Scape pubescent (in our species, or very rarely nearly glabrous), 6-40 cm tall at maturity; leaves lacking obvious air spaces; roots fibrous or spongy, not septate; petals 3 or absent; stamens 2-3, the anthers yellow at maturity.
  2 Scape pubescent with eglandular hairs; roots fibrous, branched, dark; heads white, gray, or brown; leaves bright green, tapering gradually through most of their lengths, herbaceous in texture ..... ***Lachnocaulon***
  2 Scape pubescent with glandular hairs (or a mixture of glandular and eglandular hairs); roots spongy, unbranched, pale; heads yellowish-tan or gray; leaves bluish green, narrowly linear to the abruptly flared base, stiff in texture ..... ***Syngonanthus***

Eriocaulon Linnaeus 1753 (Pipewort)

A genus of about 400 species, of tropical and warm temperate regions (few in cold temperate areas). References: Kral in FNA (2000); Kral (1966c)=Z; Gomes de Andrade et al. (2010); Stützel in Kubitzki (1998b). Key based on Kral in FNA (2000).

1 Receptacle and/or base of flowers copiously hairy; some or most of perianth parts with chalk white hairs; heads overall appearing white, 5-20 mm in diameter when in full flower or fruit.
  2 Heads hard (little compressed by a plant press and feeling hard and knotty when squeezed between finger and thumb); leaves dark green, the tip acute to obtuse; scape sheaths shorter than most leaves; involucral bracts straw-colored, the apex acute; receptacular bracteoles pale, the apex narrowly acuminate; pistillate flower petals adaxially glabrescent; terminal cells of club-shaped hairs of the perianth whitened, the basal cells often uncongested and transparent.
    3 Leaves to 1 cm wide, with acute to rounded tip; heads 7-15 mm in diameter; [widespread in our area] ..... ***E. decangulare*** *var.* ***decangulare***
    3 Leaves to 2 cm wide, with rounded tip; heads 13-20 mm in diameter; [of the East Gulf Coastal Plain, known from Panhandle FL and s. AL] ..... ***E. decangulare*** *var.* ***latifolium***
  2 Heads soft (much flattened by a plant press, and easily compressed when fresh between finger and thumb); leaves pale green, the tip attenuate-subulate; scape sheaths longer than most leaves; involucral bracts gray or dark, the apex rounded or obtuse; receptacular bracteoles gray to dark gray, the apex acute; pistillate flower petals adaxially villous; all cells of club-shaped hairs on perianth white.
    4 Mature heads 10-20 mm in diameter; leaves 5-30 cm long; petals of staminate flowers conspicuously unequal; [plants primarily of seasonally flooded ponds] ..... ***E. compressum***
    4 Mature heads 5-10 mm in diameter; leaves (1-) 2-5 (-7) cm long; petals of staminate flower nearly equal ..... ***E. texense***
1 Receptacle and/or base of flowers glabrous or sparingly hairy; receptacular bracteoles and/or perianth parts glabrous or hairy, the hairs club-shaped, clear or white; heads dark gray or white, 3-4 mm (*E. koernickianum*, *E. parkeri*, and *E. ravenelii*), or 4-10 mm (*E. aquaticum* and *E. lineare*) in diameter when in full flower or fruit.
  5 Stamens 6; pistil 3-carpellate ..... ***E. cinereum***
  5 Stamens 4; pistil 2-carpellate.
    6 Heads 4-10 mm in diameter when in full flower or fruit; outer involucral bracts usually reflexed, obscured by bracteoles and flowers.
      7 Inner involucral bracts, receptacular bracts, and sepals darkened, usually gray to nearly black; young heads dark; seeds very faintly reticulate, not papillate; [of ne. North America] ..... ***E. aquaticum***
      7 All bracts of staminate and pistillate flowers straw-colored or pale with grayish midzone, sepals of pistillate flowers basally pale, darkening toward the tip to grayish, gray-green, or gray-brown; heads (young and mature) pale; seeds faintly rectangular-reticulate, often papillate in lines; [of the se. Coastal Plain] ..... ***E. lineare***
    6 Heads 3-4 mm in diameter when in full flower or fruit; outer involucral bracts neither reflexed nor obscured by bracteoles and flowers.
      8 Bracts straw-colored, greenish, or light gray to gray, dull, the margins often erose or lacerate, the apex blunt to obtuse; [of tidal waters and large natural lakes of the outer Coastal Plain] ..... ***E. parkeri***
      8 Bracts dark, gray to blackish, very shiny, the margins all nearly entire, the apex acute; [of moist acidic sites].
        9 Bracts orbicular or broadly oblong, the apex rounded or apiculate; bract margins and apex hairy; perianth hairy; seed not pale-reticulate ..... ***E. koernickianum***
        9 Bracts narrowly ovate to oblong or spatulate, the apex acute; bracts and perianth parts (except sometimes the petals) glabrous; seed conspicuously pale-reticulate ..... ***E. ravenelii***

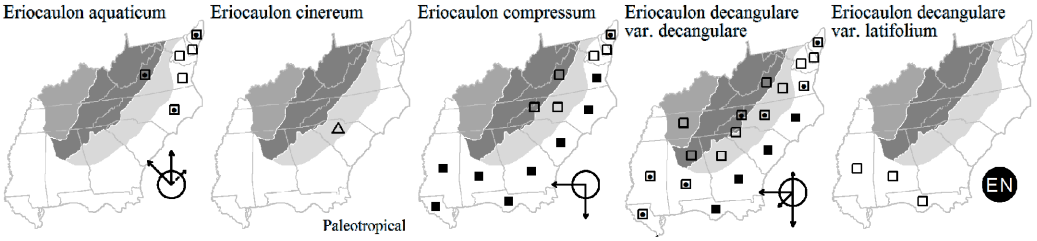
Eriocaulon aquaticum (Hill) Druce, Seven-angled Pipewort. Ponds, lakes. July-October. NB and NL (Newfoundland) west to ON and MN, south to e. NC, VA, AL, and IN; also Great Britain and Ireland. The name *E. septangulare* is invalid. *E. aquaticum* is the correct name if the species is interpreted to include both northern European and northeastern North American plants. If North American plants are distinct from European, the correct name is *E. pellucidum*. [= C, FNA, K; > *E. pellucidum* Michaux – RAB; = *E. septangulare* Withering – F, G, GW, W, Z, invalid name]

* ***Eriocaulon cinereum*** R. Brown, Ashy Pipewort. Drawdown shore of manmade lake; native of Australasia. See Kilpatrick & McMillan (2003). [= FNA, GW, K, Z]

Eriocaulon compressum Lamarck. Ponds, lakes, other depressions, wetter places in pine flatwoods and pine savannas. April-October. NJ south to s. FL, west to e. TX. [= RAB, C, F, FNA, G, GW, K, S, W, WH, Z]

Eriocaulon decangulare Linnaeus *var.* ***decangulare***, Common Ten-angled Pipewort. Wet savannas and pine flatwoods, bogs, seasonally flooded ponds. June-October. NJ south to s. FL, west to sw. AR and e. TX; Mexico, Central America. [= FNA, K; < *E. decangulare* – RAB, C, F, G, GW, S, W, WH, Z]

Eriocaulon decangulare Linnaeus *var.* ***latifolium*** Chapman ex Moldenke, Panhandle Pipewort. Seepage bogs. Restricted to Panhandle FL, s. AL, and s. MS. It appears to warrant taxonomic status, but needs additional study. [= FNA, K; < *E. decangulare* – GW, S, WH, Z]



Eriocaulon koernickianum van Heurck & Müller of Aargau, Dwarf Pipewort. Seepage areas on granite flatrocks. W. AR and e. OK south to e. TX; disjunct in c. GA. See Watson et al. (2002) for information on variation within the species. [= FNA, K; = *E. kornickianum* – GW, orthographic variant]

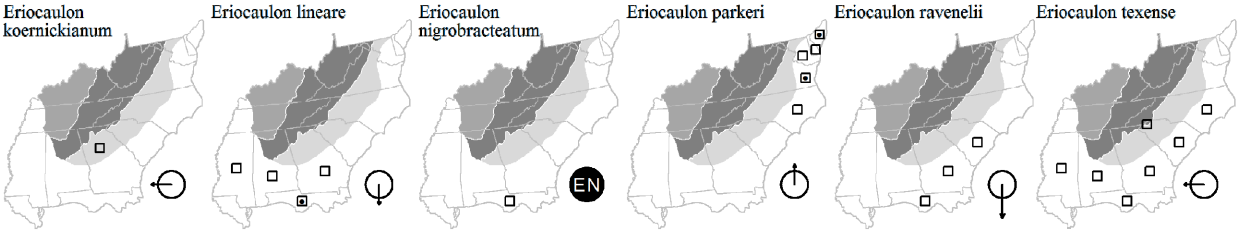
Eriocaulon lineare Small. Seepage bogs. Sw. GA south to c. peninsular FL, west to s. AL. It has been reported for NC (Kral in FNA 2000), but this is apparently in error. Kral & Sorrie (1998) proposed the conservation of the name *E. lineare* with a conserved type, as the designated type actually represents *E. texense*; this course was accepted by Brummitt (2005). [= FNA, GW, K, S, WH]

Eriocaulon nigrobracteatum E.L. Bridges & Orzell, Dark-headed Hatpins. Seepage bogs. Endemic to the FL Panhandle (Bay, Calhoun, and Gulf counties). [= FNA, K, WH] {not yet keyed]

Eriocaulon parkeri B.L. Robinson, Estuary Pipewort. Natural lakes, tidal marshes. ME and QC south to e. NC. [= C, F, FNA, G, GW, K, Z]

Eriocaulon ravenelii Chapman. Wet pine savannas. July-September. SC south to s. peninsular and Panhandle FL. [= RAB, FNA, GW, K, S, WH, Z]

Eriocaulon texense Körnick, Texas Hatpins. Sandhill seepage bogs, Altamaha Grit outcrops. Sc. NC south to w. Panhandle FL, west to e. TX. [= FNA, GW, K, WH, Z]



Lachnocaulon Kunth 1841 (Bogbuttons)

A genus of 7 species, herbs, of se. North America and Cuba. Based on work of Gomes de Andrade et al. (2010), *Lachnocaulon* is likely to be included in the large and primarily neotropical genus *Paepalanthus* Martius. References: Kral in FNA (2000); Kral (1966c)=Z; Gomes de Andrade et al. (2010); Stützel in Kubitzki (1998b).

1 Trichomes at the tips of the receptacular bracts milky white, opaque, the head therefore appearing gray to white, obscuring the brown color of the bractlets.
  2 Mature heads 4-7 mm across; seeds obviously longitudinally striate (as seen at 10× magnification) ..... ***L. anceps***
  2 Mature heads 3.5-4.0 mm across; seeds not obviously longitudinally striate, the striations obscure and very fine (not visible at 10× magnification) ..... ***L. beyrichianum***
1 Trichomes at the tips of the receptacular bracts translucent, the head therefore showing the brown color of the bractlets.
  3 Scape with ascending hairs ..... ***L. minus***
  3 Scape glabrous.
    4 Leaves 0.5-1 (-2) cm long; head light brown, usually globose; carpels 2 ..... ***L. digynum***
    4 Leaves 2-3 cm long; head reddish- or dark brown, usually elongate-cylindric; carpels 3 ..... ***L. engleri***

Lachnocaulon anceps (Walter) Morong, Common Bogbuttons. Moist to dry sands, moist peats, in pinelands, sometimes locally abundant in open disturbed areas where competition has been removed. May-October. S. NJ south to s. FL, west to se. TX; disjunct in ec. TN; West Indies (Cuba). [= RAB, C, F, FNA, G, GW, K, WH, Z; > *L. anceps* – S; > *L. floridanum* – S; > *L. glabrum* Körnick – S]

Lachnocaulon beyrichianum Sporleder ex Körnick, Southern Bogbutton. Upper margins of Coastal Plain doline ponds (sometimes under scrub oaks), flatwoods. May-September. Se. NC south to Panhandle FL and s. peninsular FL. [= RAB, FNA, GW, K, S, WH, Z]

Lachnocaulon digynum Körnick, Pineland Bogbutton. Pine savannas, bogs. Panhandle FL and s. AL west to TX. [= FNA, GW, K, S, WH, Z]

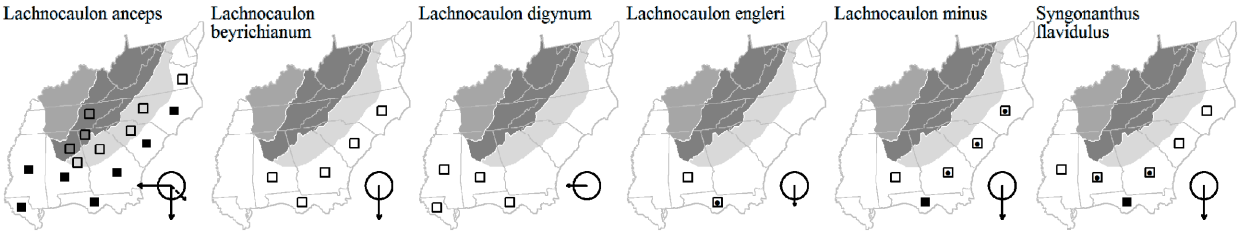
Lachnocaulon engleri Ruhland, Engler's Bogbutton. Pondshores, pine savannas. N. FL peninsula south to s. FL; Panhandle FL and s. AL. [= FNA, GW, K, S, WH, Z]

Lachnocaulon minus (Chapman) Small, Brown Bogbutton. Upper margins of Coastal Plain doline ponds, other pineland situations. May-October. E. NC south to s. peninsular FL, west to Panhandle FL and se. AL. [= RAB, FNA, GW, K, WH, Z; > *L. minus* – S; > *L. eciliatum* Small – S]

Syngonanthus Ruhland 1900 (Yellow Hatpins)

A genus of about 200 species, primarily of tropical America, but some in Africa and Madagascar; ours is the only temperate species. References: Kral in FNA (2000); Kral (1966c)=Z; Gomes de Andrade et al. (2010); Stützel in Kubitzki (1998b).

Syngonanthus flavidulus (Michaux) Ruhland, Yellow Hatpins, Bantam-buttons. Pine savannas, pine flatwoods, borders of pineland ponds, and adjacent ditches. May-October. Se. NC south to s. FL, west to s. MS. [= RAB, FNA, GW, K, S, WH, Z]



96. MAYACACEAE Kunth 1840 (Bogmoss Family) [in POALES]

A family of a single genus and 4-10 species, of tropical to warm temperate America and Africa. References: Faden in FNA (2000); Thieret (1975); Stevenson in Kubitzki (1998b).

Mayaca Aublet 1775 (Bogmoss)

A genus of 4-10 species, of tropical to warm temperate America and Africa. References: Thieret (1975)=Z; Faden in FNA (2000); Stevenson in Kubitzki (1998b).

Mayaca fluviatilis Aublet, Bogmoss. Cp (FL, GA, NC, SC): marshes, streams, swamp forests, shores of natural lakes, seepage areas, in saturated soil or variously submersed; common. May-July. Se. NC south to c. peninsular FL, west to se. TX; West Indies; Central America to South America. The two species previously recognized appear to be only different growth forms, induced by different hydrologic conditions. [= FNA, GW, K, WH, Z; > *M. aubletii* Michaux – RAB, S; > *M. fluviatilis* – RAB, S]

98. JUNCACEAE A.L. de Jussieu 1789 (Rush Family) [in POALES]

A family of about 8 genera and 350-440 species, herbs (and a few shrubs), largely of temperate regions of the Old and New World. References: Brooks & Clemants in FNA (2000); Balslev in Kubitzki (1998b); Drábková et al. (2003).

1 Leaves terete or flat, glabrous (or scabrous); capsule with > 3 seeds; [often in wetlands] ..... ***Juncus***
1 Leaves flat, pubescent; capsule with 3 seeds; [rarely in wetlands] ..... ***Luzula***

Juncus Linnaeus 1753 (Rush)
(by B.A. Sorrie and W.M. Knapp)

A genus of about 250-300 species, herbs, of cosmopolitan distribution. Drábková et al. (2003) indicate that *Juncus trifidus* may not be part of *Juncus*, and may be as closely related to *Luzula*. References: Brooks & Clemants in FNA (2000); Kirschner et al. (2002b, 2002c)= Y; Bridges & Orzell (2008); Clemants (1990); Balslev in Kubitzki (1998b); Zika (2003)=Z; Drábková et al. (2003); F; GW; RAB. The key based, in part, on those references.

subgenus *Juncus*, section *Juncus*: *acutus ssp. leopoldii, roemerianus*
subgenus *Juncus*, section *Graminifolii*: *filipendulus, marginatus, biflorus, longii, repens*
subgenus *Juncus*, section *Iridifolii*: *polycephalus*
subgenus *Juncus*, section *Ozophyllum*: *acuminatus, brachycephalus, brevicaudatus, caesariensis, canadensis, megacephalus, militaris, nodosus, paludosus, pelocarpus, subcaudatus, torreyi, trigonocarpus, validus var. validus*
subgenus *Agathryon*, section *Tenageia*: *bufonius var. bufonius*
subgenus *Agathryon*, section *Steirochloa*: *gerardii, coriaceus, [brachyphyllus], georgianus, secundus, dichotomus, tenuis, anthelatus, interior, dudleyi*
subgenus *Agathryon*, section *Juncotypus*: *gymnocarpus, [filiformis], inflexus, effusus var. solutus, pylaei, balticus*
UNCERTAIN placement (perhaps not even a *Juncus*): *trifidus*

Identification Notes: For identification of most rushes, it is important to collect plants with mature capsules and seeds. Stamen number is often a diagnostic character and can be determined after anthesis by counting the number of persistent filaments located behind the tepals. Care must be taken to collect specimens with uninjured heads, especially for the group of rushes in Key D; the long beaks of the capsules are often fragile and easily broken off.

1 Inflorescence appearing lateral; inflorescence bract erect, appearing to be a continuation of the culm..... **Key A**
1 Inflorescence appearing terminal; inflorescence bract not appearing to be a continuation of the culm.
2 Leaf blades non-septate .....**Key B**
2 Leaf blades septate (sometimes obscure in dried specimens; if so, rest leaf on hard surface and run fingernail over it lengthwise).
3 Mature seeds distinctly tailed with elongate appendages at each end (may be obscure in *J. subcaudatus*), seeds 0.7-2.5 mm long; [subgenus *Juncus*, section *Ozophyllum*] ..... **Key C**
3 Mature seeds without appendages, < 0.7 mm long.
4 Flowers solitary (rarely up to 3) along branches of inflorescence; flowers often aborted; inflorescence diffuse, with slender flexuous branches; [subgenus *Juncus*, section *Ozophyllum*] .....***J. pelocarpus***
4 Flowers in heads (glomerules) of 3 or more; flowers seldom aborted; inflorescence various.
5 Heads spherical or nearly so, usually 15-60 flowered..... **Key D**
5 Heads turbinate to hemispherical, 3-15 flowered; [subgenus *Juncus*, section *Ozophyllum*] .....**Key E**

KEY A

1 Flowers borne in heads (glomerules) of 2-6 flowers per head; leaves spine-tipped; single bracteole subtending glomerule present at base of pedicel; [plants of brackish habitats]; [subgenus *Juncus*, section *Juncus*]
2 Capsule 3.5-5 mm long, obviously longer than the tepals .....***J. acutus*** *ssp.* ***leopoldii***
2 Capsule < 3.5 mm long, shorter than or nearly equaling the tepals .....***J. roemerianus***
1 Flowers borne singly on branches of inflorescence; leaves not spine-tipped; each flower subtended by two bracteoles in addition to bracteole at base of pedicel; [plants of various habitats].
2 At least a few sheaths at base of plant with well developed blades; inflorescence bract channeled on one side; [subgenus *Agathryon*, section *Steirochloa*] .....***J. coriaceus***
2 Sheaths at base of plant bladeless; bract not channeled; [subgenus *Agathryon*, section *Juncotypus*].
3 Culms well spaced along creeping rhizomes.
4 Anthers shorter than filaments.
5 Rhizomes 1.5-2 mm diameter; culms 1 mm diameter; inflorescence 3-12 flowered; [boreal, south to ne. WV] .....***J. filiformis***
5 Rhizomes 2-4 mm diameter; culms 1.5-2.5 mm diameter; inflorescence 8-30+ flowered; [rare montane plant in NC and SC] ....***J. gymnocarpus***
4 Anthers longer than filaments.....***J. balticus*** *var.* ***littoralis***
3 Culms cespitose or tufted on short branching rhizomes.
6 Perianth much shorter than capsule (about ½ as long); stamens 6; [rare montane plant in NC and SC].....***J. gymnocarpus***
6 Perianth > 3/4 length of capsule; stamens 6 or 3.
7 Capsules 3-4 mm long; stamens 6; [rare alien in piedmont and mountains of VA] .....***J. inflexus***
7 Capsules 1.5-3.2 mm long; stamens 3; [widespread native].
8 Stems coarsely grooved, with 10-20 ridges just below inflorescence, firm; perianth 2.7-3.6 mm long, sepals slightly exceeding petals and capsule .....***J. pylaei***
8 Stems finely grooved, with 25-30 striations just below inflorescence, soft, easily compressed; perianth 1.9-2.8 mm long, sepals equaling petals .....***J. effusus*** *ssp.* ***solutus***

KEY B

1 Flowers borne in heads (glomerules) of 2 or more, individual flowers not subtended by two bracteoles (in addition to the bracteole at the base of the pedicel); [subgenus *Juncus*, section *Graminifolii*].
2 Perianth 6-10 mm long; plant aquatic, submersed and sterile or emersed/stranded and fertile; stems weak, creeping, mat-forming ....***J. repens***
2 Perianth < 6 mm long; plant of uplands or wetland margins, never submersed; stems erect, never creeping or mat-forming.
3 Heads 1-5 (-10) per culm; [calcareous glades inland, east to GA and TN].....***J. filipendulus***
3 Heads >9 per culm; [collectively widespread].
4 Infructescence usually congested, (1.8-) 2.4-4.7 (-6.4) cm long; greatest distance between adjacent rhizome cataphylls (5.3-) 6.3-10.5 (-13.0) mm; rhizome width (measured between adjacent cataphylls) (0.8-) 1.0-1.4 (-1.9) mm .....***J. longii***
4 Infructescence usually loose, (1.4-) 17.9-103.9 (-145) cm long; greatest distance between adjacent rhizome cataphylls (0.1-) 0.4-3.0 (-4.6) mm; rhizome width (measured between adjacent cataphylls) (0.4-) 1.0-3.5 (-4.5) mm.
5 Widest leaf blade (2.6-) 3.1-4.5 (-5.4) mm wide; sheath of lowest leaf (3.2-) 4.3-7.8 (-9.7) cm long; tallest culm (27.2-) 50.8-81.2 (-100.7) cm; anthers (0.5-) 0.6-1.0 (-1.3) mm long, exserted; stem base (3.4-) 5.8-9.6 (-12.0) mm wide.....***J. biflorus***

5 Widest leaf blade (1.3-) 1.6-2.6 (-3.5) mm wide; sheath of lowest leaf (1.7-) 2.2-3.8 (-4.7) cm long; tallest culm (19.2-) 26.0-44.0 (-56.8) cm; anthers (0.2-) 0.3-0.5 (-0.7) mm long, concealed by tepals; stem base (0.4-) 2.0-4.4 (-6.0) mm wide..... ***J. marginatus***

1 Flowers borne singly on branches of inflorescence, individual flowers subtended by two bracteoles (in addition to the bracteole at the base of the pedicel).

6 Plants annual, without coarse roots or persistent leaf bases; [subgenus *Agathryon*, section *Tenageia*] ..... ***J. bufonius***

6 Plants perennial, with coarse roots or persistent leaf bases.

7 Leaves finely serrulate or scabrid; auricles deeply lacerate; [rare and local in high elevation "alpine" situations]..... ***J. trifidus***

7 Leaves entire; auricles not lacerate; [subgenus *Agathryon*, section *Steirochloa*].

8 Auricles 3-6 mm long at summit of leaf sheath.

9 Capsules < 3/4 length of perianth, borne widely spaced along the usually diffuse branches of the inflorescence ..... ***J. anthelatus***

9 Capsules > 3/4 length of perianth, borne congested on branches with internodes about as long as perianth ..... ***J. tenuis***

8 Auricles < 2 mm long or absent.

10 Cauline leaves present in addition to basal leaves; blades flat..... ***J. gerardii***

10 Cauline leaves absent.

11 Leaf blades terete or channeled ..... ***J. dichotomus***

11 Leaf blades flat.

12 Perianth obtuse apically; capsule chestnut brown or darker; [alien, ranging south to MD] ..... ***J. compressus***

12 Perianth acute to acuminate; capsule light brown or tan; [native].

13 Inflorescence bract shorter than inflorescence; capsules 3-locular.

14 Perianth usually 2.5-3.5 mm long; flowers secund; capsules globose to ellipsoid..... ***J. secundus***

14 Perianth usually 4.0-5.5 mm long; flowers not secund; capsules ellipsoid or narrowly so; restricted to granite flatrocks . ..... ***J. georgianus***

13 Inflorescence bract longer than inflorescence; capsules 1-locular to falsely 3-locular.

15 Auricles yellowish, glossy; perianth spreading in fruit..... ***J. dudleyi***

15 Auricles whitish or straw colored, dull; perianth not spreading.

16 Mature capsules pale brown or darker; [of the Coastal Plain]..... ***J. dichotomus***

16 Mature capsules pale tan or darker; [of prairies and plains, east to KY, se TN]..... ***J. interior***

KEY C

1 Culms and leaves scabrid, gray-green or blue-green; seeds 2.0-2.5 mm long ..... ***J. caesariensis***

1 Culms and leaves smooth, green; seeds 0.7-2.2 mm long.

2 Seeds 1.2-2.2 mm long, seed body < ½ length of seed.

3 Mature capsules 3.0-4.0 mm long, < 1.5 mm longer than perianth, light reddish brown to light brown; heads 5-50 flowered ..... ***J. canadensis***

3 Mature capsules 4.0-5.0 mm long, 2 mm longer than perianth, dark reddish purple; heads 3-7 flowered..... ***J. trigonocarpus***

2 Seeds 0.7-1.2 mm long, seed body > ½ length of seed.

4 Perianth obtuse to subacute, with wide scarious margins..... ***J. brachycephalus***

4 Perianth acuminate, with narrow scarious margins.

5 Inflorescence narrow, the branches erect; mature capsules dark brown; heads 2-7 flowered..... ***J. brevicaudatus***

5 Inflorescence open, the branches widely spreading; mature capsules dark straw colored; heads 5-20 flowered..... ***J. subcaudatus***

KEY D

1 Leaves flattened, narrowly elliptic in cross-section.

2 Leaves with incomplete septae; heads about 10 mm diameter; tips of dehisced capsules united; [subgenus *Juncus*, section *Iridifolii*]..... ***J. polycephalos***

2 Leaves with complete septae; heads about 12 mm diameter; tips of dehisced capsules split; [subgenus *Juncus*, section *Ozophyllum*] ..... ***J. validus*** *var.* ***validus***

1 Leaves terete, not at all flattened; [subgenus *Juncus*, section *Ozophyllum*].

3 Plants strictly cespitose, without any short, hard, knotty rhizomes; tepals lanecolate ..... ***J. acuminatus***

3 Plants with at least some short, hard, knotty rhizomes; tepals lanceolate-subulate.

4 Capsules shorter than the tepals, clearly included within the tepals at maturity..... ***J. brachycarpus***

4 Capsules equaling or exceeding the tepals, exserted from or only barely included within the tepals at maturity.

5 Capsule valves separating at the apex at maturity; stamens 6.

6 Heads 6-20 flowered, 6-9 mm diameter; auricles cartilaginous, 0.5-1.0 mm long..... ***J. nodosus***

6 Heads 25-100 flowered, 10-14 mm diameter; auricles membranous, 2.5-4.0 mm long..... ***J. torreyi***

5 Capsule valves remaining united at the apex after dehiscence; stamens 3.

7 Culms 4-8 mm in diameter near the base, usually > 80 cm tall; inflorescences usually > 15 cm tall, with > 25 heads; largest leaf blades > 25 cm long and > 3 mm in diameter..... ***J. paludosus***

7 Culms 1-3 mm in diameter near the base, usually < 80 cm tall; inflorescences usually < 10 cm tall, with < 25 heads; largest leaf blades < 25 cm long and 1-2 mm in diameter.

8 Uppermost cauline leaf blade non-septate, much shorter than its sheath; outer tepals significantly longer than the inner tepals .... ***J. megacephalus***

8 Uppermost cauline leaf blade septate, longer than its sheath; outer tepals and inner tepals of similar length.

9 Heads lobulate; mature capsule 2.0-3.0 mm long..... ***J. scirpoides*** *var.* ***compositus***

9 Heads spherical, not lobulate; mature capsule 3.0-4.5 mm long..... ***J. scirpoides*** *var.* ***scirpoides***

KEY E

1 Mature capsules 2 mm or more longer than perianth, 4.0-5.2 mm long ..... ***J. diffusissimus***

1 Mature capsules < 1.5 mm longer than perianth, or subequal.
2 Stamens 6.
3 Proximal culm leaf overtopping inflorescence; culms well spaced along creeping rhizomes; plants often exceed 8 dm tall; [northeastern, south to DE, MD, disjuncts in ne. NC] ..... ***J. militaris***
3 Proximal culm leaf shorter than inflorescence; plants cespitose; plants < 8 dm tall.
4 Mature capsules slightly shorter than to slightly longer than perianth (< 0.5 mm longer); perianth 2.6-3.9 mm long; inflorescence 4-16 cm long; [widespread] ..... ***J. acuminatus***
4 Mature capsules exceeding perianth by about 1 mm (>0.5 mm longer); perianth 1.7-3.0 mm long; inflorescence 2-8 cm long; [northern, in our region montane] ..... ***J. articulatus***
2 Stamens 3.
5 Mature capsules about 1/3 longer than perianth (roughly 1-1.5 mm longer) ..... ***J. debilis***
5 Mature capsules equaling or barely exceeding perianth.
6 Heads 5-50; capsules 2.8-3.5 mm long ..... ***J. acuminatus***
6 Heads 30-250; capsules 1.9-2.9 mm long.
7 Capsules deep chestnut brown; roots with terminal tubers; inner tepals usually > 2.4 mm long; [southeastern] ..... ***J. elliottii***
7 Capsules straw colored; roots without terminal tubers; inner tepals usually 1.7-2.3 mm long; [midwestern, east to w. Panhandle FL and se. TN] ..... ***J. nodatus***

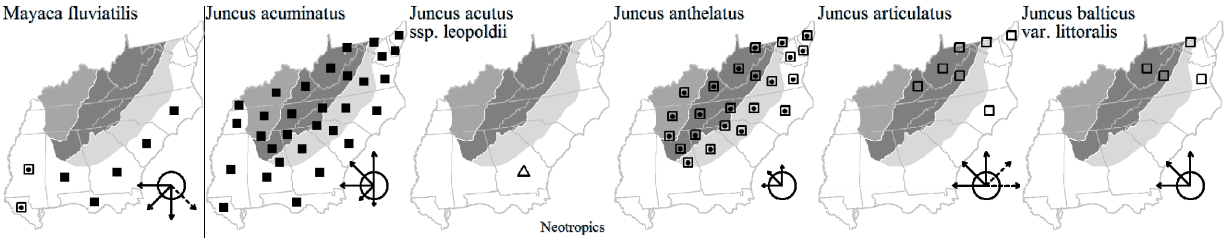
Juncus acuminatus Michaux. In damp soils. May-August. ME and NS to ON and MN, south to n. peninsular FL, TX, and n. Mexico; Honduras; BC to CA. [= RAB, C, F, FNA, G, GW, K, S, W, WH, WV, Y]

* ***Juncus acutus*** Linnaeus *ssp.* ***leopoldii*** (Parlatore) Snogerup. Sandy soil at edge of salt marsh. Reported for se. GA by Jones & Coile (1988) and Kartesz (1999), but not by FNA. The distribution in GA is documented by a correctly-identified specimen at Herbarium GA. [= FNA, K, Y] {not yet keyed}

Juncus anthelatus (Wiegand) R.E. Brooks. Moist or wet sites. July-September. NB and ME west to MN, south to GA and AR. [= FNA, Y; < *J. tenuis* Willdenow – RAB, G, GW, K, S, W; < *J. tenuis* var. *tenuis* – C; = *J. tenuis* var. *anthelatus* Wiegand – F, WV]

Juncus articulatus Linnaeus, Jointleaf Rush. Marshes, calcareous seepage wetlands, wet open ground. July-September. Nearly cosmopolitan; in North America from NL (Newfoundland) to AK, south to e. NC (Cape Hatteras, Dare County) (Sorrie & LeBlond 2008), s. WV, sw. VA, and CA. [= RAB, C, FNA, G, K, WV; > *J. articulatus* var. *articulatus* – F; > *J. articulatus* var. *obtusatus* Engelmann – F; = *J. articulatus* ssp. *articulatus* – Y]

Juncus balticus Willdenow *var.* ***littoralis*** Engelmann. Open calcareous wetlands. The species is circumboreal; var. *littoralis* is North American: NL (Labrador) west to BC, south to NY (Long Island), NJ, PA, w. VA, OH, IN, MO, and KS. [= F, G, K; = *J. arcticus* Willdenow var. *littoralis* (Engelmann) Boivin – C; < *J. arcticus* Willdenow var. *balticus* (Willdenow) Trautvetter – FNA; < *J. balticus* – WV; = *J. balticus* ssp. *littoralis* (Engelmann) Snogerup – Y]



Juncus biflorus Elliott. Pine savannas, pine flatwoods, mesic areas in sandhill-pocosin ecotones, roadsides, low fields in the Piedmont, wet meadows. June-October. MA to MO, south to FL, TX, Mexico and Central America, and disjunct in South America. See Knapp & Naczi (2008) for clarification of the *Juncus marginatus* complex. [= RAB, F, K, W, WV; < *J. biflorus* – C, G (also see *J. longii*); < *J. marginatus* – FNA, GW, WH, Y (also see *J. biflorus* and *J. longii*); = *J. aristulatus* Michaux var. *biflorus* (Elliott) Small– S]

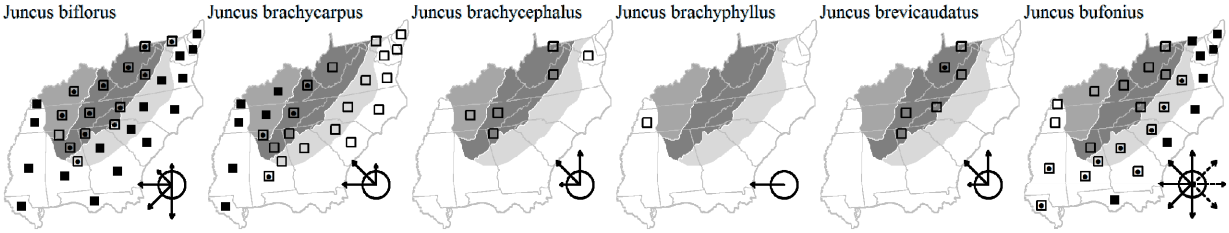
Juncus brachycarpus Engelmann, Short-fruited Rush. Wet, sandy soil. June-September. MA to IL, south to SC, wc. GA, and TX. [= RAB, C, F, FNA, G, GW, K, S, WV, Y]

Juncus brachycephalus (Engelmann) Buchenau. Calcareous wetlands. NS west to ND, south to MA, OH, and IL; disjunct southward in VA, n. GA, TN, and CO. [= C, F, FNA, G, K, Y]

Juncus brachyphyllus Wiegand. Wet sandy areas. MO and KS, south to TX; MT, ID, and WA south to CA; disjunct in the Coastal Plain of w. TN. [= FNA, C, K, Y] {not yet keyed}

Juncus brevicaudatus (Engelmann) Fernald, Short-tailed Rush. Bogs and seeps, southwards at high elevations. July-September. NL (Newfoundland) to MB south to MN, PA, and in mountains south to NC; scattered in w. North America. [= RAB, C, F, FNA, G, K, W, WV, Y]

Juncus bufonius Linnaeus, Toad Rush. Wet, open ground, roadsides, dried pools, drawdown shores. June-November. Cosmopolitan, and polymorphic; a number of varieties have sometimes been recognized, but need additional study. [= RAB, FNA, GW, S, W, WH, WV, Y; > *J. bufonius* var. *bufonius* – C, F, G, K]



Juncus caesariensis Coville, New Jersey Rush. Sphagnous seepages in the Coastal Plain of VA, seeps and bogs at low to moderate elevations in the Mountains of NC. July-October. Found in 1992 from a seepage bog in Clay County, NC, and in 1993 from a bog in Henderson County, NC, where associated with northern disjuncts. Rare throughout its range, it is known only from several sites in NJ, MD, VA, NC, and NS (Newell & Newell 1994). The scabrid leaf blades and large seeds quickly separate this species from the other long-tailed rushes. It should be looked for along seepage slopes and bogs in the fall-line sandhills and the outer Coastal Plain. [= C, F, FNA, G, K, Y]

Juncus canadensis J. Gay ex Laharpe, Canadian Rush. Lake, pond and stream margins, swamps, bogs, seepage slopes, wet meadows, ditches. July-October. NL (Newfoundland) to MN, south to c. peninsular FL, TN, and LA. *J. canadensis* is here treated as a single, polymorphic species. Fernald and others have described up to 5 forms and varieties of *J. canadensis*, based on variation in flower and capsule size (from 2.5 mm to nearly 4.0 mm), shape of the glomerules (densely flowered and subglobose to few-flowered and turbinate), and structure and size of the inflorescence (congested to open). Further study is necessary to determine whether any of these taxa should be recognized. [= RAB, C, FNA, G, GW, K, S, W, WH, WV, Y; > *J. canadensis* var. *canadensis* – F; > *J. canadensis* var. *euroauster* Fernald – F]

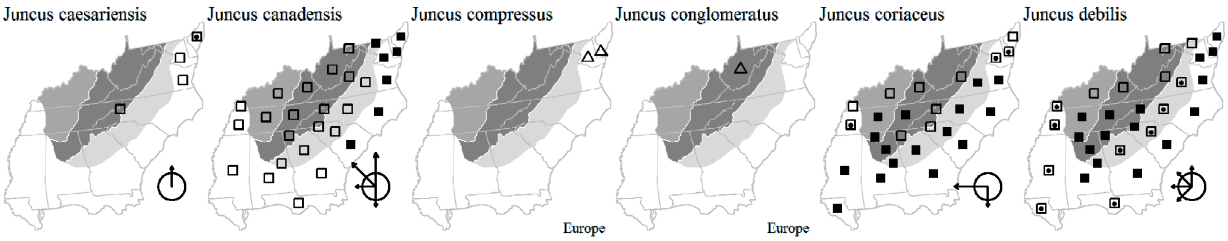
* *Juncus capitatus* Weigel. Reported for n. AL (Kartesz 1999); rejected by Kral et al. (2010). [= K] {rejected; not keyed}

* ***Juncus compressus*** Jacquin. Disturbed ground, ditches, in saline or alkaline soils; native of Europe. NS to ON, south to MD, PA, w. NY, MI, WS, and sporadically distributed westward in high elevations. [= FNA, C, F, FNA, G, K, Y]

* ***Juncus conglomeratus*** Linnaeus. Low, marshy or peaty places; native of Europe. July-September. Reported for WV and northwards. [= C, K; < *J. effusus* – FNA; = *J. effusus* Linnaeus var. *conglomeratus* (Linnaeus) Engelmann – F]

Juncus coriaceus Mackenzie. Stream and pond margins, swamps, flatwoods depressions, roadside ditches. June-September. S. NJ to c. peninsular FL, west to e. TX, north in the interior KY, AR, and OK. [= RAB, C, F, FNA, G, GW, K, W, WH, Y; = *J. setaceus* Rostkovius – S, misapplied]

Juncus debilis A. Gray, Weak Rush. Marshy shores, stream and pond margins, along puddles in wet, disturbed clearings, ditches. May-August. RI to MO, south to n. FL and e. TX; Honduras. [= RAB, C, F, FNA, G, GW, K, S, W, WH, Y]



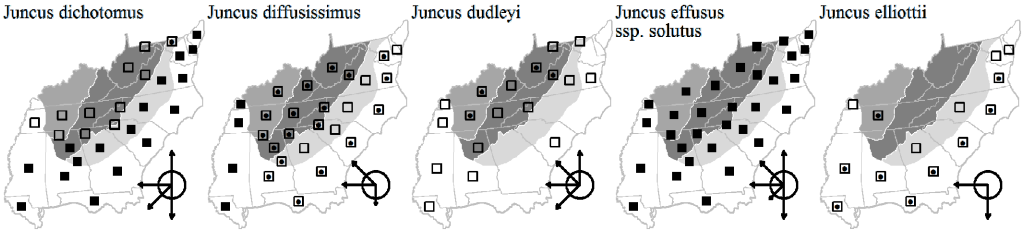
Juncus dichotomus Elliott. Often in disturbed, open, wet areas, ditches, wet meadows. June-October. MA to c. peninsular FL, west to OK and TX; Central America. The character used to separate *J. platyphyllus* (Wiegand) Fernald from *J. dichotomus* (flat leaf blade vs. terete leaf blade) does not appear to be reliable; leaf blades from culms in the same clump may vary from flat to slightly involute to completely terete. [= FNA, GW, W, WV, Y; > *J. dichotomus* – RAB, F; > *J. platyphyllus* (Wiegand) Fernald – RAB, F; = *J. tenuis* var. *dichotomus* (Elliott) A. Wood – C; > *J. dichotomus* var. *dichotomus* – G, K, S; > *J. dichotomus* var. *platyphyllus* Wiegand – G, K, S]

Juncus diffusissimus Buckley, Diffuse Rush, Slim-pod Rush. Low, wet open areas, ditches, margins of ponds and streams. May-September. Mostly Coastal Plain from se. VA to c. peninsular FL, west to e. and nc. TX; also s. IN to MO, KA, OK, TN, and KY. [= RAB, C, F, FNA, G, GW, K, S, W, WH, WV, Y]

Juncus dudleyi Wiegand, Dudley's Rush. Calcareous seepages and fens, river-scours. NL (Labrador) to NU, YT and AK, south FL, TX, CA, and Mexico. First reported for South Carolina by Hill & Horn (1997) and for NC by Tom Govus (pers. comm., 2005). [= F, FNA, K, S, W, WV, Y; = *J. tenuis* Willdenow var. *dudleyi* (Wiegand) F.J. Hermann – C; < *J. tenuis* – G, GW]

Juncus effusus Linnaeus *ssp.* ***solutus*** (Fernald & Wiegand) Hämet-Ahti, Common Rush, Soft Rush. Moist soil, marshes, margin of streams, ponds, lakes and swamps, low meadows. June-September. NL (Newfoundland) to MN, south to s. FL and Mexico. Ssp. *effusus* is European, and also occurs (allegedly introduced) in the ne. United States. [= WH, Y, Z; < *J. effusus* – RAB, FNA, GW, S, W; = *J. effusus* Linnaeus var. *solutus* Fernald & Wiegand – C; > *J. effusus* Linnaeus var. *solutus* Fernald & Wiegand – F, K ; > *J. griscomii* Fernald – F, G; >< *J. effusus* Linnaeus var. *solutus* Fernald & Wiegand – G (also see *J. pylaei*); > *J. effusus* var. *compactus* – G, misapplied; > *Juncus effusus* Linnaeus var. *conglomeratus* (Linnaeus) Engelmann – K]

Juncus elliottii Chapman, Elliott's Rush. Margins of ponds and lakes, depressions in savannas and flatwoods, wet, disturbed clearings, roadside ditches. May-September. Coastal Plain, DE to c. peninsular FL, west to se. TX. Capsules of *J. elliottii* are similar in shape to *J. acuminatus*, but the presence of tubiferous roots, shorter perianth (2.0-2.5 mm long vs. 2.5-3.5 mm) and fewer-flowered glomerules (3-8 flowered vs. 5-many flowered) clearly distinguishes *J. elliottii* from *J. acuminatus*. [= RAB, C, F, FNA, G, GW, S, WH, Y; > *J. elliottii* var. *elliottii* – K; > *J. elliottii* var. *polyanthemus* C. Mohr – K]



Juncus filiformis Linnaeus, Thread Rush. Bogs, wet acid areas. June-August. Circumboreal, south in North America to e. PA, w. PA, ne. WV, n. MI, and n. MN. [= C, F, FNA, G, K]

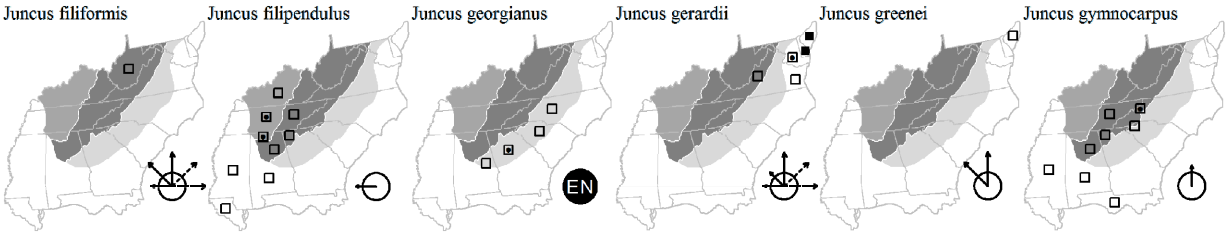
Juncus filipendulus Buckley, Texas Plains Rush. Prairies, limestone barrens. KY, TN, and AL west to OK and TX. [= FNA, GW, K, S, Y]

Juncus georgianus Coville. Shallow depressions in granitic outcrops. June-August. An endemic of the Southeastern Piedmont, restricted to granitic flatrocks of NC, SC, GA, and ec. AL. [= RAB, FNA, K, S, W, Y]

Juncus gerardii Loiseleur, Blackfoot Rush, Blackgrass. Brackish marshes, salt marshes. May-July. Circumboreal, in North America from Greenland and NL (Newfoundland) west to BC, south to VA, MO, OK, UT, and CA (some of the southern occurrences perhaps introduced). [= C, FNA, W; > *J. gerardi* var. *gerardi* – F; = *J. gerardi* – G, orthographic variant; > *J. gerardii* var. *gerardii* – K; > *J. gerardii* ssp. *gerardii* – Y]

Juncus greenei Oakes & Tuckerman, Greene's Rush. Pine barrens, other dry, open sandy sites. June-July. NB west to MN, south to s. NJ, n. OH, n. IN, n. IL, and IA. [= C, F, FNA, G, K]

Juncus gymnocarpus Coville, Seep Rush. Bogs, seeps, streambanks. July-September. Local, mountains of e. PA, w. NC, e. TN, nw. SC and ne. GA, Coastal Plain of se. AL, s. MS (Sorrie & Leonard 1999), and w. Panhandle FL. In the Appalachians, *J. gymnocarpus* is scattered in mountain bogs and seeps throughout the mountain region; it reaches its most general occurrence in the escarpment gorge region of Transylvania, Macon, and Jackson counties, NC, where it also occurs along streambanks, especially in the vicinity of waterfalls. [= RAB, C, F, FNA, G, GW, K, S, W, WH, Y]



* ***Juncus inflexus*** Linnaeus. Wet meadows, disturbed wet or moist ground; native of Eurasia. Introduced in VA (Virginia Botanical Associates 2006, Kartesz 1999). [= C, F, FNA, G, K, Y]

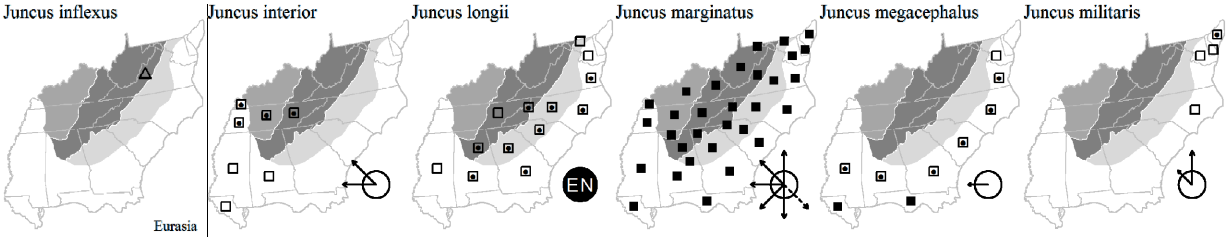
Juncus interior Wiegand. Prairies, disturbed sites. OH west to SK, south to e. TN, AL (Sorrie & LeBlond 2008), MS (Sorrie & LeBlond 2008), LA, TX, and NM. Also reported for VA and NC (Kartesz 1999); the NC report is based on a misidentified specimen. {further investigate} [= FNA, G, S, W, Y; > *J. interior* var. *interior* – K; < *J. tenuis* Willdenow var. *tenuis* – C; < *J. tenuis* – GW]

Juncus longii Fernald. Usually in very wet, often inundated sites, bogs, ditches, rooting in clay or peat. June-August. MD south through VA, NC, SC to s. MS, mainly in the Coastal Plain; disjunct inland in boggy sites, as in w. NC, nc. GA, TN, and n. AL (Knapp & Naczi 2008, more extensive distributions are based on misattribution). See Knapp & Naczi (2008) for clarification of the *Juncus marginatus* complex. [= RAB, F, K; < *J. biflorus* – C, G; < *J. marginatus* – FNA, GW, Y (also see *J. biflorus* and *J. longii*); = *J. aristulatus* Michaux var. *aristulatus* – S]

Juncus marginatus Rostkovius. Wet meadows, bogs, generally throughout in wet, sandy or peaty soil. June-September. NS to ON, MI, and NE, south to s. peninsular FL and TX; disjunct in CA and in South America. See Knapp & Naczi (2008) for clarification of the *Juncus marginatus* complex. [= RAB, C, G, K, S, W, WV; > *J. marginatus* var. *marginatus* – F; > *J. marginatus* var. *setosus* Coville – F; < *J. marginatus* – FNA, GW, WH, Y (also see *J. biflorus* and *J. longii*); > *J. marginatus* – G; > *J. setosus* (Coville) Small – G]

Juncus megacephalus M.A. Curtis, Large-headed Rush. Brackish and freshwater marshes, bogs, wet prairies, ditches, wet, open places. June-August. Coastal Plain, e. MD and VA to s. FL, west to se. TX; e. MD. [= RAB, C, F, FNA, G, GW, K, S, WH, Y]

Juncus militaris Bigelow, Bayonet Rush. Lakeshores, shallow streams. NS to MD, DE, and ne. PA; inland near the Great Lakes; disjunct at Phelps Lake, Washington County, NC (Sorrie & LeBlond 2008). [= C, F, FNA, G, K, Y]



Juncus nodatus Coville. Shallow water, marshes, sloughs, savannas, bogs. KY west to KS, south to TN, AL, w. Panhandle FL, MS (Sorrie & LeBlond 2008), LA, and TX. [= FNA, C, G, GW, K, Y; ? *J. robustus*, preoccupied] {synonymy incomplete}

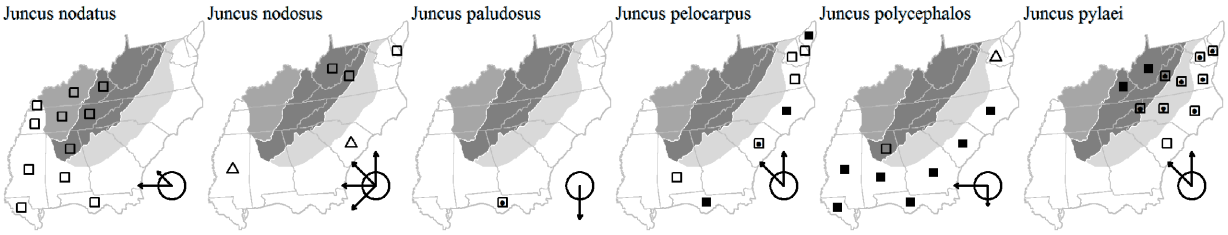
Juncus nodosus Linnaeus. Swamps, streamsides. July-August. NL (Newfoundland) to BC, south to DE, w. VA, WV, IN, MO, TX, and CA. [= C, F, FNA, G, WV, Y; > *J. nodosus* var. *nodosus* – K]

Juncus paludosus E.L. Bridges & Orzell. Hardwood swamps, cypress swamps and stringers with seasonally flowing water, adjacent ditches. April-May; May-July. Ne. FL and e. FL Panhandle south to s. FL. See Bridges & Orzell (2008) for more detailed information.

Juncus pelocarpus E. Meyer. Ditches, along pond and stream margins, seepage slopes, disturbed open areas, sea-level fens, interdunal swales, Atlantic white-cedar swamps. July-October. NL (Labrador) west to MN, south to DE, e. VA, n. IN; se. VA to SC; FL Panhandle and s. AL. The septae along the narrow leaf blades of *J. pelocarpus* are often difficult to detect. More southern populations (from VA southwards) are more robust and have sometimes been separated as *J. abortivus*, but variation appears to be clinal. [= FNA, WH, Y; > *J. pelocarpus* – K; > *J. pelocarpus* var. *pelocarpus* – C, F, G; > *J. abortivus* Chapman – RAB, F, GW, K, S; > *J. pelocarpus* E. Meyer var. *crassicaudex* Engelmann – C, F, G]

Juncus polycephalos Michaux, Many-headed Rush. Sandy pond margins, ditches, savannas. July-September. Coastal Plain, NC to s. FL, west to e. TX. [= WH; = *Juncus polycephalus* – RAB, F, FNA, GW, K, S, Y, orthographic variant]

Juncus pylaei Laharpe, Common Rush. Moist soil, marshes, margin of streams, ponds, lakes and swamps, low meadows(overlooked and probably more widespread and common than shown). June-September. Throughout eastern North America, south to NC and SC. [= C, K, Y, Z; < *J. effusus* – RAB, FNA, GW, S, W; > *J. effusus* var. *costulatus* St. John – F; > *J. effusus* Linnaeus var. *pylaei* (Laharpe) Fernald & Wiegand – F; < *J. effusus* Linnaeus var. *solutus* Fernald & Wiegand – G]



Juncus repens Michaux, Creeping Rush. Streams, ponds, lakes, ditches, wet depressions in flatwoods, cypress savannas. June-October. DE to s. FL, west to TX, north into OK and TN; Mexico (Tabasco); Cuba. This species commonly forms dense mats – a useful field character. [= RAB, C, F, FNA, G, GW, K, S, WH, Y]

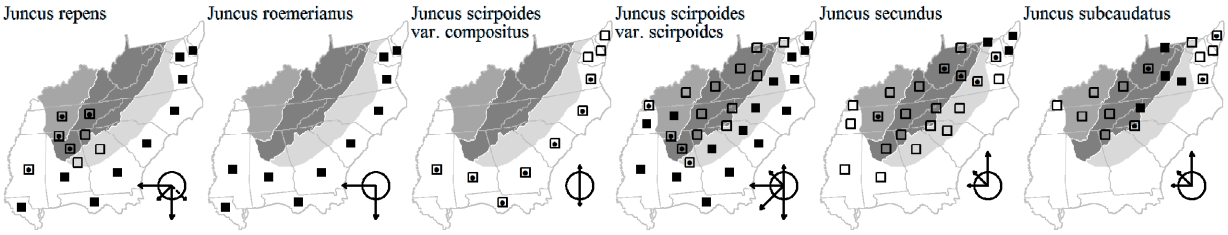
Juncus roemerianus Scheele, Black Needle Rush. Coastal tidal marshes, forming dense stands at and above mean high tide, above the *Spartina alterniflora* zone. January-June; May-October. MD to s. FL, west to se. TX. See Eleuterius (1977) for additional information on this species. [= RAB, C, F, FNA, G, GW, K, S, WH, Y]

Juncus scirpoides Lamarck *var.* ***compositus*** R.M. Harper, Lobe-headed Rush. Roadsides, wet, open, disturbed areas. June-October. Coastal Plain: NC, GA, FL, AL, MS, LA, SC, TX, VA. [= S; < *J. scirpoides* – RAB, FNA, GW, K, WH, Y; >< *J. scirpoides* – K; <? *J. scirpoides* var. *meridionalis* Buchenau – F, application uncertain; > *J. glomeratus* Batson – K, nomen nudum]

Juncus scirpoides Lamarck *var.* ***scirpoides***. Wet, open, disturbed areas, ditches, sandhill pocosin ecotones and seepage bogs, savannas and wet pine flatwoods, wet meadows. June-October. S. NY to s. FL, mostly Coastal Plain and Piedmont; west to TX; IN to MI, MO, OK. [= F, S; < *J. scirpoides* – RAB, C, FNA, G, GW, K, W, WH, WV, Y]

Juncus secundus Beauvois ex Poiret. Dry fields, rock outcrops. June-October. ME to IN, south to e. OK, n. AL, and n. GA. [= RAB, C, F, FNA, G, K, S, W, WV, Y]

Juncus subcaudatus (Engelmann) Coville & Blake, Somewhat-tailed Rush. Bogs, mossy woods and other wet places. July-October. NS to NY, southwest to MO and southeast to GA. *J. subcaudatus* is one of the more difficult rushes to identify. Although it is grouped with *J. canadensis*, *J. brevicaudatus*, and the other long-tailed rushes, its seeds lack distinct, long appendages. In general appearance it matches *J. acuminatus* quite well; mature seed size and mature capsule size (*J. subcaudatus* capsules are generally well exserted above the perianth, while *J. acuminatus* capsules are equal to only slightly exserted above the capsule) need to be examined in order not to confuse the two taxa. [= RAB, C, FNA, G, W, WV, Y; > *J. subcaudatus* var. *subcaudatus* – F, K]



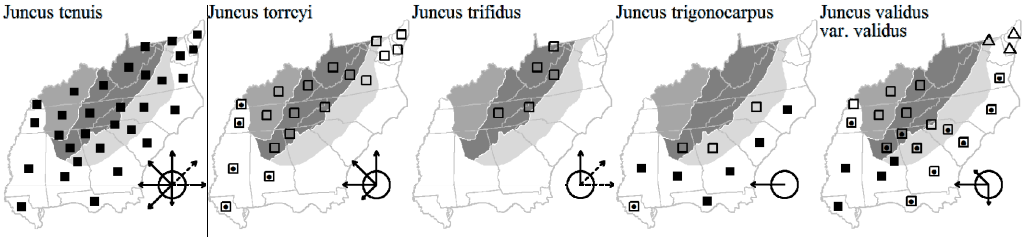
Juncus tenuis Willdenow, Path Rush. Dry or moist soil along roadsides and paths, fields. June-September. NL (Labrador) west to AK, south to FL, TX, CA, and n. Mexico; Central and South America; introduced widely around the world. *J. tenuis* as it is here treated includes *J. tenuis* var. *williamsii* Fernald, which has a more congested inflorescence with arched to recurved inflorescence branches. [= FNA, Y; < *J. tenuis* – RAB, G, GW, K, S, W, WH; < *J. tenuis* var. *tenuis* – C; > *J. tenuis* var. *tenuis* – F, WV; > *J. tenuis* var. *williamsii* Fernald – F]

Juncus torreyi Coville, Torrey's Rush. Bogs, other sites with wet soil. June-September. NB west to BC, south to GA, TX, CA, and n. Mexico. [= FNA, C, F, G, GW, K, S, W, WV, Y]

Juncus trifidus Linnaeus, Highland Rush. Rock crevices at high elevations, on greenstone, mica schist, amphibolite, hornblende gneiss, and quartzitic sandstone. June-September. The species is circumboreal, occurring in arctic-alpine situations in n. Europe and n. North America where it ranges from NL (Newfoundland) to QC, south to s. New England and NY; disjunct in VA (Stony Man, Page County) and NC (Craggy Pinnacle, Craggy Dome, and Craggy Gardens, Buncombe County; Eagle Cliff, Mitchell County; Three Top Mountain, Ashe County), and WV (North Fork Mountain, Pendleton County). As with many circumboreal species of polymorphic nature, there is disagreement over the recognition of infraspecific taxa. Var. *monanthos* (Jacquin) Bluff & Fingerhuth or ssp. *monanthos* (Jacquin) Ascherson & Graebner has often been applied to e. North American *J. trifidus*, but should apply (if considered valid at all) only to *J. trifidus* of limestone areas of Europe. Although Hämet-Ahti (1980) correctly showed that Appalachian *J. trifidus* (from acidic and mafic gneisses and schists) does not belong to *J. monanthos* (*J. trifidus* ssp. *monanthos, J. trifidus* var. *monanthos)*, her treatment of Appalachian plants as ssp. *carolinianus* Hämet-Ahti has been controversial. This treatment follows Clemants (1990), who concludes that the primarily vegetative characters used to separate Appalachian plants from the European (blade lengths and relative positions) are too variable to warrant recognition of subspecies or varieties in the taxon. Further study is warranted. [= Y; < *J. trifidus* – FNA, S; > *J. trifidus* var. *monanthos* (Jacquin) Bluff & Fingerhuth – RAB, F, G, W, misapplied; > *J. trifidus* ssp. *carolinianus* Hämet-Ahti – C, K]

Juncus trigonocarpus Steudel. Seepage slopes, bogs, along stream margins, ditches. July-October. Coastal Plain, NC to FL Panhandle, west to e. TX. Young *J. trigonocarpus* and *J. canadensis* are often confused; once mature, however, the two can usually be separated by capsule color alone. Although *J. canadensis* capsules redden, they never approach the dark reddish-purple tone of *J. trigonocarpus*. Seed and capsule size are also distinct for the two taxa. [= RAB, FNA, GW, K, S, WH, Y]

Juncus validus Coville *var.* ***validus***, Vigorous Rush. Stream and pond margins, roadside ditches, wet, open, often disturbed ground. July-September. NC to n. FL, west to TX, OK and MO. Var. *fascinatus* M.C. Johnston is endemic to TX. [= FNA, K, Y; < *J. validus* – RAB, C, F, G, GW, S, W, WH]



Luzula A.P. de Candolle 1805 (Wood-rush)

A genus of about 75-115 species, cosmopolitan. References: Coffey Swab in FNA (2000); Kirschner et al. (2002a)=Z; Balslev in Kubitzki (1998b). Key adapted in part from Coffey Swab in FNA (2000), C, and F.

1 Flowers borne singly; inflorescences branched or unbranched; [subgenus *Pterodes*].
  2 Inflorescences simple, with an occasional pedicel branching from the base of a flower; apical appendages of seeds 0.6-1.5 (-2.1) mm long; seed/appendage length ratio 0.8-1.7 ..... ***L. acuminata*** *var.* ***acuminata***
  2 Inflorescences usually branching, the pedicels commonly paired; apical appendages of seeds 0.4-1.1 mm long; seed/appendage length ratio 1.0-2.8 ..... ***L. acuminata*** *var.* ***carolinae***
1 Flowers borne in dense glomerate clusters (glomerules); inflorescences spikelike or umbellate; [subgenus *Luzula*, section *Luzula*].
  3 Inflorescence branches divergent, at least some widely spreading; glomerules capitate to broadly ovoid, not cylindric ..... ***L. echinata***
  3 Inflorescence branches erect, none widely spreading; glomerules often cylindric (less commonly merely capitate).
    4 Seeds 0.9-1.3 mm long; caruncle 0.5-0.7 mm long; plants producing several basal bulblets (white swollen leaf bases) ..... ***L. bulbosa***
    4 Seeds 1.1-1.7 mm long; caruncle 0.2-0.5 mm long; plants not producing basal bulblets..... ***L. multiflora*** *var.* ***multiflora***

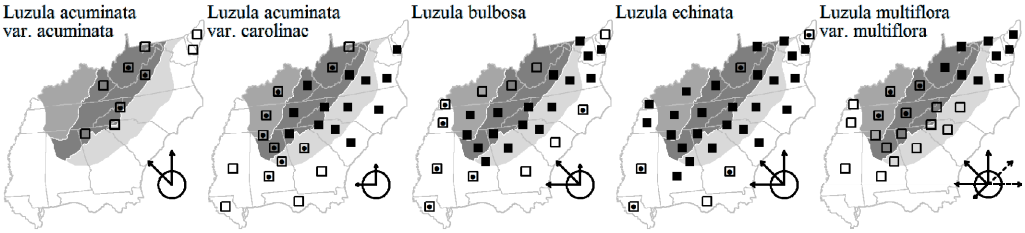
Luzula acuminata Rafinesque *var.* ***acuminata***. Moist forests. April-August. NL (Newfoundland) west to MB, south to SC and AR. [= RAB, C, F, FNA, G, GW, K; = *Juncoides saltuense* (Fernald) Small – S; < *L. acuminata* – W, WV; = *L. acuminata* ssp. *acuminata* – Z]

Luzula acuminata Rafinesque *var.* ***carolinae*** (S. Watson) Fernald. Moist forests. April-August. MA, NY, PA, and se. OH south to n. FL and AR. Perhaps better treated at the species level. [= RAB, C, F, FNA, G, GW, K; = *Juncoides carolinae* (S. Watson) Kuntze – S; < *L. acuminata* – W, WV; = *L. acuminata* ssp. *carolinae* (S. Watson) Z. Kaplan – Z]

Luzula bulbosa (Wood) Smyth & Smyth. Dry forests and fields. March-August. MA, PA, IN, and NE south to n. FL, LA, and c. TX. [= RAB, C, F, FNA, GW, K, WV, Z; = *L. campestris* (Linnaeus) A.P. de Candolle var. *bulbosa* Wood – G; = *Juncoides bulbosum* – S; < *L. multiflora* – W]

Luzula echinata (Small) F.J. Hermann, Spreading Wood-rush. Forests, bogs. Se. MA, se. NY PA, WV, and IA south to GA, AL, MS, and e. TX. March-August. [= C, FNA, GW, K, RAB, WV, Z; > *L. echinata* var. *echinata* – F; > *L. echinata* var. *mesochorea* F.J. Hermann – F; = *L. campestris* (Linnaeus) A.P. de Candolle var. *echinata* (Small) Fernald & Wiegand – G; = *Juncoides echinatum* Small – S; < *L. multiflora* – W]

Luzula multiflora (Ehrhart) Lejeune *var.* ***multiflora***. Forests. March-August. Circumboreal, in North America from NL (Newfoundland), ON, SK, and BC, south to NC, GA, AL, MS, MO, MT, and OR; Eurasia; Costa Rica. [= F, WV; < *L. multiflora* – C, RAB; = *L. campestris* (Linnaeus) A.P. de Candolle var. *multiflora* (Ehrhart) Celak – G; = *L. multiflora* ssp. *multiflora* var. *multiflora* – K; = *L. multiflora* ssp. *multiflora* – FNA, Z; < *L. multiflora* – W]



99. CYPERACEAE A.L. de Jussieu 1789 (Sedge Family) [in POALES]

A family of about 100 genera and 5000 species, mostly herbs, cosmopolitan. References: Ball, Reznicek, & Murray in FNA (2002b); Tucker (1987); Goetghebeur in Kubitzki (1998b).

1 Achene enclosed in a perigynium (a sac-like structure); [subfamily *Caricoideae*, tribe *Cariceae*] ..... ***Carex***
1 Achene not enclosed in a perigynium.

2 Scales obviously and strongly distichously imbricate; spikelets aggregated into spikes or heads; [subfamily *Cyperoideae*].
3 Inflorescence axillary; leaves predominantly cauline, conspicuously 3-ranked; perianth bristles subtending the achene 6-9; [tribe *Dulichieae*] ..... ***Dulichium***
3 Inflorescence terminal, more-or-less scapose (though immediately subtended by leafy bracts); leaves predominantly basal, not 3-ranked; perianth bristles absent (*Cyperus* and *Kyllinga*) or present (*Schoenus*); [tribe *Cypereae*].
4 Perianth bristles present ..... ***Schoenus***
4 Perianth bristles absent.
5 Inflorescences branched; spikelets 1-many-flowered; rachilla elongate; scales broadly rounded ..... ***Cyperus***
5 Inflorescences unbranched (the spikelets sessile); spikelets 1-2-flowered; rachilla not or only slightly elongate; scales conspicuously keeled ..... ***Kyllinga***
2 Scales spirally imbricate; spikelets not usually aggregated.
6 Achene (when ripe) bony and white; style base persistent on the summit of the achene, forming a differently-textured or differently-colored tubercle; spikelets all imperfect, the pistillate ones 1-flowered, the staminate ones several-flowered; [subfamily *Sclerioideae*, tribe *Sclerieae*] ..... ***Scleria***
6 Achene mostly brown, black, or tan; style base persistent as a differentiated tubercle (*Bulbostylis, Eleocharis, Rhynchospora*) or not (*Cladium, Eriophorum, Fuirena, Hemicarpha, Isolepis, Lipocarpha, Schoenoplectus, Scirpus, Trichophorum*); spikelets mostly or all perfect; [subfamily *Cyperoideae*].
7 Style base persistent as a differentiated tubercle (this small and inconspicuous in *Bulbostylis* and some spp. of *Rhynchospora*).
8 Leaves consisting of bladeless sheaths; spikelet 1 per stem, terminal (very rarely proliferating and with > 1 spikelet); [tribe *Eleocharideae*] ..... ***Eleocharis***
8 Leaves with well-developed blades; spikelets few to many per stem, usually subtended by foliaceous bracts.
9 Perianth bristles absent; spikelets several-many-flowered; leaves capillary; [tribe *Abildgaardieae*] ..... ***Bulbostylis***
9 Perianth bristles present (rarely absent in species without capillary leaves); spikelets 1-2-flowered (several-many-flowered in some species without capillary leaves); leaves capillary to broad; [tribe *Schoeneae*] ..... ***Rhynchospora***
7 Style base not persistent as a differentiated tubercle.
10 Achene not subtended by a modified perianth of bristles or scales (in addition to the scales of the spikelets).
11 Involucral bracts 1-3, the lowest erect, appearing like a continuation of the culm, the inflorescence therefore appearing lateral.
12 Achenes 0.5-0.7 mm long, 1.8-3× as long as wide, minutely papillose in longitudinal lines; [tribe *Cypereae*] ..... ***Lipocarpha***
12 Achenes 1.2-1.5 mm long, 1-1.4× as long as wide, minutely pitted or transversely rugose.
13 Achenes transversely rugose; [tribe *Fuireneae*] ..... ***Schoenoplectus erectus***
13 Achenes minutely pitted in longitudinal lines; [tribe *Cypereae*]
14 Spikelets in a loose cluster (not spherical) ..... ***Isolepis***
14 Spikelets agregated into spherical glomerules ..... ***Scirpoides***
11 Involucral bracts 2-several, spreading, the inflorescence therefore appearing terminal.
15 Plants diminutive, to 5 dm tall; leaves 3-15 cm long, to 1 mm wide; [tribe *Abildgaardieae*] ..... ***Bulbostylis***
15 Plants moderate to very robust, 7-30 dm tall; leaves 30-150 cm long, 1.5-15 mm wide.
16 Flowers 1-2 per spikelet; [tribe *Schoeneae*] ..... ***Cladium***
16 Flowers several-many per spikelet.
17 Style fimbriate; leaves 0.5-5 mm wide; [tribe *Abildgaardieae*] ..... ***Fimbristylis***
17 Style smooth; leaves (2-) 5-18 mm wide; [tribe *Scirpeae*] ..... ***Scirpus georgianus***
10 Achene subtended by a modified perianth of either bristles, 3 stalked paddle-like scales, or 1-2 broad-based scales (in addition to the scales of the spikelets).
18 Achene subtended by stalked paddle-like scales or broad-based scales.
19 Achene subtended by a perianth of 3 stalked paddle-like scales; plants 2-7 dm tall; [tribe *Fuireneae*] ..... ***Fuirena***
19 Achene lacking a perianth, but subtended by 1-2 broad-based scales; plants 0.5-3 dm tall; [tribe *Cypereae*] ..... ***Lipocarpha***
18 Achene subtended by bristles.
20 Bristles 10-many, > 5× as long as the achene, white to tawny, straight; [tribe *Scirpeae*] ..... ***Eriophorum***
20 Bristles 1-6, usually < 4× as long as the achene, brown, straight or conspicuously twisted (twisted if > 3× as long as the achene).
21 Involucral bracts lacking, or consisting only of the slightly modified basal scales of the solitary and terminal spikelet; [of hillsides, upland forests, or cliffs; never (in our area) in marshes, bogs, or streambeds]; [tribe *Scirpeae*] ..... ***Trichophorum***
21 Involucral bracts present, consisting either of a single, erect bract appearing as a continuation of the culm (the inflorescence thus appearing lateral) or of 2 or more spreading, foliaceous bracts (the inflorescence thus appearing terminal); [of marshes, bogs, streambeds, ditches, or (rarely) terrestrial or on rock outcrops].
22 Main involucral bract 1 (rarely 2), erect, appearing as a continuation of the culm (the inflorescence thus appearing lateral, though in some species the longer inflorescence branches may overtop the bract); [tribe *Fuireneae*] ..... ***Schoenoplectus***
22 Main involucral bracts 2-8, spreading and foliaceous (the inflorescence thus appearing terminal).
23 Spikelets 10-40 mm long, 6-12 mm in diameter, 3-50 per culm; [tribe *Fuireneae*] ..... ***Bolboschoenus***
23 Spikelets 2.5-19 mm long, 2-4 mm in diameter, usually > 50 per culm; [tribe *Scirpeae*] ..... ***Scirpus***

Bolboschoenus Palla 1905 (Bulrush)

A genus of about 10-16 species, herbs, cosmopolitan. The distinction of this genus from *Schoenoplectus* is uncertain and controversial; it is generally accepted in the Old World, and generally not in the New World. References: Smith in FNA (2002b); Strong (1994)=Z; Goetghebeur in Kubitzki (1998b).

1 Ventral summit of leaf sheaths truncate or concave, the nerves destined for the leaf margins diverging gradually ..... ***B. maritimus*** *ssp.* ***paludosus***
1 Ventral summit of leaf sheaths convex, the nerves destined for the leaf margins diverging abruptly, making a nearly right-angle bend.
2 Bristles mostly equaling to surpassing the distinctly trigonous achene ..... ***B. fluviatilis***
2 Bristles shorter than to equaling the lenticular or plano-convex achene.

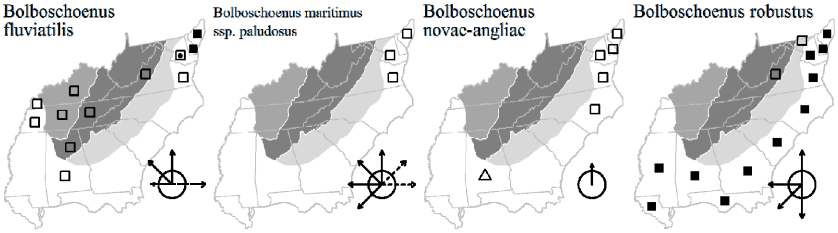
3 Inflorescence relatively open, with (10-) 15-50 spikelets; bristles persistent ..... ***B. novae-angliae***
3 Inflorescence relatively congested, mostly with 5-20 spikelets; bristles more or less caducous..... ***B. robustus***

Bolboschoenus fluviatilis (Torrey) Soják, River Bulrush. Tidal and river marshes. June-early July; July-August. NB west to SK, BC (Vancouver Island) and WA, south to VA, KY, TN, s. AL, OH, IN, KS, AZ, and CA; Asia; Australia and New Zealand. [= FNA; = *Scirpus fluviatilis* (Torrey) A. Gray – C, F, G; = *Schoenoplectus fluviatilis* (Torrey) M.T. Strong – K, Z]

Bolboschoenus maritimus (Linnaeus) Palla *ssp.* ***paludosus*** (A. Nelson) T. Koyama, Alkali Bulrush, Salt-marsh Bulrush. Marshes. Interruptedly circumboreal, south in North America to VA, NY, MN, MO, OK, TX, and Mexico. [= FNA; > *Scirpus maritimus* var. *maritimus* – C; < *Scirpus maritimus* var. *fernaldii* (Bicknell) Beetle – F (also see *Bolboschoenus novae-angliae*); = *Scirpus maritimus* var. *fernaldii* (Bicknell) Beetle – G; < *Scirpus maritimus* Linnaeus; < *Schoenoplectus maritimus* (Linnaeus) Lye – K, Z]

Bolboschoenus novae-angliae (Britton) S.G. Smith, Salt-marsh Bulrush. Fresh to brackish tidal marshes, ditches. Late June-July; July-September. ME to GA. Probably a hybrid derivative of *Bolboschoenus fluviatilis* and *B. robustus*, but its distinctiveness and ecological behavior suggest that it should be treated as a species; see Schuyler (1975) and Cronquist (1991) for additional discussion. [= FNA; = *Scirpus cylindricus* (Torrey) Britton – C, K, Beal (1977), illegitimate name; < *Scirpus maritimus* var. *fernaldii* (Bicknell) Beetle – F; = *Scirpus robustus* Pursh var. *novae-angliae* (Britton) Beetle – G; = *Schoenoplectus novae-angliae* (Britton) M.T. Strong – K, Z]

Bolboschoenus robustus (Pursh) Soják, Salt-marsh Bulrush. Brackish marshes. Late May-June (-September); late June-September. Along the coasts, from NS to s. FL, west to TX, and into tropical America; also in CA. [= FNA; = *Scirpus robustus* Pursh – RAB, C, F, GW, S, W, WH; = *Scirpus robustus* var. *robustus* – G; = *Schoenoplectus robustus* (Pursh) M.T. Strong – K, Z]



Bulbostylis Kunth (Hairsedge)

A genus of about 100 species, herbs, of tropical and warm temperate areas, concentrated especially in tropical Africa and tropical South America. References: Kral (1971)=Z; Kral in FNA (2002b); Goetghebeur in Kubitzki (1998b).

1 Spikelets sessile, the inflorescence therefore a capitate cluster (sometimes a few spikelets pedicellate, but the pedicels not generally longer than the spikelets, the inflorescence still appearing glomerate).
2 Inflorescence bracts widened abruptly at its base, the widened portion prominently fimbriate-pectinate; perennial, culms 10-50 cm tall; achene 1-1.3 mm long, white or yellowish, the apex retuse (the three lobes projecting beyond and surrounding the tubercle) ..... ***B. warei***
2 Inflorescence bracts not widened abruptly at its base, the membranous margins smooth or ciliate; annual, culms 5-35 cm tall; achene 0.5-1.2 mm long, pale brown or gray, the apex rounded or truncate (the three lobes not exceeding the tubercle).
3 Inflorescence bracts numerous and conspicuous, several much exceeding the cluster of spikelets; achenes 0.8-1.2 mm long, transversely rugose; spikelet scales usually greenish or pale brown, dull, puberulent..... ***B. stenophylla***
3 Inflorescence bracts few and inconspicuous, none or sometimes one exceeding the cluster of spikelets (and then only slightly); achenes 0.5-0.6 mm long, finely reticulate; spikelet scales usually reddish-brown, lustrous, smooth or nearly so ..... ***B. barbata***
1 Spikelets mostly on slender pedicels, the inflorescence therefore open and umbel-like.
4 Achenes finely transversely rugose, tan or brown (when ripe); spikelet scales 1.5-2.0 mm long, with truncate apices ..... ***B. capillaris***
4 Achenes very finely papillose and waxy, gray or dark greenish-brown (when ripe); spikelet scales 0.7-1.8 mm long, with obtuse to rounded apices.
5 Annual, to 1-2 (-3) dm tall; inflorescence a simple (rarely compound) umbel of few (3-9) lance-ovoid spikelets; longest involucral bract seldom exceeding the inflorescence; leaf margins usually hispidulous ..... ***B. ciliatifolia***
5 Perennial, to 1.5-4 dm tall; inflorescence a compound (rarely simple) umbel of many (8-30) oblong or lance-linear spikelets; longest involucral bract commonly exceeding the inflorescence; leaf margins usually distinctly tuberculate-scabrid..... ***B. coarctata***

* ***Bulbostylis barbata*** (Rottbøll) C.B. Clarke, Old World Hairsedge. Sandy fields; native of the Old World tropics. July-October. [= RAB, FNA, GW, K, W, WH, Z; = *Stenophyllus barbatus* (Rottbøll) Britton – S]

Bulbostylis capillaris (Linnaeus) Kunth ex C.B. Clarke, Common Hairsedge. Thin soils on rock outcrops, especially granite domes and granite flatrocks (but also on mafic rocks, such as diabase), sandy soils, fields, bogs (in FL). July-October. ME to MN, south to Panhandle FL and TX, and west to AZ and CA, also in Mexico, Central America, the West Indies, and s. Asia. This species frequently has a mixture of long and very short culms, the short culms only a few cm long and thus nearly hidden amongst the leaves. [= RAB, C, FNA, G, GW, W, WH, Z; > *B. capillaris* var. *capillaris* – F; > *B. capillaris* var. *crebra* Fernald – F; > *B. capillaris* var. *isopoda* Fernald – F; = *B. capillaris* ssp. *capillaris* – K; = *Stenophyllus capillaris* (Linnaeus) Britton – S]

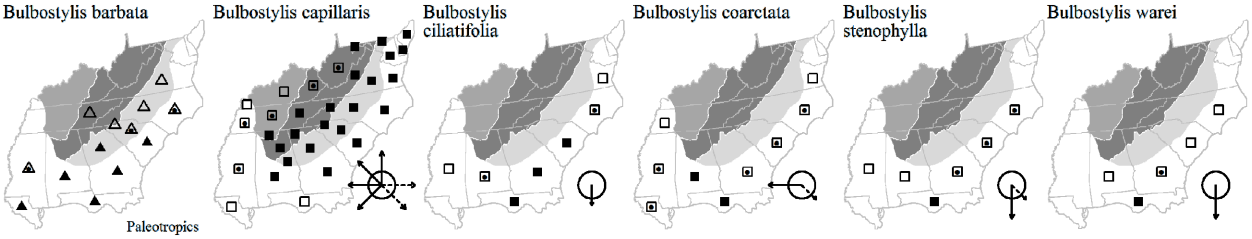
Bulbostylis ciliatifolia (Elliott) Fernald, Savanna Hairsedge. Moist to wet sands of savannas, roadsides, disturbed areas. July-October. Se. VA south to s. FL and west to s. AL. Kral (1971) describes this plant as occurring in generally wetter habitats and being much weedier than *B. coarctata*. The sympatry of this taxon and *B. coarctata* suggests that they are best recognized as species. [= F, G; = *Bulbostylis ciliatifolia* (Elliott) Fernald *var. ciliatifolia* – C, FNA, GW, K, Z; < *B. ciliatifolia* – RAB, WH (also see *B. coarctata*); = *Stenophyllus ciliatifolius* (Elliott) C. Mohr – S]

Bulbostylis coarctata (Elliott) Fernald, Elliott's Hairsedge. Sandhills, usually associated with longleaf pine and wiregrass. July-October. Se. VA south to s. FL and west to e. TX, north in the interior to sw. TN; Cuba. [= F, G; = *Bulbostylis ciliatifolia*

(Elliott) Fernald *var. coarctata* (Elliott) Kral – C, FNA, GW, K, W, Z; < *B. ciliatifolia* – RAB, WH; = *Stenophyllus coarctatus* (Elliott) Britton – S]

Bulbostylis stenophylla (Elliott) C.B. Clarke. Sandhills, dry savannas, and disturbed sandy areas. July-October. Se. NC south to s. FL, west to w. FL; Cuba. [= RAB, FNA, GW, K, WH, Z; = *Stenophyllus stenophyllus* (Elliott) Britton – S]

Bulbostylis warei (Torrey) C.B. Clarke, Ware's Hairsedge. Sandhills, dry pine flatwoods, dunes. July-October. Se. NC south to s. FL and west to s. AL. [= RAB, FNA, GW, K, Z; = *Stenophyllus warei* (Torrey) Britton – S]



Carex Linnaeus 1753 (Sedge)
(by Alan S. Weakley, with assistance from Bruce A. Sorrie)

A genus of about 2000 (or more) species, herbs, cosmopolitan, especially temperate and boreal. References: Mackenzie (1931-1935)=M; Ball & Reznicek in FNA (2002b); Goetghebeur in Kubitzki (1998b); Frye & Lea (2001). Key to sections adapted closely from FNA.

Key to the keys to the sections of *Carex*

1 Spike 1 per culm, all flowers attached to the main stem in a terminal spike ..... **Key A**
1 Spikes 2 or more per culm (some flowers in lateral spikes)
  2 All flowers staminate ..... **Key B**
  2 At least some flowers pistillate.
    3 Stigmas 2; achenes flat or biconvex in cross-section (lenticular) ..... **Key C**
    3 Stigmas (2-) 3 (-4); achenes trigonous or terete in cross-section.
      4 Body of perigynium pubescent, scabrous, hispid, or papillose (if papillose, the papillae longer than wide) ..... **Key D**
      4 Body of perigynium glabrous or papillose (if papillose the papillae shorter than wide).
        5 Bracts sheathless or with sheath < 4 mm long (rarely longer, and then the sheath shorter than the diameter of the stem) ..... **Key E**
        5 Bracts (at least the lower) with sheath > 4 mm long (and longer than the diameter of the stem) ... **Key F** {not complete at this time}

Key A

1 Leaf blades 20-60 mm wide, without a midrib (with 40-100 parallel nerves all of equal prominence), leathery, the apex obtuse; leaf margin scarious, minutely crisped-ruffled (feeling scaberulous to the touch) ..... ***C. fraseriana***
1 Leaf blades 0.5-25 (-52) mm wide, with a midrib, herbaceous, the apex acute; leaf margin various (smooth or scabrous, but not as described below).
  2 Spike entirely staminate
    3 Culms distinctly red or purple at the base ..... ***C. picta*** in **Section 41: *Pictae***
    3 Culms yellow to brown or black, without red or purple coloration.
      4 Culms shorter than the leaves; widest leaf blades > 2 mm wide ..... **Section 44: *Phyllostachyae***
      4 Culms longer than the leaves; widest leaf blades < 2 mm wide ..... ***C. exilis*** in **Section 11: *Stellulatae***
  2 Spike pistillate or with both pistillate and stamainate flowers.
    5 Stigmas 2; achenes lenticular ..... ***C. exilis*** in **Section 11: *Stellulatae***
    5 Stigmas 3; achenes trigonous.
      6 Perigynia pubescent near the tip ..... ***C. picta*** in **Section 41: *Pictae***
      6 Perigynia glabrous.
        7 Spikes gynecandrous; beak of perigynium with apical teeth > 0.3 mm long ..... ***C. squarrosa*** in **Section 34: *Squarrosae***
        7 Spikes androgynous or entirely pistillate; beak of perigynium with apex entire, emarginate, or with teeth < 0.2 mm long.
          8 Lower pistillate scales > 10 mm long ..... **Section 44: *Phyllostachyae***
          8 Lower pistillate scales < 10 mm long.
            9 Perigynium beak > 2 mm long, as long as or longer than the perigynium body ..... **Section 44: *Phyllostachyae***
            9 Perigynium beak < 2 mm long, or if more, thentapering to the perigynium body and shorter than the body.
              10 Perigynia > 4× as long as wide ..... ***C. pauciflora*** of **Section 38: *Leucoglochin***
              10 Perigynia < 4× as long as wide ..... **Section 46: *Leptocephalae***

Key B

1 Widest leaves 4-8 mm wide; inflorescences more-or-less capitate (occasionally with the lowermost 1 or 2 spikes separated ..... ***C. kobomugi*** in **Section 8: *Macrocephalae***
1 Widest leaves 1-4 mm wide; inflorescences ovoid to cylindric ..... **Section 10: *Divisae***

Key C

1 Perigynia pubescent, not papillose ..... **Section 39: *Acrocystis***
1 Perigynia glabrous, papillose or not.
2 Lateral spikes usually pedunculate; lowermost inflorescence bracts sometimes with sheath; peduncles with prophyll at base.
3 Pistillate scales (at least the lower) long-awned ..... **Section 13: *Phacocystis***
3 Pistillate scales obtuse to acuminate or cuspidate.
4 Perigynia smooth; style persistent on the achene ..... **Section 30: *Vesicariae***
4 Perigynia often papillose over most of the surface; style deciduous ..... **Section 13: *Phacocystis***
2 Lateral spikes sessile; bracts sheathless; peduncles without (or rarely with) a prophyll
5 Perigynia papillose (visible at 20× magnification).
6 Terminal spike staminate, androgynous, or gynecandrous (if gynecandrous, the staminate flowers more numerous than the pistillate); lateral spikes at least 2× as long as wide ..... **Section 13: *Phacocystis***
6 Terminal spike staminate or gynecandrous (if gynecandrous, the pistillate flowers more numerous than the pistillate); lateral spikes not much longer than wide ..... **Section 9: *Glareosae***
5 Perigynia smooth.
7 Terminal spike gynecandrous; lateral spikes gynecandrous or pistillate.
11 Margins of perigynia flat, at least in the upper ½, flat portion (measured at the tip of the achene and base of beak) > (0.1-) 0.2 mm wider
12 Achenes rounded at apex (style dehiscing at the surface of the achene); style conspicuously enlarged at the base ..... **Section 10: *Deweyanae***
12 Achenes with short apiculus formed by the persistent base of the style; style not conspicuously enlarged at base ..... **Section 12: *Ovales***
11 Margins of perigynia rounded, or with flat portion < 0.1 mm wide.
13 Margins of perigynia rounded or with a very narrow rounded edge; achenes nearly filling the perigynium bodies ..... **Section 9: *Glareosae***
13 Margins of perigynia sharply edged or narrowly winged; achenes distinctly smaller than the perigynium bodies.
14 Inflorescences in fruit 1-1.5× as long as wide ..... **Section 12: *Ovales***
14 Inflorescences in fruit 1.5-2 (or more)× as long as wide.
15 Lowermost perigynia in each spike spreading ..... **Section 11: *Stellulatae***
15 Lowermost perigynia in each spike ascending or erect.
16 Perigynium serrulate on the margins of the upper body and lower beak ..... **Section 10: *Deweyanae***
16 Perigynium entire on the margins of the upper body and the lower beak ..... **Section 12: *Ovales***
7 Terminal spike androgynous (rarely entirely staminate or entirely pistillate); lateral spikes androgynous, staminate, or pistillate.
8 Sheath fronts of lower cauline leaves transversely rugose.
9 Perigynia mostly > 2× as long as wide, widest near the base ..... **Section 1: *Vulpinae***
9 Perigynia mostly < 2× as long as wide, widest near middle.
10 Inflorescence usually branched, at least at the base, usually with > 15 spikes; pistillate scales usually yellow or brown, sometimes with hyaline margins, 3-veined ..... **Section 3: *Multiflorae***
10 Inflorescence unbranched or with 1 or 2 short branches at the base, with < 15 spikes; pistillate scales greenish hyaline, 1-veined ..... **Section 4: *Phaestoglochin***
8 Sheath fronts of lower cauline leaves smooth (or very weakly and indistinmctly transversely rugose).
17 Fronts of leaf sheaths dotted red, brown, or yellow.
18 Perigynia widest near the base; culms usually > 1 mm wide ..... **Section 1: *Vulpinae***
18 Perigynia widest near the middle; culms usually < 1 mm wide.
19 Plants densely cespitose, with short rhizomes; pistillate scales acute to acuminate ..... **Section 2: *Heleoglochin***
19 Plants loosely cespitose, sometimes with long rhizomes; pistillate scales (at least the upper) obtuse ..... **Section 3: *Multiflorae***
17 Fronts of leaf sheaths not dotted red, brown, or yellow.
20 Upper leaves of culms with front of sheaths green-veined, not differentiated from thye rest of the sheath ..... **Section 5: *Holarrhenae***
20 Upper leaves of culms with front of sheaths with at least a narrow hyaline or whitish-hyaline band extending at least ½ the length of the sheath.
21 Perigynia with flat, winglike margins > 0.1 mm wide; plants long-rhizomatous, not cespitose, sometimes forming large colonies ..... **Section 7: *Ammoglochin***
21 Perigynia without a flat margin, or with a flat margin < 0.1 mm wide; plants short-rhizomatous or inconspicuously rhizomatous, cespitose or not, sometimes forming large colonies.
22 Plants colonial from long rhizomes ..... **Section 6: *Divisae***
22 Plants cespitose.
23 Spikes not consistently androgynous, the terminal either entirely staminate or pistillate, the lateral spikes irregularly pistillate, or staminate, or mixed ..... **Section 11: *Stellulatae***
23 Spikes consistently androgynous, occasionally some of the lateral spikes entirely pistillate.
24 Perigynium widest near the base, tapering from base to beak ..... **Section 1: *Vulpinae***
24 Perigynium widest above the base, often abruptly beaked ..... **Section 4: *Phaestoglochin***

Key D

1 Pistillate spikes all from the base of the plant ..... **Section 39: *Acrocystis***
1 Pistillate spikes all or in part borne on the elongate, aboveground stem.
2 Bracts of the lowermost non-basal spike with well-developed sheath > 4 mm long.
3 Beak of perigynium with distinct teeth > 0.6 mm long ..... **Section 29: *Carex***
3 Beak of perigynium entire, notched, or with indistinct teeth < 0.6 mm long.
4 Bracts of the lowermost non-basal spike bladeless, or with a blade < 2 mm long.

5 Perigynia 2.0-2.9 mm long; leaf blades 0.9-3.3 mm wide..... ***C. richardsonii*** in **Section 40: *Clandestinae***
5 Perigynia 4-5 mm long; leaf blades 4-8 mm wide..... ***C. baltzellii*** in **Section 41: *Pictae***
4 Bracts of the lowermost non-basal spike with blade > 3 mm long (and often much longer).
6 Achene tip with persistent, enlarged, circular style base..... ***C. caryophyllea*** in **Section 42: *Mitratae***
6 Achene tip with at most a short apiculus.
7 Leaves pubescent or pilose..... **Section 23: *Hymenochlaenae***
7 Leaves usually glabrous.
8 Bases of plants brown ..... ***C. tenax*** in **Section 26: *Hallerianae***
8 Bases of plants distinctly red or purple.
9 Lowermost pistillate scales awned; leaves somewhat septate-nodulose; plants usually long-rhizomatous and forming large clonal colonies ..... **Section 28: *Paludosae***
9 Lowermost pistillate scales obtuse to acuminate; leaves not septate-nodulose; plants cespitose, short-rhizomatous..... **Section 23: *Hymenochlaenae***
2 Bracts of the lowermost non-basal spike sheathless or with sheath < 4 mm long.
10 Perigynia > 10 mm long.
11 Pistillate spoikes globose, about as long as wide; staminate spikes usually 1..... **Section 31: *Lupulinae***
11 Pistillate spikes cylindric, much longer than wide; staminate spikes 1-8..... **Section 29: *Carex***
10 Perigynia < 10 mm long.
12 Perigynium beak with 2 teeth > 0.6 mm long ..... **Section 29: *Carex***
12 Perigynium beak entire or with teeth < 0.6 mm long.
13 Terminal spike gynecandrous or pistillate..... **Section 24: *Porocystis***
13 Terminal spike staminate (or rarely androgynous).
14 Leaf sheaths (and usually the blades as well) pubescent.
15 Pistillate scales sometimes pubescent; pistillate spikes with 40-200 perigynia..... **Section 28: *Paludosae***
15 Pistillate scales glabrous; pistillate spikes with < 40 (-50) perigynia.
16 Perigynia usually < 3.2 mm long, the apex rounded and beakless, or abruptly beaked..... **Section 24: *Porocystis***
16 Perigynia > 3.5 mm long, the tip tapering or abruptly beaked.
17 Longer peduncles of pistillate spikes > 1 cm long; perigynia > 3× as long as wide, tapering gradually to the base..... **Section 23: *Hymenochlaenae***
17 Longer peduncles of pistillate spikes 0-1 cm long; perigynia < 3× as long as wide, abruptly contracted to a short stipe at the base.
18 Perigynia distinctly 20-30-veined; beak < 0.5 mm long..... **Section 26: *Hallerianae***
18 Perigynia veinless except for 2 marginal veins; beak > 0.7 mm long..... **Section 27: *Hirtifoliae***
14 Leaf sheaths and blades glabrous.
19 Achene tip with persistent, enlarged, circular style base..... ***C. caryophyllea*** in **Section 42: *Mitratae***
19 Achene tip with at most a short apiculus.
20 Leaf blades scabrous on the upper surface; beak of perigynium recurved..... ***C. scabrata*** in **Section 25: *Anomalae***
20 Leaf blades glabrous on the upper surface, often with rough margins or tip; beak of perigynium straight.
21 Fronts of sheaths of lower leaves ladder-fibrillose; leaves and sheaths septate-nodulose (sometimes obscurely so)..... **Section 28: *Paludosae***
21 Fronts of leaf sheaths not ladder-fibrillose, sometimes breaking into longitudinal fibers; leaves and sheaths not septate-nodulose.
22 Perigynia strongly 12-30-veined.
23 Leaf blades, at least towards the tip, M-shaped in cross-section when young, the upper surface usually with 2 marginal veins more prominent than the midvein; staminate spikes 1-4..... **Section 28: *Paludosae***
23 Leaf blades V-shaped in cross-section when young, the upper surface lacking 2 marginal veins more prominent than the midrib; staminate spike 1 ..... **Section 39: *Acrocystis***
22 Perigynia 0-12-veined.
24 Plants with at least some pistillate spikes basal; culms much shorter than the leaves..... **Section 39: *Acrocystis***
24 Plants with most pistillate spikes on obvious elongated stems; culms shorter than or longer than the leaves.
25 Upper leaves with blades > 2 cm long, longer than the sheaths..... **Section 39: *Acrocystis***
25 Upper leaves bladeless or with blades < 1 cm long and also shorther than the sheaths..... **Section 40: *Clandestinae***

[26a] Section 1: *Vulpinae*

A section of ca. 15 species, of North America, temperate Eurasia, Africa, and Australia. References: Jones & Reznicek (1995); Standley in FNA (2002b). Key 2 adapted from Jones & Reznicek (1995).

Key 1a

1 Leaf sheath fronts yellow, thickened, and not fragile at the top; leaf blades papillose adaxially (at 25× magnification)..... ***C. laevivaginata***
1 Leaf sheath fronts green or whitish, thin, and fragile at the top; leaf blades not papillose adaxially.
2 Leaf sheath fronts smooth.
3 Larger perigynia 6-8 mm long; leaves to 12 mm wide..... ***C. crus-corvi***
3 Larger perigynia 3-5 mm long; leaves to 7 mm wide.
4 Perigynia smoothly rounded at base, not distended; perigynium veins 3-5 abaxially, 0 adaxially..... ***[C. alopecoidea]***
4 Perigynia cordate at base, distended; perigynium veins 10-12 abaxially, 7 adaxially ..... ***C. oklahomensis***
2 Leaf sheath fronts rugose.
5 Perigynia broadly rounded at base, not distended; perigynium veins 3-5 abaxially, 0 adaxially..... ***C. conjuncta***
5 Perigynia cordate or truncate at base, distended; perigynium veins 15 abaxially, 7 adaxially.
6 Perigynia (5-) avg. 5.4 (-6) mm long, the beak > 3 mm long; larger leaves mostly 8-17 mm wide; perigynium scales cuspidate to short-awned; [mostly of the Coastal Plain and lower Piedmont]..... ***C. stipata*** *var.* ***maxima***

6 Perigynia (4-) avg. 4.7 (-5) mm long, the beak < 2.5 mm long; larger leaves mostly 4-10 mm wide; perigynium scales acuminate to cuspidate; [widespread in our area] ..... ***C. stipata*** *var.* ***stipata***

Key 1b

1 Beak of the perigynium shorter than the body.
2 Perigynia somewhat abruptly contracted into a beak ca. 0.5 × as long as the perigynium body; ventral surface of the perigynium with several incomplete veins basally; culms sharply triangular and narrowly winged, somewhat spongy and easily crushed; dorsal leaf sheaths green; ventral leaf sheaths with scattered red dots, and transversely rugose; [normally of shaded locations] ..... ***C. conjuncta***
2 Perigynia tapering into a beak, much shorter than the perigynium body; ventral surface of the perigynium with several inconspicuous complete veins; culms inconspicuously triangular to roundish, not winged, neither spongy nor easily crushed; dorsal leaf sheaths dark blue-green with conspicuous white dots; ventral leaf sheaths without scattered red dots, not transversely rugose; [nomally of sunny locations] ..... ***C. oklahomensis***
1 Beak of the perigynium as long as, or longer than, the body.
3 Ventral leaf sheath margins with orange-red dots; achene ovate-lanceolate; perigynium wall adhering to achene ..... ***C. crus-corvi***
3 Ventral leaf sheath margins without orange-red dots; achene broadly ovate to ovate-orbicular; perigynium wall not adhering to the achene (or only slightly so).
4 Ventral leaf sheaths not transversely rugose, more or less concave at the apex and not prolonged upward past the base of the blade, thickened, not friable ..... ***C. laevivaginata***
4 Ventral leaf sheaths transversely rugose, more or less convex at the apex and prolonged upward past the base of the blade, friable.
5 Perigynia (5-) avg. 5.4 (-6) mm long, the beak > 3 mm long; larger leaves mostly 8-17 mm wide; perigynium scales cuspidate to short-awned; [mostly of the Coastal Plain and lower Piedmont] ..... ***C. stipata*** *var.* ***maxima***
5 Perigynia (4-) avg. 4.7 (-5) mm long, the beak < 2.5 mm long; larger leaves mostly 4-10 mm wide; perigynium scales acuminate to cuspidate; [widespread in our area] ..... ***C. stipata*** *var.* ***stipata***

[26b] Section 2: *Heleoglochin (Paniculatae)*

A section of 11-12 species, of temperate North America, Eurasia, n. Africa, and Australasia. References: Cochrane in FNA (2002b).

1 Inflorescence 7-15 cm long, the basal 3-9 branches well-separated from one another; perigynia broadly obovoid, 1.3-1.5× as long as wide; sheaths concave at the mouth; leaves 3-8 mm wide; [of swamps of the Coastal Plain and lower Piedmont] ..... ***C. decomposita***
1 Inflorescence 2-8 cm long, the basal 1-5 branches indistinct to slightly separated; perigynia ovoid to lance-ovoid, ca. 2× as long as wide; sheaths prolonged beyond the blade; leaves 1-3 mm wide; [of Mountain wetlands in VA (and TN?) and northward].
2 Inner band of leaf sheath whitish (and red-dotted); basal branches of inflorescence overlapping; perigynia not concealed by the scales ..... ***C. diandra***
2 Inner band of leaf sheath strongly copper-colored (and also red-dotted); basal branches of inflorescence often weakly separated; perigynia nearly or completely concealed by the scales ..... ***C. prairea***

[26c] Section 3 – section *Multiflorae*

A section of 7 species, of North America (including Mexico). References: Standley in FNA (2002b). Key based on FNA.

1 Perigynia red-dotted ..... ***C. triangularis***
1 Perigynia not red-dotted.
2 Perigynia golden yellow or yellowish-brown at maturity ..... ***C. annectens***
2 Perigynia dull yellow-green or pale brown at maturity.
3 Leaves longer than the flowering stem; perigynia 2.0-3.2 mm long, 1.3-1.8 mm wide, the beak 1/3-1/2 the length of the body ..... ***C. vulpinoidea***
3 Leaves shorter than the flowering stem; perigynia 3.2-4.0 mm long, 2.0-2.6 mm wide, the beak ca. 1/3 as long as the body.
4 Awn of pistillate scales 1-3 mm long; adaxial surface of perigynia with 3-5 nerves; [native, of wet pine savannas of se. SC, GA southward ..... ***C. fissa*** *var.* ***aristata***
4 Awn of pistillate scales 0.5-1.5 mm long; adaxial surface of perigynia lacking nerves; [introduced in our area from sc. United States, of disturbed sites] ..... ***C. fissa*** *var.* ***fissa***

[26d] Section 4 – section *Phaestoglochin (Bracteosae)*

A section of ca. 27 species, mainly of temperate North America. References: Ball in FNA (2002b); Webber & Ball (1984). Key adapted from FNA, C, M, and Webber & Ball (1984).

1 Sheaths loose, membranaceous, and fragile on the ventral side, septate-nodulose and usually mottled or striped with green and white on the dorsal side.
2 Bodies of pistillate scales 1.5-2.5 mm long, 1.1-1.8 mm wide, mostly < ½ as long as the perigynia, apex obtuse to acuminate to shortly awned.
3 Basal intermodes of the inflorescence usually < 1 cm long, and usually < 2× as long as the spikes; bodies of perigynia with wing < 0.1 mm wide ..... ***C. cephaloidea***
3 Basal internodes of the inflorescence usually >2 cm long, at least 2× as long as the spikes; bodies of perigynia with wing 0.1-0.2 mm wide ..... ***C. sparganioides***
2 Bodies of pistillate scales 2.2-4.4 mm long, 1.2-2.4 mm wide, mostly > ½ as long as the perigynia, apex acuminate to awned.
4 Fronts of leaf sheaths yellow or brownish, thick, firm, the back often white-spotted ..... ***C. aggregata***
4 Fronts of leaf sheaths white, hyaline, fragile, the backs not white-spotted.

5 Perigynia 4-5 mm long, 2× as long as wide; perigynia nerveless or very obscurely nerved on the dorsal face ... ***C. gravida*** *var.* ***gravida***
5 Perigynia 3-4.5 mm long, 1.3-1.5× as long as wide; perigynia strongly few-nerved on the dorsal face ..... ***C. gravida*** *var.* ***lunelliana***

1 Sheaths tight on the ventral side, neither septate-nodulose nor mottled with green and white on the dorsal side.
6 Perigynia corky-thickened in the lower 1/3 to 1/2 (and not > 4.0 mm long); perigynia spreading or reflexed at maturity; perigynia (2-) 3-12 (-20) per spike; leaves 0.5-3 mm wide.
7 Beak of perigynium smooth; pistillate scales acuminate, early deciduous.
8 Average perigynium width ≥ 1.3 mm; average spongy portion of the perigynium ≥ 1.1 mm long; perigynium base distinctly nerved, bulging on the ventral surface, making the perigynium biconvex in cross-section; perigynium 2-2.5× as long as wide; perigynium gradually narrowed to a short beak; leaves 1-3 mm wide ..... ***C. retroflexa***
8 Average perigynium width < 1.3 mm; average spongy portion of the perigynium < 1.1 mm long; perigynium base nerveless, flattened on the ventral surface, making the perigynium planoconvex in cross-section; perigynium ca. 3× as long as wide; perigynium narrowed to a conspicuous beak; leaves 0.75-1.5 mm wide ..... ***C. texensis***
7 Beak of perigynium serrulate; pistillate scales obtuse, persistent.
9 Plants with creeping rhizomes, the culms arising scattered along the rhizome; perigynia 4-5× as long as wide ..... ***C. socialis***
9 Plants densely cespitose, the culms arising from the center of clump; perigynia 2-3× as long as wide.
10 Widest leaves 0.9-1.7 mm wide; base of fertile culm 0.7-1.4 mm wide.
11 Base of perigynium cuneate to rounded; distance from base of perigynium to base of achene 0.1-0.5 mm; [primarily of the Mountains in our area] ..... ***C. appalachica***
11 Base of perigynium rounded to truncate; distance from base of perigynium to base of achene 0.5-0.9 mm; [widespread in our area] ..... ***C. radiata***
10 Widest leaves 1.7-3.0 mm wide; base of fertile culm 1.4-2.2 mm wide.
12 Stigmas 0.03-0.06 mm thick, straight to slightly twisted; widest leaves < 2.0 mm wide; perigynia 3-7 (-8) per spike .... ***C. radiata***
12 Stigmas 0.07-0.10 mm thick, mostly coiled; widest leaves > 1.7 mm wide; perigynia (6-) 7-14 (-20) per spike ..... ***C. rosea***
6 Perigynia not conspicuously corky-thickened at base (except corky-thickened in the rare alien, *C. spicata*, which has perigynia 4.0-5.5 mm long); perigynia ascending to spreading at maturity; perigynia (3-) 8-40 per spike; leaves 1-5 mm wide.
13 Inflorescence ovoid in outline, the spikes densely aggregated, nearly indistinguishable except by the projecting setaceous bracts which subtend each spike.
14 Perigynia 1.3-1.7× as long as wide, widest near the broadly rounded, truncate, or even subcordate base ..... ***C. leavenworthii***
14 Perigynia 1.6-2.5× as long as wide, widest just below the middle, the base broadly cuneate to rounded.
15 Pistillate scales (excluding the awns) shorter than the perigynium body; culms not greatly exceeding the leaves .... ***C. cephalophora***
15 Pistillate scales (excluding the awns) as long as or exceeding the perigynium body; culms much exceeding the leaves ..... ***C. mesochorea***
13 Inflorescence spicate-racemose, the individual spikes readily distinguishable (often separated by an exposed internode of the axis).
16 Pistillate scales brown or reddish-purple; [alien, sparsely naturalized in our area].
17 Roots and basal sheaths brown to black; perigynia not corky-thickened at base; ligule blunt, wider than long ..... ***C. divulsa***
17 Roots and basal sheaths purplish-tinted; perigynia corky-thickened at base; ligule acute, longer than wide ..... ***C. spicata***
16 Pistillate scales green, hyaline, or pale tan; [native in our area (except *C. austrina* and *C. muricata* ssp. *lamprocarpa*), common and widespread in our area].
18 Spikes with 5-10 perigynia; pistillate scales brown with green-veined center ..... ***C. muricata*** *ssp.* ***lamprocarpa***
18 Spikes with 8-20 perigynia; pistillate scales scarious-white (rarely brown) with green-veined center.
19 Perigynia ascending, nerveless on the ventral surface; scales awned, the awns 1.5-4 mm long; lowest inflorescence bract elongate, the free portion 1-5 cm long ..... ***C. austrina***
19 Perigynia spreading, either nerved or nerveless on the upper (ventral) surface; scales acuminate or with an awn to 1.5 (-2.0) mm long; lowest inflorescence bract short, delicate, the free portion 0.5-2 cm long.
20 Perigynia 3.0-3.5 mm long, nerveless on the upper (ventral) face ..... ***C. muehlenbergii*** *var.* ***enervis***
20 Perigynia 3.5-4.0 mm long, nerved on both faces ..... ***C. muehlenbergii*** *var.* ***muehlenbergii***

[26h] Section 5 – section *Holarrhenae (Intermediae)*

A section of 2 species, of temperate Northern Hemisphere. References: Reznicek & Catling in FNA (2002b).

One species ..... ***C. sartwellii***

[26i] Section 6 – section *Divisae*

A section of 14 species, subcosmopolitan. References: Reznicek & Catling in FNA (2002b).

1 Beak of the perigynium 1/5 to 1/3 as long as the body; spikes 2-7; [alien, naturalized primarily in brackish to salty coastal habitats] ... ***C. divisa***
1 Beak of the perigynium 1/3 to 1/2 as long as the body; spikes 5-15; [alien, naturalized primarily inland along highways treated with salt] ..... ***C. praegracilis***

[26j] Section 7 – section *Ammoglochin (Arenariae)*

A section of 14 species, of temperate Northern Hemishere. References: Reznicek in FNA (2002b). Key based closely on FNA

1 Perigynia thin-margined and prominently winged at base of beak; pistillate scales usually longer than perigynia; terminal spike usually staminate; [alien in maritime situations] ..... ***C. arenaria***
1 Perigynia thin-margined, lacking a prominent, expanded wing; pistillate scales shorter than to nearly equaling the perigynia; terminal spike usually pistillate or androgynous; native, inland] ..... ***C. siccata***

[26k] Section 8 – section *Macrocephalae*

A section of 2 species, of maritime e. Asia and nw. North America. References: Mastrogiuseppe in FNA (2002b).

One species ..... ***C. kobomugi***

[26m] Section 9 – section *Glareosae (Heleonastes)*

A section of 20-25 species, circumboreal, but extending in montane areas to South America, New Zealand, and Australia. References: Toivonen in FNA (2002b).

1 Spikes (1-) 2 (-3); perigynia 1-5 per spike, 2.5-4 mm long.
  2 Leaves 0.3-0.8 mm wide, filiform-involute; ligules 0.3-0.8 (-1.2) mm long; inflorescences 14-32 mm long; spikes 2-3 per inflorescence; terminal spike with 1-3 perigynia per spike; [south to PA and s. NJ] ..... ***C. billingsii***
  2 Leaves 0.8-1.9 mm wide, flat or thinly M-shaped; ligules 0.5-1.9 mm long; inflorescences (14-) 23-55 mm long; spikes (2-) 3-4 per inflorescence; terminal spike with (1-) 2-6 perigynia per spike; [south to w. NC] ..... ***C. trisperma***
1 Spikes 4-9; perigynia 5-30 per spike; 1.7-2.5 mm long.
  3 Perigynia (10-) 15-30 per spike; perigynium without ventral nerves (or the nerves very obscure); spike at maturity somewhat bristly appearing in silhouette because of the perigynium beaks ..... ***C. brunnescens*** *var.* ***sphaerostachya***
  3 Perigynia 5-10 (-15) per spike; perigynium ventrally nerved; spike at maturity nearly smooth in silhouette (the perigynium beaks strongly appressed)
    4 Culms 15-60 cm tall; inflorescence 3-5 (-7) cm long, all but the lowest spikes approximate, the lowest spikes 0.5-2.5 cm apart ..... ***C. canescens*** *var.* ***canescens***
    4 Culms 30-90 cm tall; inflorescences 6-12 (-15) cm long, the lower and middle spikes well-spaced, the lowest spikes 2-5 cm apart ..... ***C. canescens*** *var.* ***disjuncta***

[26n] Section 10 – section *Deweyanae*

A section of 8 species, of North America and e. Asia. References: Naczi (1990); Naczi in FNA (2002b).

1 Widest leaf (1.3-) 1.5-2.9 (-3.1) mm wide; culms (0.5-) 0.6-1.0 (-1.1) mm thick at mid-height; plant densely to loosely cespitose, the rhizome internodes 0.2-20 mm long; [of swamp forests and other wetlands, widespread in our area] ..... ***C. bromoides*** *ssp.* ***bromoides***
1 Widest leaf 2.8-4.4 mm wide; culms 1.0-1.6 mm thick at mid-height; plants densely cespitose, the rhizome internodes 0.2-1.0 (-8.5) mm long; [of seeps and bogs in the Blue Ridge and Blue Ridge Escarpment region] ..... ***C. bromoides*** *ssp.* ***montana***

[26o] Section 11 – section *Stellulatae*

A section of ca. 15 species, semicosmopolitan (except Africa). References: Reznicek & Ball (1980); Reznicek in FNA (2002b). Key based on Reznicek & Ball (1980).

1 Spikes usually solitary; leaves involute; anthers 2.0-3.6 mm long; [rare disjuncts in Coastal Plain bogs] ..... ***C. exilis***
1 Spikes 2-8; leaves flat or folded; anthers 0.6-2.2 (-2.4) mm long.
  2 Perigynium beak smooth-margined (use at least 10× magnification) ..... ***C. seorsa***
  2 Perigynium beak serrulate on margin (use at least 10× magnification).
    3 Widest leaves 2.8-5.0 mm wide.
      4 Lower perigynia of spikes mostly 1.1-1.6× as long as wide; perigynia mostly 2.1-3.0 mm wide ..... ***C. atlantica***
      4 Lower perigynia of spikes (1.5-) 1.7-3× as long as wide; perigynia mostly 1.2-2.0 mm wide ..... ***C. ruthii***
    3 Widest leaves 0.8-2.7 mm wide.
      5 Terminal spikes entirely staminate; anthers (1.0-) 1.2-2.2 (-2.4) mm long ..... ***C. sterilis***
      5 Terminal spikes partly or entirely pistillate; anthers 0.6-2.2 (-2.4) m long.
        6 Terminal spikes without a distinct narrowed base of staminate scales, the staminate portion < 1 mm long ..... ***C. sterilis***
        6 Terminal spikes with a distinct narrowed base of staminate scales 1.0-16.5 mm long.
          7 Lower perigynia 2.0-3.0 mm wide ..... ***C. atlantica***
          7 Lower perigynia 0.9-2.0 mm wide.
            8 Lower perigynia mostly 2.8-4.8 mm long; lower perigynia (1.7-) 1.8-3.6× as long as wide; perigynia beaks 0.95-2.0 mm long, mostly 0.45-0.85× as long as the perigynium body ..... ***C. echinata*** *ssp.* ***echinata***
            8 Lower perigynia mostly 1.9-3.0 mm long; lower perigynia 1.0-2.0 (-2.2)× as long as wide; perigynia beaks 0.4-0.95 mm long, mostly 0.2-0.5× as long as the perigynium body.
              9 Perigynia mostly nerveless over the achene on the adaxial surface; beak of perigynia conspicuously setulose-serrulate; perigynia often more-or-less convexly tapered from widest point to the beak, thus forming a weak shoulder; [of calcareous sites, in our area restricted to the Mountains of VA] ..... ***C. interior***
              9 Perigynia mostly 1-10-nerved over the achene on the adaxial surface; beak of perigynia more sparsely serrulate, with definite spaces between the often single teeth; perigynia more-or-less cuneate or concavely tapered from widest point to the beak, not forming a shoulder; [of a variety of situations, not generally calcareous].
                10 Widest leaves 1.6-2.7 mm wide; infructescence mostly 18-45 mm long; [widespread in our area] ..... ***C. atlantica***
                10 Widest leaves 0.6-1.6 mm wide; infructescence mostly 8-20 mm long; [primarily of the Coastal Plain in our area, widely scattered elsewhere] ..... ***C. howei***

[26q] Section 12 – section *Ovales*

A section of ca. 85 species, largely North American, but also occurring in Central and South America and Eurasia. References: Mastrogiuseppe et al. in FNA (2002b); Rothrock, Reznicek, & Hipp (2009); Rothrock, Reznicek, & Ganion (1997). Key closely adapted from FNA.

1 Pistillate scales uniformly as long as or longer than the mature perigynia, usually concealing the beaks (though not necessarily the bodies), apex obtuse to acuminate, not awned.
2 Perigynium beak cylindric, unwinged, lacking serrations for ca. 0.4 mm below the apex ..... ***C. ovalis***
2 Perigynium beak flattened, ciliate-serrulate all the way to the apex.
3 Principal leaves stiff, more-or-less glaucous, often bearing auricles at the base, the summit of the sheaths truncate, prolonged 1-4 mm beyond the collar; flat margins of perigynia 0.5-0.8 mm wide; achenes 1.0-1.2 mm wide; [of maritime dunes and shores] ..... ***C. silicea***
3 Principal leaves pliable, green, almost always without auricles, the summit of the sheaths U-shaped, only slightly prolonged beyond the collar; flat margins of perigynia 0.2-0.6 mm wide; achenes 1.0-1.7 mm wide; [of inland, non-maritime habitats].
4 Perigynia ascending to spreading, strongly and evenly veined on the adaxial face, finely granular-papillose; spikes (3-) 7-15, the uppermost usually densely aggregated ..... ***C. argyrantha***
4 Perigynia erect-ascending, often veinless on the adaxial face or with a few veins of unequal strength, smooth; spikes 3-7 (-11), the uppermost often more-or-less separated ..... ***C. foenea***

1 Pistillate scales (excluding the awns, if present) shorter than the perigynia at least in the middle portions of the spikes, the apical portion of the pistillate scales narrower than the perigynia braks and not completely covering them, the apex awned in some species.
5 Pistillate scales in middle or lower portions of spikes with apex acuminate with subulate or awned tip.
6 Perigynia 2.6-4.0 × as long as wide, the bodies lanceolate, 1.2-2.0 mm wide ..... ***C. scoparia*** *var.* ***scoparia***
6 Perigynia < 2.5 × as long as wide, the bodies lance-ovate, ovate, broadly elliptic, orbiculate, or obovate, 1.8-3.9 mm wide.
7 Perigynium body obovate, often with conspicuous "shoulders;" leaves 2.5-6 mm at widest ..... ***C. alata***
7 Perigynium body elliptic, suborbiculate, or weakly obovate; leaves 1-3 (-4.2) mm at widest.
8 Perigynium body cuneately tapered to the base, the body of the perigynium more-or-less diamond-shaped; inflorescences dense, stiffly erect, with 3-5 spikes ..... ***C. suberecta***
8 Perigynium body convexly tapered to the base (the base rounded), the body of the perigynium ovate, elliptic, orbiculate, or weakly obovate; inflorescences dense and erect or open and nodding, with 3-11 spikes.
9 Scales with white-hyaline or pale yellowish margins; perigynia greenish to straw-colored or pale brown, (2.3-) 2.5-4.0 (-4.2) mm long, often indistinctly 0-4 (-6) veined on the outer side ..... ***C. festucacea***
9 Scales with reddish-brown margins; perigynia reddish-brown, (3.8-) 4.0-5.5 mm long, conspicuously veined on the outer side with 5 or more veins.
10 Beaks ascending, < ½ the length of the lance-ovate to weakly obovate perigynium body; lateral spikes with acute staminate bases mostly < 2 mm long; [of tidal marshes] ..... ***C. hormathodes***
10 Beaks widely spreading, > ½ the length of the suborbicular perigynium body; lateral spikes with tapered staminate bases 2-6 mm long; [of freshwater wetlands] ..... ***C. straminea***
5 Pistillate scales with apex obtuse, acute, or acuminate (but not subulate or awned).
11 Perigynia < 2 mm wide.
12 Perigynia thin, often not winged to the base; leaf sheaths somewhat expanded towards the apex, bearing narrow wings continuous with the midvein and the edges of the leaf blade; leaves 3-7.5 mm wide; vegetative shoots tall, conspicuous, with numerous leaves spaced along the upper half of the culm.
13 Lower perigynia of each spike spreading or recurved (at an angle of > 80 degrees); spikes globose; pistillate scales hidden, 1.6-2.3 mm long ..... ***C. cristatella***
13 Lower perigynia of each spike appressed-ascending to somewhat spreading (at a 30-75 degree angle); spikes subglobose to ovate-oblong; pistillate scales evident, 2.0-3.0 mm long.
14 Inflorescences usually flexible, nodding at the tip, the lower spikes usually separated; perigynia usually 15-40, spreading at a 40-75 degree angle to the spike axis; leaf sheaths firm or friable at the summit ..... ***C. projecta***
14 Inflorescences straight and stiff, the lower spikes overlapping; perigynia usually > 40, appressed-ascending at a 30-40 degree angle to the spike axis; leaf sheaths firm at the summit.
15 Perigynia 3.0-4.0 mm long, 2.2-2.8 (-3) × as long as wide ..... ***C. tribuloides*** *var.* ***sangamonensis***
15 Perigynia (3.3-) 3.6-5.4 mm long, 3-5 × as long as wide ..... ***C. tribuloides*** *var.* ***tribuloides***
12 Perigynia thick, winged to the base; leaf sheaths with more-or-less rounded edges, not distinctly expanded towards the apex; leaves 1-4.5 mm wide (except in *C. normalis*); vegetative shoots usually inconspicuous, with relatively few leaves clustered at the tip.
16 Perigynia (2.5-) 2.6-4 × as long as wide, the body lanceolate, distance from beak tip to top of achene 2.2-5 mm ..... ***C. scoparia*** *var.* ***scoparia***
16 Perigynia < 2.5 × as long as wide, the body obovate, orbiculate, or ovate; distance from beak tip to top of achene 0.8-2.2 mm.
17 Perigynium body obovate, widest toward the tip (excluding the beak).
18 Perigynium beak spreading, slender; pistillate scales acute; styles sinuous at base ..... ***C. albolutescens***
18 Perigynium beak appressed-ascending, triangular; pistillate scales obtuse; styles straight ..... ***C. longii***
17 Perigynium body ovate, elliptic, or orbiculate, widest towards the base or near the middle (excluding the beak).
19 Inflorescences on tallest culms compact, 1.5-3 × as long as wide, erect, the spikes overlapping, the lowest internode of the inflorescence 1-6 (-7.5) mm, ½ to 1/5 (-¼) the length of the inflorescence
20 Achenes 0.6-0.9 mm wide; perigynia veinless or 1-3 veined on the inner face, these faint or basal only; inflorescences < 3.0 cm long ..... ***C. bebbii***
20 Achenes 0.9-1.3 mm wide; perigynia often 3-veined on the inner face; inflorescences 12-60 mm long.
21 Perigynia broadly elliptic or nearly orbiculate, the wing margin 0.4-0.8 mm wide, 0-6 veined on the inner face ..... ***C. molesta***
21 Perigynia ovate to broadly ovate, the wing margin 0.25-0.45 mm wide, 4-7 veined on the inner face ..... ***C. normalis***
19 Inflorescences on tallest culms elongate, more-or-less open towards the base, (2.5-) 3.0-5.1 × as long as wide, often arching or nodding at the tip; spikes more-or-less separate; lowermost internode (5-) 7-19 mm long, mostly 1/5-⅓ (-½) the length of the inflorescence.
22 Perigynium orbiculate, widest at mid-body ..... ***C. festucacea***
22 Perigynium narrowly to broadly ovate, widest below mid-body.
23 Sheaths smooth, often whitish-mottled; perigynium beak spreading, exceeding the pistillate scales by 0.7-1.6 mm; beak and shoulders of perigynia greenish to yellowish or greenish brown at maturity ..... ***C. normalis***

23 Sheaths, at least some, papillose near the collar (at magnification of 30 ×), not prominently whitish-mottled; perigynium beak appressed or ascending in spikes, exceeding the pistillate scales by 0.0-0.8 mm; beak and shoulders of perigynia straw-colored to reddish-brown at maturity ..... ***C. tenera*** *var.* ***tenera***

11 Perigynia > 2 mm wide.

24 Spikes 12-28 mm long, with tapered base and acute tip; perigynium body lanceolate, 6-9 mm long; vegetative culms conspicuous..... ***C. muskingumensis***

24 Spikes **either** shorter than 12 mm **or** longer and with either rounded bases or tips or both; perigynium body ovate, elliptic, orbicular, or obovate, or lanceolate (if lanceolate, then shorter than 6 mm long); vegetative culms conspicuous or not.

25 Perigynium bodies obovate, widest towards the tip; leaf sheaths green-veined adaxially nearly to the summit, or with a narrow Y-shaped hyaline area.

26 Achenes 1.3-1.8 mm wide ..... ***C. opaca***

26 Achenes 0.75-1.2 (-1.3) mm wide.

27 Inflorescences erect, 1-4.5 cm long; spikes slightly separated to congested ..... ***C. albolutescens***

27 Inflorescences arching or nodding, 2.3-8.4 cm long; spikes widely separated ..... ***C. silicea***

25 Perigynium bodies lanceolate, ovate, elliptic, orbicular, or reniform, widest at the middle or towards the base; leaf sheaths various, some with prominent hyaline band near the apex adaxially.

28 Plants colonial,from creeping rhizomes; vegetative culms numerous, conspicuous, strongly 3-ranked, with 15-35 leaves when fully-developed; achenes 1.6-2 × as long as wide; larger spikes with 5-25 (-30) perigynia ..... ***[C. hyalina]***

28 Plants clumping; vegetative culms few, inconspicuous, usually with fewer than 15 leaves, not strikingly 3-ranked; achenes 1-1.6 (-1.7) × as long as wide; larger spikes with 15-80 perigynia.

29 Perigynia finely granular-papillose (as seen with 30× magnification), the body reniform to orbiculate, 0.6-0.9 ×as long as wide, 3.5-4.5 (-4.9) mm wide; lowermost pistillate scale obtuse-rounded ..... ***C. reniformis***

29 Perigynia smooth, the body broadly ovate, elliptic, orbicular, or slightly obovate, (0.7-) 0.9-1.7 × as long as wide, 1.5-6.1 mm wide; lowermost pistillate scales obtuse to acuminate-awned.

30 Leaf sheaths green-veined adaxially neral to the summit; inflorescences dense to somewhat open, erect, the lowermost internode usually < 8 (-12) mm long

31 Perigynia with acute bases, 2.0-2.8 mm wide; beak appressed, > 2/5 × the length of the body; broadest leaves 1.5-2.5 mm wide; [of sw. VA northward] ..... ***C. suberecta***

31 Perigynia with rounded bases, 3.0-4.4 mm wide; beak spreading, ca. ⅓ × the length of the body; broadest leaves 2-5 mm wide; [of FL] ..... ***C. vexans***

30 Leaf sheaths with white-hyaline area adaxially; inflorescences open or dense.

32 Perigynium body narrowly to broadly ovate, greenish; pistillate scales with green midstripe, hyaline or pale margins (rarely brown tinged); leaves 2.5-6.5 mm wide, the sheaths green mottled, with mouth truncate, and prolonged to 2 mm distal to base of the leaf blades ..... ***C. normalis***

32 Perigynium body broadly ovate, broadly elliptic, or orbiculate, yellowish to tan brown; pistillate scales greenish or dark brown; leaves 1.5-4 (-5) mm wide, the sheaths usually evenly colored, with mouth concave.

33 Leaf sheaths finely papillose (at magnification of 30-40 ×), especially near the leaf base.

34 Perigynia strongly and evenly 4-8-veined over the achene adaxially, (4.5-) 5.1-5.5 mm long; pistillate scales usually (1.0-) 1.4-2.3 mm shorter than the perigynia; anthers (2.4-) 2.8-4.2 mm long ..... ***C. bicknellii***

34 Perigynia veinless or faintly and irregularly 0-4 (-6)-veined over the achene adaxially, 2.5-4.2 mm long; pistillate scales 0.2-1.3 mm shorter than the perigynia; anthers 1.0-2.1 mm long ..... ***C. festucacea***

33 Leaf sheaths smooth.

35 Spikes on larger culms (3-) 5-7 (-11), tapered at the base, the terminal spike with a conspicuous staminate base; inflorescences typically open, 2.5-4.5 (-6.5) cm long, the lowermost internode (3-) 4-13 (-23) mm long; perigynium body (0.7-) 0.9-1.3 × as long as wide.

36 Achenes 1.2-1.8 mm long, 1.0-1.3 mm wide; perigynia 2.5-4.2 mm long, 1.5-2.3 (-2.5) mm wide, mostly 2-4 (-6)-veined adaxially ..... ***C. festucacea***

36 Achenes (1.6-) 1.7-2.2 mm long, (1.2-) 1.4-1.8 mm wide; perigynia 3.2-5.5 mm long, 2.5-3.6 mm wide, veinless or faintly 1-5 (-7)-veined adaxially.

37 Perigynia 3.2-4.8 (-5.2) mm long; beak 0.8-1.5 mm long; pistillate scales 3.3-4.0 (-4.3) mm long, acute; achenes 1.0-1.3 (1.4) × as long as wide ..... ***C. brevior***

37 Perigynia (5.6-) 6.0-7.1 mm long; beak (1.2-) 1.5-2.1 (-2.3) mm long; pistillate scales (3.6-) 3.9-5.0 mm long, obtuse to acute ..... ***C. opaca***

35 Spikes on larger culms 2-4 (-5), rounded at the base, the terminal spike usually lacking a conspicuous staminate base; inflorescences compact, 1.2-3.0 (-3.6) cm long, the lowermost internode 1.5-7 (-13) mm long; perigynium body (0.7-) 0.9-1.6 × as long as wide.

38 Achenes of larger perigynia ellipsoid to narrowly oblong, 0.9-1.3 mm wide, 1.3-1.6 × as long as wide; perigynia (25-) 30-80 per spike, squarrose-spreading at maturity, 1.8-3.0 mm wide ..... ***C. molesta***

38 Achenes of larger perigynia broadly oblong to nearly orbicular, 1.35-1.8 mm wide, 1-1.3 × as long as wide; perigynia (10-) 15-40 (-45) per spike, appressed-ascending at maturity, (2.1-) 2.5-3.4 (-3.5) mm wide.

39 Perigynia veinless or faintly and irregularly 1-5-veined over the achene adaxially, more-or-less orbicular, the bodies (2-) 2.3-3.2 mm long, (0.7-) 0.9-1.1 (-1.3) × as long as wide; pistillate scales mostly acute, about as long as to 0.7 (-0.9) mm shorter than the subtended perigynium (flattened and measured separately)..... ***C. brevior***

39 Perigynia strongly 4-6-veined over the achene adaxially, broadly ovate to broadly elliptic, (or rarely nearly orbicular), the bodies (2.7-) 3-4 mm long, (0.9-) 1.0-1.6 × as long as wide; pistillate scales mostly obtuse, 0.7-1.7 mm shorter than the subtended perigynium (flattened and measured separately) ..... ***C. molestiformis***

{add *C. cumulata, C. hyalina*}

[26r] Section 13 – section *Phacocystis* (*Cryptocarpae* and *Acutae*)

A section of 70-90 species, cosmopolitan. References: Standley, Cayouette, & Bruederle in FNA (2002b); Standley (1983); Bruederle & Fairbrothers (1986); Bruederle, Fairbrothers, & Hanks (1989). Key based in part on C.

1 Lowest spike erect or ascending.
2 Lower sheaths scabrous, reddish-brown, the sheath fronts (ventral faces) with prominent veins forming a persistent network; lower sheaths usually bladeless ..... ***C. stricta***
2 Lower sheaths glabrous, the sheath fronts (ventral faces) not forming a persistent network; lower sheaths usually with leaf blades.
3 Perigynia evidently nerved on both faces ..... ***C. emoryi***
3 Perigynia not nerved, or very faintly nerved.
4 Longest bracts overtopping the spikes; perigynia flattened, elliptic to obovate; pistillate scales acute to obtuse, generally shorter than the perigynia ..... ***C. aquatilis***
4 Longest bracts shorter than the spikes; perigynia inflated, obovate; pistillate scales acuminate, longer than the perigynia ..... ***C. haydenii***
1 Lowest spike pendent.
5 Pistillate scales awnless, the sides black or deep purple-brown ..... ***C. torta***
5 Pistillate scales awned, the sides medium brown.
6 Sheath backs glabrous [prickles 0-1 (-5) per mm^2 of sheath surface 5 cm from base]; perigynia somewhat inflated, obovoid, rounded above to an abrupt beak; lowest bract of the infructescence 1.7-6.2 dm long.
7 Perigynia strongly obovoid, 3-4.5 mm long, 2-3 mm wide; achene symmetrical ..... ***C. crinita*** *var.* ***brevicrinis***
7 Perigynia ellipsoid to slightly obovoid, 2-3 (-3.5) mm long, 1-2 mm wide; achene usually shortened on one side, therefore asymmetrical ..... ***C. crinita*** *var.* ***crinita***
6 Sheath backs scabrous [prickles (1-) 5-54 per mm^2 of sheath surface 5 cm from base]; perigynia flattened, elliptic to ovoid, tapering from near or below the middle to a minute beak; lowest bract of the infructescence 0.7-3.5 dm long.
8 Perigynia smooth to slightly papillate toward the apex, the papillae mostly < 10 µm long; lower pistillate scales usually acute or acuminate, tapering into the awn; sheaths strongly scabrous; [mainly distributed in our area in the Mountains] ..... ***C. gynandra***
8 Perigynia densely granular-papillate throughout, the papillae mostly > 13 µm long; lower pistillate scales usually truncate or retuse, abruptly awned; sheaths finely scabrous; [mainly distributed in our area in the Coastal Plain and Piedmont] ..... ***C. mitchelliana***

[26s] Section 14 – section *Racemosae (Atratae)*

A section of ca. 60 species, of North America and Eurasia. References: Murray in FNA (2002b).

One species ..... ***C. buxbaumii***

[26u] Section 15 – section *Limosae (including Scitae)*

A section of 6 species, in cool temperate parts of North America, Eurasia, and s. South America. References: Ball in FNA (2002b).

1 Pistillate scales 1.2-2.0 mm wide, narrower than the perigynia ..... ***C. barrattii***
1 Pistillate scales 2.0-3.8 mm wide, wider than the perigynia ..... ***C. limosa***

[26w] Section 16 – section *Rhynchocystis*

A section of 5 species, of Europe, w. Asia, and Europe. References: Reznicek in FNA (2002b).

One species ..... ***C. pendula***

[26x] Section 17 – section *Glaucescentes (Pendulinae)*

A section of 3 species, of se. North America. References: Standley in FNA (2002b).

1 Awn of the pistillate scale tapering gradually into the scale; perigynium 2-ribbed, and also distinctly and evenly nerved between the ribs; [of swamps and marshes] ..... ***C. joorii***
1 Awn of the pistillate scale emerging from a retuse notch in the apex of the scale; perigynium 2-ribbed, obscurely nerved between the ribs; [generally of acid seepages, pocosins, and blackwater situations, often associated with *Pinus serotina*].
2 Lowest pistillate spike drooping, on a peduncle 1-4 cm long; perigynia reddish-glaucous, lacking nerves; achenes slightly longer than wide ..... ***C. glaucescens***
2 Lowest pistillate spike erect, sessile or with a peduncle up to 1 cm long; perigynia white-glaucous, rather distinctly 6-8 nerved; achenes as wide as long ..... ***C. verrucosa***

[26aa] Section 18 – section *Paniceae*

A section of 14 species, of temperate parts of North America and Eurasia, and montane Central America and South America. References: Rothrock & Reznicek in FNA (2002b).

1 Perigynia with a distinct beak, 1.0-2.2 mm long.
2 Basal leaves with well-developed blades; basal sheaths brown; perigynia glabrous; [of moist, usually calcareous habitats of the Coastal Plain] ..... ***C. chapmanii***
2 Basal leaves reduced to bladeless sheaths; basal sheaths strongly purple; [of dry, acidic habitats of the Mountains] ..... ***C. polymorpha***
1 Perigynia beakless, or with an indistinct beak < 0.5 mm long.
3 Basal sheaths with well-developed blades; basal sheaths brown to strongly purple.

4 Pistillate spike 5-7 mm in diameter, with ca. 6 vertical rows of perigynia; perigynia 3.3-4.2 mm long, 2.0-2.5 mm wide; leaves 3-7 mm wide, blue green ..... ***C. meadii***
4 Pistillate spike 3-4 mm in diameter, with ca. 2-3 vertical rows of perigynia; perigynia 2.5-3.5 mm long, 1.5-2.0 mm wide; leaves 2-4.5 mm wide, pale green ..... ***C. tetanica***
3 Basal sheaths bladeless, or with blades to 3 cm long; basal sheaths strongly purple.
5 Culms to 10 dm tall, (2-) 3-5 mm in diameter near base; larger leaves ca. 5 mm wide; plants forming large clumps; [plants of shallow soils on sloping rock outcrops] ..... ***C. biltmoreana***
5 Culms to 5 dm tall, ca. 1-2 mm in diameter near the base; larger leaves ca. 2-4 mm wide; plants forming small, spaced clumps, interconnected by long-creeping rhizomes; [plants of mountain slopes in more-or-less deep soils] ..... ***C. woodii***

{add *C. livida* to key}

[26bb] Section 19 – section *Laxiflorae*

A section of ca. 16 species, of North America and Central America. References: Bryson & Naczi in FNA (2002b); Naczi, Kral, & Bryson (2001). Key based in part on Naczi, Kral, & Bryson (2001).

1 Perigynia with 8-18 veins, 2-3 conspicuous, narrowly cuneate basally; perigynium beak short and usually abruptly bent; foliage dark green; bracts surpassing the staminate spike ..... ***C. leptonervia***
1 Perigynium with (22-) 25-32 veins, all of which are conspicuous (the central one slightly more distinct); perigynium beak various; foliage various; bracts various.
2 Perigynium with a short, bent beak, usually abruptly bent to one side.
3 Spikes loosely flowered, most perigynia not overlapping.
4 Bracts very broad, 8-20 mm wide; basal leaves very wide, up to 40 mm wide; plant glaucescent; basal sheaths purple or brown ..... ***C. albursina***
4 Bracts narrow, 2.5-6 mm wide; basal leaves narrow, 3-8 mm wide; plant green; basal sheaths purple, often weathering to brown ..... ***C. ormostachya***
3 Spikes densely flowered, the perigynia overlapping.
5 Basal sheaths purple when fresh, weathering to brown; uppermost bract rarely overtopping the staminate spike; staminate spike usually long-stalked ..... ***C. gracilescens***
5 Basal sheaths brown; uppermost bract overtopping the staminate spike; staminate spike sessile or short-stalked
6 Widest bract of the uppermost lateral spike 0.5-3.4 mm wide ..... ***C. blanda***
6 Widest bract of the uppermost lateral spike (2.9-) 3.2-8.3 mm wide ..... ***C. kraliana***
2 Perigynium tapering to a straight or slightly curved beak (or a long, curved beak in *C. radfordii*) (note: some beaks may curve in pressing).
7 Perigynium beaks long (to 1.5 mm long) and excurved; basal sheaths green, white, and brownish striped; [endemic to the escarpment gorge area near the SC-NC-GA tricorner] ..... ***C. radfordii***
7 Perigynium beaks straight or slightly curved; basal sheaths either purple, wine-red, or brownish, not prominently green-and-white striped; [collectively widespread in our area].
8 Basal sheaths purple or wine-red (may weather to brown in *C. gracilescens*).
9 Spikes densely flowered, the perigynia overlapping ..... ***C. gracilescens***
9 Spikes loosely flowered, the spikelets not overlapping.
10 Mature leaf blades of sterile shoots 4-5 (-6) mm wide, green; culms green, chalky red at base (best seen in fresh material); pistillate spikes (3-) 5-7 (-8) flowered; staminate spike on a peduncle 0-1 cm long ..... ***C. manhartii***
10 Mature leaf blades of sterile shoots (6-) 7-10 mm wide, glaucous; culms glaucous, bright red at base (best seen in fresh material); pistillate spikes (4-) 7-11 (-15) flowered; staminate spike on a peduncle 2-3 (-6) cm long ..... ***C. purpurifera***
8 Basal sheaths brown, not purple or wine-red.
11 Mature perigynia obovoid.
12 Spikes overlapping, densely flowered; staminate spike more-or-less obscured; plant green ..... ***C. crebriflora***
12 Spikes scattered, loosely flowered; staminate spike prominently exserted; plant usually glaucescent ..... ***C. laxiflora***
11 Mature perigynia fusiform.
13 Spikes overlapping, the staminate more-or-less obscured and overtopped by the uppermost bract ..... ***C. crebriflora***
13 Spikes scattered, the staminate prominent and exceeding the uppermost bract.
14 Spikes densely flowered; perigynium beaks curved; lowest spike exserted on a long, arching, peduncle ..... ***C. styloflexa***
14 Spikes loosely flowered; perigynium beaks straight; lowest spike on a short, erect or ascending, peduncle ..... ***C. striatula***

[26cc] Section 20 – section *Granulares*

A section of ca. 6 species, of temperate North America south through Mexico to Central America. References: Cochrane & Naczi in FNA (2002b). Key based on FNA.

1 Plants with long-creeping rhizomes, the culms therefore mostly solitary; terminal spike and uppermost lateral spike usually separated.
2 Staminate scales with apex rounded to obtuse; widest leaves 1.8-3.0 (-4.4) mm wide; perigynium beak 0.1-0.3 mm long; [widespread] ..... ***C. crawei***
2 Staminate scales with apex acute to awned; widest leaves 2.8-8.3 mm wide; perigynium beak 0.3-0.9 mm long; [of Panhandle FL and AL westward] ..... ***C. microdonta***
1 Plants with short rhizomes, the culms therefore clumped; terminal and uppermost lateral spike usually overlapping.
3 Leaves green; longest bract blade of uppermost lateral spike 1.6-4.6 (-7.1) cm long; perigynia (1.6-) 1.9-3× as long as thick; [of the Coastal Plain] ..... ***C. gholsonii***
3 Leaves glaucous (rarely green); longest bract blade of uppermost lateral spike 4.1-15.8 cm long; perigynia 1.4-2.2 (-2.4)× as long as thick; [widespread] ..... ***C. granularis***

[26dd] Section 21 – section *Careyanae*

A section of 8 species, of temperate e. North America. References: Bryson & Naczi in FNA (2002b).

1 Basal sheaths purplish, sometimes mixed with brown.
2 Widest leaf blade 3-6 mm wide; peduncles of lateral spikes usually drooping ..... ***C. austrocaroliniana***
2 Widest leaf blade 10-25 mm wide; peduncles of lateral spikes usually erect or spreading.
3 Bracts of middle and basal portions of culms with blades 2.1-9.2 cm long; perigynia 5.0-6.6 mm long; longest (per plant) lateral spike with 4-9 perigynia ..... ***C. careyana***
3 Bracts of middle and basal portions of culms bladeless, or with blades 0.1-1.9 cm long; perigynia 3.7-4.9 mm long; longest (per plant) lateral spike with 9-13 perigynia ..... ***C. plantaginea***
1 Basal sheaths brownish, lacking any purple coloration.
4 Widest leaf blade 11-25 mm wide; leaf blades of vegetative shoots 3.8-9.0 × as wide as bract leaves; bract blades from middle and basal portions of the culms 2.0-6.2 cm long; foliage glaucous ..... ***C. platyphylla***
4 Widest leaf blade 2-14 mm wide; leaf blades of vegetative shoots 1.0-3.5 × as wide as bract leaves; bract blades from middle and basal portions of the culms 4.5-24 cm long; foliage green or glaucous.
5 Basalmost scale of each lateral spike sterile (lacking a perigynium) or subtending a staminate flower.
6 Foliage usually bright green; longest (per plant) terminal spike 0.6-2.0 (-2.3) cm long; widest leaf blade 5.3-8.3 mm wide ..... ***C. laxiculmis*** *var.* ***copulata***
6 Foliage usually glaucous; longest (per plant) terminal spike (1.0-) 1.2-2.5 cm long; widest leaf blade 6.4-11.8 mm wide ..... ***C. laxiculmis*** *var.* ***laxiculmis***
5 Basalmost scale of each lateral spike subtending a perigynium.
7 Terminal spikes (1.0-) 1.2-2.7 mm wide; staminate scales acute, those from the the middle region of the staminate spike 3.6-5.5 mm long; vegetative shoots shorter than or slightly taller than the culms, the tallest vegetative shoot 0.5-1.3 (-1.8) × as tall as the tallest culm.
8 Terminal spike usually surpassing the bract blade of the distalmost lateral spike; longest (per plant) peduncle of terminal spike (6.3-) 8.1-15.9 cm long; widest leaf blade 2.0-2.9 (-3.5) mm wide; each perigynium face 7-10-nerved.. ***C. digitalis*** *var.* ***macropoda***
8 Terminal spike usually surpassed by the bract blade of the distalmost lateral spike; longest (per plant) peduncle of terminal spike 0.9-7.2 (-11.4) cm long; widest leaf blade 2.7-4.5 (-5.3) mm wide; each perigynium face (8-) 11-15-nerved.
9 Perigynia 2.5-3.3 mm long, the apex barely excurved ..... ***C. digitalis*** *var.* ***digitalis***
9 Perigynia 3.2-4.2 mm long, the apex noticeably excurved ..... ***C. digitalis*** *var.* ***floridana***
7 Terminal spikes 0.6-1.4 (-1.6) mm wide; staminate scales obtuse, those from the the middle region of the staminate spike 2.6-3.6 (-3.8) mm long; vegetative shoots much taller than the culms, the tallest vegetative shoot (1.4-) 1.7-3.7 (-4.9) × as tall as the tallest culm.
10 Perigynia 3.9-4.5 mm long; leaves strongly glaucous ..... ***C. magnifolia***
10 Perigynia 2.9-3.8 mm long; leaves green.
11 Perigynia spirally imbricate; longer lateral spikes with (6-) 8-13 perigynia; peduncles of proximal spikes usually erect, the longest (per plant) peduncle (7.0-) 15-42 (-49) mm long; bract blade of distalmost lateral spike 5.6-17 (-26) × as long as wide; loosely or densely cespitose; [primarily of the Coastal Plain in our area, though extending rarely into the Piedmont and Mountains] ..... ***C. abscondita***
11 Perigynia distichously imbricate; longer lateral spikes with 4-8 (-9) perigynia; peduncles of proximal spikes usually drooping or nodding, the longest (per plant) peduncle (28-) 44-84 (-91) mm long; bract blade of distalmost lateral spike (12-) 17-51 × as long as wide; densely cespitose; [primarily of the Mountains and Piedmont] ..... ***C. cumberlandensis***

[26ee] Section 22 – section *Griseae (Oligocarpae)*

A section of ca. 21 species, of North America (including Mexico). References: Naczi & Bryson in FNA (2002b); Naczi, Bryson, & Cochrane (2002); Naczi (1989, 1993, 1997). Key based on Naczi (1997), in part.

1Culm bases brown.
C. hitchcockiana
C. brysonii
C. flaccosperma
C. glaucodea
C. pigra
C. conoidea
C. impressinervia
C. grisea
C. amphibola

1Culm bases purple-red.
C. ouachitana
C. godfreyi
C. grisea
C. amphibola
C. corrugate
C. bulbostylis
C. paeninsulae
C. oligocarpa
C. calcifugens
C. edwardsiana
C. planispicata
C. thornei
C. paeninsulae

1 Perigynia tapering toward the base, obtusely trigonous in cross-section, usually pubescent proximally, the apex constricted to a distinct beak (nearly beakless in *C. planispicata*), the perigynia closely enveloping the achene at maturity.
2 Leaf-sheaths hispidulous; perigynia broadest well above the middle; basal sheaths brownish.
3 Leaves glaucescent, usually papillate abaxially; pistillate scale margins entire; perigynia 3.7-5.1 mm long, 1.5-1.8 mm wide; [of the Cumberland Plateau of n. AL] ..... ***C. brysonii***
3 Leaves deep green, abaxially smooth or sparsely scabrous on midrib; pistillate scale margins denticulate; perigynia 4.5-6.2 mm long, 1.9-2.3 mm wide; [of ne. United States, south in our area to w. NC and w. VA] ..... ***C. hitchcockiana***
2 Leaf-sheaths glabrous; perigynia broadest near the middle; basal sheaths purple, greenish-white, or light tan.
4 Basal sheaths greenish-white or light tan; old leaf bases persistent as brownish fibrils; perigynium beak obscure, essentially absent..... ***C. impressinervia***
4 Basal sheaths purple; old leaf bases not persistent as fibrils; perigynium beak absent to well-developed, 0-1.0 mm long.
5 Perigynia 1.6-2.6× as long as wide; widest leaf 1.8-4.0 mm wide; achene beak 0.05-0.3 (-0.5) mm long; longest pistillate spikes with 4-8 (-10) perigynia ..... ***C. oligocarpa***
5 Perigynia (2.4-) 2.5-3.3× as long as wide; widest leaf (3.0-) 3.5-6.5 mm wide; achene beak (0.3-) 0.4-0.7 mm long; longest pistillate spikes with (5-) 7-14 perigynia ..... ***C. planispicata***
1 Perigynia convex-rounded basally, more-or-less terete in cross-section, glabrous, the apex tapered but not constricted, beakless or the beak obscure, the perigynia loosely enveloping the achene at maturity.
6 Widest leaf (5.1-) 6.2-11.1 (-13.5) mm wide; foliage glaucous; pistillate scales awnless or short-awned, the awns 0-0.9 (-1.9) mm long.
7 Perigynia (4.0-) 4.2-5.5 (-6.0) mm long, (2.0-) 2.1-2.7× as long as the achene bodies, spreading to ascending; achene stipes (0.2-) 0.3-0.5 (-0.6) mm long; pistillate spikes (5.0-) 5.9-8.0 (-9.6) mm wide; achene beaks vertical to slightly bent, usually bent 0-30º from the vertical ..... ***C. flaccosperma***
7 Perigynia 3.2-4.5 (-4.7) mm long, 1.6-2.0× as long as the achene bodies, usually ascending; achene stipes 0.05-0.3 (-0.5) mm long; pistillate spikes (3.3-) 4.2-6.1 (-7.3) mm wide; achene beaks slightly bent to recurved, usually bent 30-90º from the vertical.
8 Perigynia 3.2-4.0 (-4.1) mm long, (1.5-) 1.8-2.3 (-2.5)× as long as wide; longest pistillate spike with (14-) 19-45 (-65) flowers, densely flowered, with the ratio [mm of spike length/number of flowers] = (0.56-) 0.67-1.1 (1.3); longest peduncle of staminate spike 0.5-15 (-31) mm long ..... ***C. glaucodea***
8 Perigynia (3.7-) 3.9-4.5 (-4.7) mm long, (1.9-) 2.1-2.6 (-2.8)× as long as wide; longest pistillate spike with 11-25 (-28) flowers, rather loosely flowered, with the ratio [mm of spike length/number of flowers] = (0.97-) 1.0-1.3 (1.6); longest peduncle of staminate spike (1.5-) 7.5-37 (-62) mm long ..... ***C. pigra***
6 Widest leaf 2.0-6.8 (-9.1) mm wide; foliage green; pistillate scales relatively long-awned, the awns (0.2-) 1.1-8.3 (-13.7) mm long.
9 Axis of inflorescence and pistillate spike peduncles scabrous; perigynia 2.5-4 mm long ..... ***C. conoidea***
9 Axis of inflorescence and pistillate spike peduncles smooth; perigynia 3-6 mm long.
10 Plants densely to loosely cespitose; culm purple-red coloration extending (3.5-) 4.0-9.6 cm up from base; widest leaves 2.4-6.5 mm wide; perigynia either distichously or spirally imbricate; achene stipe either 0.2-0.4 or 0.6-0.8 (-0.9) mm long.
11 Purple-red coloration extending (3.4-) 4.0-7.3 cm up from base; widest leaves 2.4-4.0 (-5.3) mm wide; perigynia spirally imbricate; achene stipe 0.6-0.8 (-0.9) mm long ..... ***C. godfreyi***
11 Purple-red coloration extending (3.4-) 5.5-9.6 cm up from base; widest leaves 2.4-6.5 mm wide; perigynia distichously imbricate; achene stipe 0.2-0.4 mm long ..... ***C. planispicata***
10 Plants densely cespitose; culm purple-red coloration extending 0-3.6 (-3.9) cm up from base; widest leaves 3.3-6.8 (-9.1) mm wide; perigynia spirally imbricate; achene stipe (0.2-) 0.3-0.6 mm mm long.
12 Perigynia 1.5-1.9 (-2.2) mm wide, (2.2-) 2.5-3.1× as long as wide ..... ***C. amphibola***
12 Perigynia (1.7-) 1.8-2.6 mm wide, 1.8-2.4 (-2.6)× as long as wide.
13 Widest leaves 3.3-5.6 (-8.0) mm wide; achene stipe (0.3-) 0.4-0.6 mm long ..... ***C. corrugata***
13 Widest leaves (4.8-) 5.0-6.8 (-9.1) mm wide; achene stipe (0.2-) 0.3-0.4 (0.5) mm long ..... ***C. grisea***

{add *C. acidicola*, *C. thornei*}

[26ff] Section 23a – section *Hymenochlaenae (the "Longirostres" group)*

1 Perigynia several-nerved, the beak much shorter than the body; basal sheath not conspicuously fibrous ..... ***C. cherokeensis***
1 Perigynia 2-ribbed (otherwise nearly nerveless), the beak about as long as the body; basal sheath conspicuously fibrous ..... ***C. sprengelii***

[26ff] Section 23b – section *Hymenochlaenae (the "Gracillimae" group)*

A section of 50-60 species, semicosmopolitan. References: Waterway in FNA (2002b).

1 Lowest pistillate bract auriculate but not sheathing; terminal spike normally staminate (rarely with a few perigynia terminally); leaf blades 1-2 mm wide; basal sheaths purplish or red; [of cliffs and rock outcrops at moderate to high elevations in the Mountains] ..... ***C. misera***
1 Lowest pistillate bract sheathing (the sheath short in *C. prasina*); terminal spike normally gynecandrous, rarely merely staminate (often merely staminate in *C. prasina*); leaf blades 1.5-7 mm wide; basal sheaths purplish or red (brownish or greenish in *C. prasina*); [of various habitats, only rarely as above].
2 Perigynia strongly trigonous, the lateral ribs at the angles, broadest below the middle; basal sheaths brownish or greenish; leaf sheaths glabrous on the hyaline ventral portion ..... ***C. prasina***
2 Perigynia terete to obscurely trigonous, the lateral ribs not at the angles, broadest near the middle; basal sheaths purplish or red; leaf sheaths pubescent on the hyaline ventral portion (glabrous in *C. gracillima*).
3 Perigynia densely white-hirsute; achenes brown with dark red spots ..... ***C. roanensis***
3 Perigynia glabrous; achenes without dark red spots.
4 Leaf sheaths glabrous on the hyaline ventral portion; larger leaves 3-9 mm wide ..... ***C. gracillima***
4 Leaf sheaths pubescent on the hyaline ventral portion; larger leaves 1.5-6 mm wide.
5 Perigynia 2.5-3.0 mm long, 0.9-1.2 mm wide; perigynium beaks absent or very short, the orifice entire; leaf blades1.5-2.5 mm wide ..... ***C. aestivalis***

5 Perigynia 3.0-4.6 mm long, 1.4-2.0 mm wide; perigynium beaks very short to short, the orifice bidentate; leaf blades 2-6 mm wide.
6 Perigynia 3.0-4.0 mm long, 1.5-1.75 mm wide; leaves 2-4 mm wide ..... ***C. aestivaliformis***
6 Perigynia 3.5-6 mm long, 1.75-2.0 mm wide; leaves 3-8 mm wide.
7 Upper pistillate scales awned; perigynia 4.5-6 mm long; leaves 4-8 mm wide ..... ***C. davisii***
7 Upper pistillate scales acuminate; perigynia 3.5-4.6 mm long; leaves 3-5 mm wide ..... ***C. oxylepis***

[26ff] Section 23c – section *Hymenochlaenae (the "Sylvaticae" group)*

1 Achene sessile in the base of the perigynium; perigynia 3.2-6 mm long; sterile shoots with leaves 5-10 mm wide; [**either** alien and rarely naturalized in our area, **or** native and rare].
2 Perigynia 3.2-4.8 mm long, abruptly narrowed to a short stipe; [native, of northern hardwoods forests in the Mountains of NC and VA] ..... ***C. arctata***
2 Perigynia 5-6 mm long, sessile; [alien, rarely naturalized in our area] ..... ***C. sylvatica***
1 Achene on a stipe 0.5-1.5 mm long; perigynia (4.5-) 5.6-8.0 (-10) mm long; sterile shoots with leaves 2-8 mm wide; [native, collectively common and widespread in our area].
3 Internodes between the perigynia mostly 1.0-1.5 mm; sheaths of the pistillate bracts puberulent at the mouth.
4 Perigynia glabrous, (5.2-) avg. 6.2 (-7.7) mm long ..... ***C. oblita***
4 Perigynia puberulent, (6.4-) avg. 7.2 (-8.1) mm long ..... ***C. venusta***
3 Internodes between the perigynia mostly 2.0-4.0 (-6.0) mm; sheaths of the pistillate bracts glabrous at the mouth.
5 Perigynia puberulent, (5-) avg. 7 (-9) mm long; pistillate scales usually with the midrib excurrent as a short awn ..... ***C. allegheniensis***
5 Perigynia glabrous, (4.5-) avg. 5.6-7 (-10) mm long; pistillate scales usually with the midrib terminating below the apex, not excurrent.
6 Perigynia (6-) 7.0 (-10) mm long, broadest below the middle, tapering with straight or slightly convex sides to a conspicuous beak with a hyaline tip; [of swamps, bogs, and other moist to wet habitats, nearly throughout our area] ..... ***C. debilis***
6 Perigynia (4.5-) 5.6 (-7) mm long, broadest near the middle, tapering with concave sides to a short beak lacking a hyaline tip; [of dry to moist upland forests and openings in the Mountains] ..... ***C. flexuosa***

[26ii] Section 24 – section *Porocystis (Virescentes)*

A section of 10 species, of temperate North America, Central America, and South America. References: Ball in FNA (2002b).

1 Terminal spike staminate (rarely gynecandrous, with fewer than 25% of the flowers pistillate) ..... ***C. pallescens***
1 Terminal spike gynecandrous (and with > 30% of the flowers pistillate).
2 Perigynia densely pubescent; larger lateral spikes 2-4 mm wide; ligules longer than wide.
3 Terminal spikes 5-15 (-20) mm long; anthers 0.7-1.3 (-1.6) mm long ..... ***C. swanii***
3 Terminal spikes (18-) 20-35 mm long; anthers (1.0-) 1.6-2.0 (-2.8) mm long ..... ***C. virescens***
2 Perigynia glabrous, or minutely papillose, or with few scattered hairs; larger lateral spikes (3.5-) 4-8 mm wide; ligules as wide as long.
4 Perigynia papillose, with a short but definite beak, 2.5-4.0 mm long; anthers 2.5-3.5 mm long; pistillate scales about equal to perigynia or slightly longer; pistillate spikes 6-10 mm wide ..... ***C. bushii***
4 Perigynia not papillose, beakless or with a short but definite beak [*C. caroliniana*], 2.0-3.5 mm long; anthers 1.3-2.5 mm long; pistillate scales usually much shorter than perigynia; pistillate spikes 4-7 mm wide.
2 Perigynia with a short but distinct beak, when mature more-or-less rounded in ×-section and with no faces flattish; blades glabrous or glabrate ..... ***C. caroliniana***
5 Perigynia beakless, when mature more-or-less triangular in ×-section (or hemispheric) and with the inner face flattish, blades glabrous or glabrate [*C. complanata*] or densely hirtellous [*C. hirsutella*].
6 Blades glabrous or glabrate, especially on lower surface, sheaths glabrate to pubescent (if so, pubescence dense only in summit region); [mostly Coastal Plain and Piedmont] ..... ***C. complanata***
6 Blades and sheaths densely hirtellous throughout; [mostly Coastal Plain, Piedmont, and Mountains] ..... ***C. hirsutella***

[26kk] Section 25 – section *Anomalae*

A section of ca. 20 species, of North America, e. Asia, and Australia. References: Cochrane in FNA (2002b).

One species ..... ***C. scabrata***

[26ll] Section 26 – section *Hallerianae*

A section of 5 or more species, s. North America to Central America, s. Europe, sw. Asia, and n. Africa. References: Ball in FNA (2002b); Jones & Jones (1993). Key adapted from Jones & Jones (1993).

1 Perigynia densely white-villous apically, glabrous basally; achene body 2.0-2.7 mm long, long-stipitate ..... ***C. dasycarpa***
1 Perigynia puberulent throughout; achene body 3.0-3.3 mm long, sessile ..... ***C. tenax***

[26nn] Section 27 – section *Hirtifoliae*

A monotypic section, of e. North America. References: Ball in FNA (2002b); Jones & Jones (1993).

One species ..... ***C. hirtifolia***

[26oo] Section 28 – section *Paludosae*

A section of about 35 species, mostly of temperate Asia and North America. References: Reznicek & Catling in FNA (2002b); Reznicek (1993).

Identification notes: All species of this section in our area form large clonal colonies by rhizomes.

1 Perigynium body pubescent.
  2 Culms central, with the withered remains of the previous year's leaves at the base; basal sheaths of of fertile culms not at all or only slightly reddened; [of the Coastal Plain] ..... ***C. striata*** *var.* ***striata***
  2 Culms lateral, with bladeless sheaths at the base; basal sheaths strongly reddened; [collectively widespread in our area].
    3 Beak of the perigynium soft, translucent, the teeth obscure; peduncle of staminate spike 0.2-2 cm long; [of the Piedmont and Coastal Plain in our area] ..... ***C. vestita***
    3 Beak of the perigynium stiff, opaque, the teeth well-developed; peduncle of staminate spike (0.8-) 2-9 cm long; [of the Mountains in our area].
      4 Leaves folded along the midrib, appearing 0.7-2.0 (-2.2) mm wide; culms obtusely trigonous, usually smooth; base of pistillate bracts often auriculate, forming a V-shaped mouth; middle staminate scales narrowly acute ..... ***C. lasiocarpa*** *var.* ***americana***
      4 Leaves more-or-less flat or M-shaped, (1.8-) 2.2-4.5 (-6) mm wide; culms acutely trigonous, often scabrous on the angles; base of pistillate bract with a short, truncated process at mouth; middle staminate scales obtuse and short-awned, or acute ..... ***C. pellita***
1 Perigynium body glabrous.
  5 Widest leaves 1.5-5 (-6) mm wide; culms 8-90 cm tall; inflorescences 2.5-35 (45) cm long.
    6 Inflorescence rachis with rounded, smooth angles; lowermost pistillate spikes usually strongly overlapping; [introduced, in coastal sands] ..... ***C. pumila***
    6 Inflorescence rachis with sharp, scabrous angles; lowermost pistillate spikes overlapping not at all or slightly; [native, in acidic Coastal Plain wetlands] ..... ***C. striata*** *var.* ***brevis***
  5 Widest leaves (4-) 5.5-15 (-21) mm wide; culms 40-135 cm tall; inflorescences 15-60 cm long.
    7 Perigynia 3.0-4.5 mm long; [exotic species] ..... ***C. acutiformis***
    7 Perigynia 4.8-7.8 mm long; [native species].
      8 Longest ligules 2-10 (-12) mm long, < 2 × as long as wide; culms central, with the withered remains of the previous year's leaves at the base; perigynia obscurely 10-15-veined; [of the Coastal Plain] ..... ***C. hyalinolepis***
      8 Longest ligules 13-40 (-56) mm long, much longer than wide; culms lateral, with bladeless sheaths at the base; perigynia usually strongly 14-28-veined; [of the Mountains in our area] ..... ***C. lacustris***

[26pp] Section 29 – section *Carex*

A section of about 10 species, of temperate North America and Eurasia. References: Reznicek & Catling in FNA (2002b).

1 Perigynia glabrous; leaf blades finely papillose on the lower surface (and also usually long-pubescent); vegetative culms hollow, spongy (flattened when pressed) ..... ***C. atherodes***
1 Perigynia pubescent; leaf blades glabrous or pubescent abaxially, but not papillose; vegetative culms hard.
  2 Leaf blades pubescent; [rare introduction] ..... ***C. hirta***
  2 Leaf blades glabrous; [native] ..... ***C. trichocarpa***

[26qq] Section 30 – section *Vesicariae* [including 52 - *Pseudocypereae*]

A section of ca. 45 species, semicosmopolitan. Following Reznicek & Ford in FNA (2002b), this section is circumscribed to include the traditionally recognized section *Pseudocypereae*. References: Reznicek & Ford in FNA (2002b). Key adapted from Reznicek & Ford in FNA (2002b).

1 Pistillate scales with a prominent, scabrous awn (the body of the scale often ciliate as well).
  2 Plants extensively colonial from elongate, creeping rhizomes; staminate scales acute to acuminate, essentially smooth-margined except at the very tip; perigynia 7-11-nerved ..... ***C. schweinitzii***
  2 Plants densely to loosely cespitose, the rhizomes connecting individual culms in a clump < 10 cm long; staminate scales (at least some of them) with a distinct, scabrous awn; perigynia 6-25-nerved.
    3 Perigynia 6-12-nerved, the nerves separate nearly to the beak apex; perigynium bodies broadly ellipsoid to more or less globose, (1.8-) 2.0-4.2 mm wide; achenes rough-papillate.
      4 Spikes 9-14 (-15) mm thick; widest leaves 2.4-4.0 (-5) mm wide; spikes usually 2.5-3.5× as long as wide; perigynia 4.8-6.6 (-7.6) mm long, the beaks usually 0.7-1.3× as long as the body ..... ***C. baileyi***
      4 Spikes (12-) 15-22 mm thick; widest leaves (4.0-) 4.5-13 mm wide; spikes usually < 2.5× as long as wide **if** < 15 mm thick; perigynia (6-) 6.5 (-10.8) mm long, the beaks 0.6-0.9× as long as the body ..... ***C. lurida***
    3 Perigynia 12-25-nerved, the nerves (except for 2 prominent laterals) confluent at or below the middle of the beak; perigynium bodies ellipsoid to lance-ovoid, 1.1-2.2 mm wide; achenes smooth.
      5 Mature perigynia spreading or ascending when mature; perigynia round in cross-section; teeth of the perigynium beak 0.3-0.9 mm long, straight ..... ***C. hystericina***
      5 Mature perigynia reflexed when mature; perigynia obscurely trigonous; teeth of the perigynium beak 1.3-2.1 (-2.8) mm long, strongly outcurved ..... ***C. comosa***
1 Pistillate scales smooth-margined, obtuse to acuminate, awnless (rarely the lowermost scales awned in *C. utriculata*).
  6 Leaves filiform-involute, wiry, (0.5-) 1-3 (-3.2) mm wide; stems round or obtusely trigonous in cross-section, smooth; [rare, in high elevation bogs in the Mountains] ..... ***C. oligosperma***
  6 Leaves flat, U-, V-, or W-shaped in cross-section, the widest 1.5-12 (-15) mm wide; stems round to trigonous, often scabrous-angled; [collectively widespread].

7 Achenes asymmetrical, deeply indented or invaginated on one face; widest perigynia (4.0-) 4.5-7 mm wide; beaks 2.4-4.8 mm long, smooth ..... ***C. tuckermanii***
7 Achenes symmetrical; widest perigynia (2-) 2.5-3.5 (-4.5) mm wide; beaks 1-4.2 (-4.8) mm long, scabrous or smooth.
8 Perigynium beaks finely scabrous (at least near the tip and on the teeth), 2.4-4.2 (-4.8) mm long; widest leaves 1.8-4.3 (-5) mm wide. ..... ***C. bullata***
8 Perigynium beaks smooth, 1-4.5 mm long; widest leaves 1.5-15 mm wide.
9 Pistillate spikes globose or short ovoid, ca. 3-20-flowered; [plants of the Coastal Plain from e. NC southward]..... ***C. elliottii***
9 Pistillate spikes cylindric, ca. 20-150-flowered; [plants collectively of the Mountains, from nw. NC northward].
10 Bract of lowest pistillate spike (excepting isolated spikes from long-sheathing bracts on the lower part of the stem) (2.5-) 3-9× as long as the inflorescence; staminate spike often 1, slightly (if at all) elevated above the summit of the crowded pistillate spikes; perigynia reflexed ..... ***C. retrorsa***
10 Bract of lowest pistillate spike (excepting isolated spikes from long-sheathing bracts on the lower part of the stem) 0.5-2.5× as long as the inflorescence; staminate spikes 2-4 (-5), well elevated above the summit of the crowded pistillate spikes; perigynia spreading or ascending.
11 Plant colonial from long-creeping rhizomes; widest leaves (4.5-) 5-12 (-15) mm wide; ligules about as long as wide; basal sheaths usually spongy-thickened and only slightly or not red-tinged ..... ***C. utriculata***
11 Plant cespitose; widest leaves 1.8-6.5 mm wide; ligules longer than wide; basal sheaths not spongy-thickened and often tinged with reddish-purple ..... ***C. vesicaria***

[26rr] Section 31 – section *Lupulinae*

A section of 6 species, of e. North America. References: Reznicek & Ball (1974); Reznicek in FNA (2002b); Uttal (1971). Key adapted in part from Reznicek & Ball (1974) and Reznicek in FNA (2002b).

1 Sheath of uppermost leaf absent or <1.5 (-2.5) cm long; beak of perigynia 1.5-4.2 mm long; achenes with elliptic or obovate sides.
2 Perigynia rhombic-ovoid, cuneate to the base, 8-35 per spike, radiating in all directions and therefore forming a globular spike..... ***C. grayi***
2 Perigynia lanceoloid to ovoid, convex to the base, 1-12 (-20) per spike, ascending to spreading (the lowest sometimes slightly reflexed) and therefore forming an ovoid to obovoid spike.
3 Perigynia 3-5 mm wide at the widest point; achenes broadest above the middle, with a pronounced shoulder rounding abruptly to the tip; style of mature achene with a half to full coil in its lower portion; [of high elevations in our area, generally in spruce-fir or northern hardwoods forests] ..... ***C. intumescens*** *var.* ***fernaldii***
3 Perigynia 5-8 mm wide at the widest point; achenes broadest at the middle, smoothly rounded to the tip; style of mature achene straight or arcuate; [widespread in our area]..... ***C. intumescens*** *var.* ***intumescens***
1 Sheath of uppermost leaf usually >1.7 cm long; beak of perigynia 4.5-10 mm long; achenes with rhombic or nearly triangular sides.
4 Achenes distinctly wider than long, widest above the middle; perigynia stiffly spreading at right angles to the rachis..... ***C. gigantea***
4 Achenes as wide as long or longer, widest near the middle; perigynia ascending.
5 Angles of the achenes pointed, often even knobbed, with nipple-like points; achenes (2.2-) 2.4-3.4 mm wide, often nearly as wide as long ..... ***C. lupuliformis***
5 Angles of the achenes smoothly curved, not pointed or knobbed; achenes 1.7-2.6 (-2.8) mm wide, distinctly longer than wide.
6 Staminate peduncle (3-) 6-18 cm long, usually exceeding the uppermost spike by 2-12 cm; plants loosely colonial by long slender rhizomes ..... ***C. louisianica***
6 Staminate peduncle 0.5-6 (-7) cm long, shorter than to exceeding the uppermost pistillate spike by < 2 cm; plants solitary or loosely cespitose in small clumps connected by stout, short rhizomes ..... ***C. lupulina***

[26ss] Section 32 – section *Rostrales (Folliculatae)*

A section of 5 species, of e. North America and e. and se. Asia. References: Reznicek in FNA (2002b). Key based on FNA.

1 Perigynia 6.4-10.7 mm long, 2.6-3.9× as long as wide ..... ***C. turgescens***
1 Perigynia (8.3-) 10.5-15.6 mm long, 4-7× as long as wide.
2 Widest leaf blades 1.6-3.5 (-4.2) mm wide; bract sheaths concave at the apex; [of MD northward] ..... ***C. michauxiana***
2 Widest leaf blades (3.5-) 5-18 mm wide; bract sheaths truncate to convex at the apex; [collectively widespread in our area].
3 Pistillate scales usually awned (rarely merely cuspidate); pistillate scales (including the awn, if present) 0.5-1.2× as long as the perigynia; widest leaves of vegetative shoots 8-18 (-21) mm wide; pistillate spikes normally not staminate at apex (rarely with a few staminate flowers); [primarily of the Mountains and Piedmont] ..... ***C. folliculata***
3 Pistillate scales acute or long-acuminate (rarely short-awned); pistillate scales (including the awn, if present) 0.3-0.6× as long as the perigynia; larger leaves mostly 4-12 mm wide; pistillate spikes normally staminate at apex; [primarily of the Coastal Plain] ..... ***C. lonchocarpa***

[26tt] Section 33 – section *Collinsiae*

A monotypic section, of e. North America. References: Standley in FNA (2002b).

One species..... ***C. collinsii***

[26uu] Section 34 – section *Squarrosae*

A section of 4 species, of e. and c. North America and temperate South America. References: Ford in FNA (2002b). Key based on FNA.

1 Terminal spike usually entirely staminate; pistillate scales with an awn equaling or surpassing the perigynium; achenes 1.2-2.1 mm long.

2 Pistillate scales 0.4-0.9 (-1.1) mm wide, the body wide and translucent; staminate scales 0.9-1.6 mm wide, tightly imbricate in the spike; plants colonial, long-rhizomatous..... ***C. aureolensis***
2 Pistillate scales 0.1-0.4 mm wide, the body narrow and indistinct; staminate scales 0.3-0.8 mm wide, irregularly imbricate with spreading tips; plant cespitose, short-rhizomatous..... ***C. frankii***
1 Terminal spike gynecandrous, mainly pistillate; pistillate scales awnless, or with a short awn not surpassing the perigynium; achenes 2.0-3.0 mm long.
3 Achene 1.9-2.5× as long as wide; style persistent, strongly kinked at the base; spikes 1-2 (-3) per stem..... ***C. squarrosa***
3 Achene 1.2-1.9× as long as wide; style deciduous, straight or slightly curved; spikes (1-) 2-4 (-6) per stem..... ***C. typhina***

[26vv] Section 35 – section *Shortianae*

A monotypic section, of e. North America. References: Cochrane in FNA (2002b).

One species..... ***C. shortiana***

[26ww] Section 36 – section *Spirostachyae (Extensae)*

A section of ca. 15 species, of Eurasia. References: Crins & Reznicek in FNA (2002b).

1 Leaves of flowering stems flat, the widest 3.3-5.0 mm wide..... ***C. distans***
1 Leaves of flowering stems channeled or involute, the widest 1.0-3.5 (-4.3) mm wide..... ***C. extensa***

[26xx] Section 37 – section *Ceratocystis*

A section of 7 species, in temperate North America, Eurasia, and Australia. References: Crins in FNA (2002b).

1 Pistillate scales coppery brown; terminal (staminate) spike 6-24 mm long; pistillate spikes 2-5 per culm; culms 1-8 dm tall; [of calcareous seepages in the Mountains of VA and northward]..... ***C. flava***
1 Pistillate scales yellowish green; terminal (staminate) spike 12-39 mm long; pistillate spikes 1-5 per culm; culms 1-12.5 dm tall; [**either** of calcareous savannas of the Coastal Plain of NC, **or** of acid situations in NJ and northward]
2 Pistillate scales yellowish-green; terminal (staminate) spike 12-21 mm long; pistillate spikes (1-) 2-5 per culm; culms 1-5 dm tall; [of acid situations in NJ and northward]..... ***C. cryptolepis***
2 Pistillate scales yellowish green; terminal (staminate) spike (9-) 17-39 mm long; pistillate spikes 1-2 (-3) per culm; culms 5-12.5 dm tall; [of calcareous savannas of the Coastal Plain of NC]..... ***C. lutea***

[26aaa] Section 38 – section *Leucoglochin (Orthocerates)*

A section of 5-6 species, of arctic, boreal, and alpine North America, Eurasia, and South America. References: Cochrane in FNA (2002b).

One species..... ***C. pauciflora***

[26bbb] Section 39 – section *Acrocystis (Montanae)*
[by D.B. Poindexter & A.S. Weakley]

A section of ca. 35 species, subcosmopolitan in temperate and boreal regions. References: Crins & Rettig in FNA (2002b); Rettig (1988); Cusick (1992); Rettig & Crins (1996); Werier (2006); Sorrie et al. (in prep.); Poindexter et al. (in prep.). Key based in part on Rettig (1988), Werier (2006), C, and M.

1 Spikes borne above the middle of the primary culm, but also with pistillate spikes borne on short or elongate peduncles from the sheathed base of the culm (referred to as subradical or basal spikes).
2 Culms usually delicate and flexous; subradical pistillate spikes born on slender elongate peduncles, not densely aggregated at the base of the plant; terminal staminate spikes almost always with at least one approximate pistillate spike.
3 Perigynia (2.2-) 2.6-3.1 (-3.2) mm long, subglobose to obovoid, occassionally papillate (view at 45x); pistillate scales often shorter than the body of mature perigynia; staminate spike 3.5-5.9 (-6.7) mm long: lowest proximal pistillate bract "flag-like", usually exceeding the staminate spike; leaves generally broader, 0.9-2.6 (-3.2) mm wide [north temperate, arctic-boreal]..... ***C. deflexa*** *var.* ***deflexa***
3 Perigynia (2.0-) 2.3-2.6 (-3.0) mm long, ovoid-ellipsoid to narrowly obovate (occasionally subglobose), distinctly papillate; pistillate scales often subequal to longer than the body of mature perigynia; lowest proximal pistillate bract shorter or longer than the staminate spike but very thin, not "flag-like"; staminate spike 3-11 (-16) mm long; leaves thin, delicate 0.4-2.0 (-2.4) mm wide.
4 Terminal staminate spike 3-9 mm, always closely aggregated with (1-) 2 (-3) sessile pistillate spikes; perigynia elliptic or narrowly obovate; perigynium body glabrate, with large conspicuous papillae and rarely small trichomes confined to the beak and distal end; lowest proximal pistillate bract often exceeding the staminate spike; leaves greatly exceeding the culms; [of the se. Coastal Plain]..... ***Carex species 1***
4 Terminal staminate spike 6-11 (-16) mm, some culms with staminate spikes elevated above 1 (-2) sessile to subsessile pistillate spikes; perigynia ovoid-ellipsoid to subglobose; perigynium body pubescent with short trichomes and minute papillae; lowest proximal pistillate bract usually shorter than the staminate spike; leaves shorter than to exceeding the culms; [of the Southern Appalachian Mountains and ne. US]..... ***Carex species 2***
2 Culms thick and erect; subradical pistillate spikes born on rigid, often short peduncles and densely aggregated at the base of the plant; terminal staminate spikes often alone or associated with a pistillate spike.
5 Perigynia (2.2-) 2.3-3.2 (-3.3) mm long, beaks (0.4-) 0.5-0.9 mm long; young leaves long, thin and flexuous..... ***C. umbellata***

5 Perigynia (3.0-) 3.1-4.7 mm long, beaks (0.9-) 1.0-2.1 mm long; young leaves variable.
6 Perigynium body usually pubescent; young leaves long, thin and flexuous ..... ***C. rugosperma***
6 Perigynium body essentially glabrous, with a few hairs on the angles of the beak; young leaves short, broad and rigid ..... ***C. tonsa***

1 Spikes all borne close together above the middle of the primary culm (i.e., lacking additional basal spikes originating from the same sheaths); some taxa may exhibit naturally short individual culms (e.g., *C. emmonsii, C. nigromarginata, C. reznicekii*).
7 Body of the perigynium (excluding the beak and the contracted base) subglobose to obovoid, usually about as wide as long.
8 Plants cespitose (often loosely so from thin rhizomes in *C. deflexa* var. *deflexa*); leaves 0.9-4.7 mm wide; perigynium body pubescent.
9 Perigynia occassionally papillate (mainly at the base of the beak); lowest proximal pistillate bract often exceeding the terminal staminate spike; widest leaves typically less than 3.0 mm wide..... ***C. deflexa*** var. ***deflexa***
9 Perigynia distinctly papillate; lowest proximal pistillate bract usually shorter than the terminal staminate spike; widest leaves usually more than 3.0 mm wide.
10 Perigynium tooth (0.1-) 0.2-0.5 mm long; pistillate scales 3.4-4.8 mm long, (1.4-) 1.6-1.8 mm wide, conspicuously exceeding the perigynia; plants densely cespitose, the culms erect, arching at the tips; [of nw. SC, sw. NC, and adjacent GA] ..... ***C. communis*** *var.* ***amplisquama***
10 Perigynium tooth 0.1-0.2 (-0.3) mm long; pistillate scales 2.5-4.1 mm long, (1.2-) 1.4-1.6 (-2.0) mm wide, about as long as the perigynia; plants loosely cespitose, the culms prostrate; [widely distributed]..... ***C. communis*** *var.* ***communis***
8 Plants with long rhizomes, forming clonal patches; leaves 1.0-3.0 (-3.5) mm wide; perigynium body pubescent to nearly glabrous.
11 Beak of perigynium (0.2-) 0.6-1.0 (-1.2) mm long; perigynium body 2.2-3.4 mm long, 1.0-1.8 mm wide, pubescent and papillate; [widely distributed in our area] ..... ***C. pensylvanica***
11 Beak of perigynium (1.0-) 1.2-1.6 (-2.6) mm long; perigynium body 3.1-4.6 mm long, 1.0-1.3 (-1.5) mm wide, pubescent or nearly glabrous, with or without papillae; [of the Mountains of sw. VA, w. NC, and nw. SC northwards].
12 Beak of the perigynium averaging 1.5 mm long, the orifice oblique; leaves mostly 1.1-1.3 mm wide; perigynium pubescent primarily near the summit, at the base of the beak, papillae usually not distinguishable; male spikes <15 mm long; [of WV southwards] ..... ***C. lucorum*** *var.* ***australolucorum***
12 Beak of the perigynium averaging 1.3 mm long, the beak split more-or-less equally; leaves mostly 1.5-2.8 mm wide; perigynium pubescent over the body, papillae usually distinguishable; male spikes > 15 mm long; [of MD, NJ, and PA northwards] ..... ***C. lucorum*** *var.* ***lucorum***
7 Body of the perigynium (excluding the beak and the contracted base) ellipsoid, distinctly longer than wide or thick, often also wider than thick, and slightly trigonous.
13 Plants with conspicuously long rhizomes, forming clonal patches; perigynia typically papillate [collectively of the Coastal Plain and, less commonly, Piedmont].
14 Achene body (1.4-) 1.5-1.7 (-2.0) mm long, biconvex, trigonous, or both; fertile culms 7-17 cm tall, usually much shorter than the leaves; basal sheaths usually very fibrillose; pistillate scales (2.7-) 3.0-3.7 (-4.2) mm long..... ***C. floridana***
14 Achene body (1.1-) 1.2-1.3 (-1.4) mm long, trigonous; fertile culms 20-43 cm tall, equaling or exceeding the leaves; basal sheaths usually not fibrillose; pistillate scales (2.3-) 2.6-3.0 (-3.4) mm long ..... ***C. physorhyncha***
13 Plants cespitose (sometimes loosely so from slender rhizomes in *C. novae-angliae*); perigynia papillae not evident to rather conspicuous [collectively widespread in our area].
15 Pistillate scales usually shorter than the body of the mature perigynia they subtend, perigynia without easily discernable papillae, lowermost 2 pistillate spikes remote, several separated by > 7 mm, staminate spike often elevated above pistillate spikes; leaves thin, delicate 0.7-1.5 mm wide..... ***C. novae-angliae***
15 Pistillate scales mostly longer than the body of the mature perigynia they subtend, perigynia with discernable papillae, lowermost 2 pistillate spikes overlapping, usually separated by < 7 mm, staminate spike often closely associated with pistillate spikes; leaves various.
16 Achene body (1.3-) 1.4-1.6 (-1.7) mm long; fertile culms mostly 2-20 cm tall.
17 Culms usually variable in length, (4.5-) 6.6-38 (-51) cm tall; widest leaf (1.9-) 2.3-4.5 mm wide; at least some pistillate scales often with reddish to purplish/black color below the distal tip extending laterally from near the margin to the green or brown longitudinal mid-stripe on either side of midvein ..... ***C. nigromarginata***
17 Culms subequal in length, height 1.9–9.9 (–13.7) cm tall, widest leaf 1.2–2.2 (–2.5) mm wide; any reddish color on pistillate scales below the distal tip not extending laterally from near the margin to the green or brown longitudinal mid-stripe on either side of midvein ..... ***C. reznicekii***
16 Achene body (0.9-) 1.2-1.3 (-1.5) mm long; fertile culms mostly 17-35 cm tall; pistillate scales (2.0-) 2.5-3.1 (-3.2) mm long.
18 Scales of the median portion of the staminate spike with a weak to moderately prominent midrib usually not extending to the tip, and minute teeth rarely present on the midrib (visible at 15× or greater); perigynium teeth mostly 0.2-0.3 mm long; staminate spike 8.4-11.1 mm long; culms erect to ascending, equaling or exceeding the leaves, the inflorescence typically conspicuous; pistillate scales with green midrib, hyaline margins, and usually reddish-tinged; [mostly of loamy or clayey soils of the Piedmont and Mountains] ..... ***C. albicans***
18 Scales of the median portion of the staminate spike either with a strong, prominent midrib extending to the tip (or even aristate), and with minute teeth usually present on the midrib (visible at 15× or greater); perigynium teeth mostly 0.15-0.25 mm long; staminate spike 5.0-8.5 mm long; culms lax or weakly ascending, often shorter than, curving under, and more-or-less hidden by the leaves; pistillate scales with green midrib, hyaline margins, and only rarely reddish-tinged; [mostly of acid, sandy soils of the Coastal Plain] ..... ***C. emmonsii***

[26ccc] Section 40 – *Clandestinae (Digitatae)*

A section of ca. 20 species, circumboreal. References: Crins in FNA (2002b).

1 Pistillate scales short-awned..... ***C. pedunculata***
1 Pistillate scales acute..... ***C. richardsonii***

[26ddd] Section 41 – section *Pictae*

A section of 2 species, of e. North America. References: Ball in FNA (2002b).

1 Plants monoecious, with 3-8 spikes per stem; leaf blades 4-8 mm wide, glaucous on the upper surface; [of the East Gulf Coastal Plain, east to sw. GA and Panhandle FL] ..... ***C. baltzellii***
1 Plants dioecious, with a single unisexual spike per stem; leaf blades 2-4.5 mm wide, green on the upper surface; [of areas west of area, east to c. TN and nc. GA] ..... ***C. picta***

[26fff] Section 42 – section *Mitratae (Praecoces)*

A section of ca. 20 species, of Europe, e. Asia, and Australia. References: Standley in FNA (2002b).

1 Plant cespitose; lowest inflorescence bract longer than the inflorescence ..... ***C. breviculmis***
1 Plant from creeping rhizomes; lowest inflorescence bract much shorter than the inflorescence ..... ***C. caryophyllea***

[26ggg] Section 43 – section *Albae*

A section of 4 species, north temperate. References: Ball in FNA (2002b).

One species..... ***C. eburnea***

[26kkk] Section 44 – section *Phyllostachyae*

A section of ca. 10 species, of North America. References: Crins, Naczi, Reznicek, & Ford in FNA (2002b); Naczi, Reznicek, & Ford (1998); Ford et al. (1998); Naczi & Ford (2001); Ford & Naczi (2001). Key adapted in part from Naczi, Reznicek, & Ford (1998), Catling, Reznicek, & Crins (1993), and Naczi & Ford (2001).

1 Achenes subglobose, 1-1.5× as long as wide; staminate scales more or less truncate.
  2 Tallest culm 3.2-9.1 cm high, 15-32% of plant height; terminal spike with 4-8 perigynia; wider leaves with hyaline margins 0.05-0.2 mm wide; hyaline margins of distal pistillate scales 0.05-0.3 mm wide; perigynium beak 30-38% (-43%) of perigynium length; [of calcareous glades in w. VA and north and west of our area] ..... ***C. juniperorum***
  2 Tallest culm 9.0-41 cm high, 39-86% of plant height; terminal spike with 1-4 perigynia; wider leaves with green margins; hyaline margins of distal pistillate scales 0.3-0.7 mm wide; perigynium beak 34-53% of perigynium length; [of rich forests or rocky calcareous glades and woodlands].
    3 Longest (per plant) staminate portion of terminal spike (4.9-) 5.8-13.5 mm long; proximalmost staminate scale in terminal spike 1.1-1.8 (-2.1) mm long, 13-26 (-35)% of length of staminate portion of terminal spike; perigynium beaks (1.9-) 2.3-3.9 mm long, 39-53% of perigynium length; shoot bases lacking red-purple; [of rich mesic forests widespread in our area, especially VA]..... ***C. jamesii***
    3 Longest (per plant) staminate portion of terminal spike 3.4-5.6 (-6.2) mm long; proximalmost staminate scale in terminal spike (1.9-) 2.1-3.3 mm long, (35-) 44-77% of length of staminate portion of terminal spike; perigynium beaks 1.4-2.3 (-2.5) mm long, 34-44% of perigynium length; shoot bases tinged with reddish-purple; [of c. TN and c. KY and westward]..... ***C. timida***
1 Achenes ellipsoid, 1.5-2.0× as long as wide; staminate scales obtuse to acute.
  4 Tallest culm 0.18-0.38× as tall as plant; perigynia (7.0-) 7.5-10.8 mm long; perigynium beaks (3.6-) 4.1-6.4 mm long; culms erect; peduncles usually erect to spreading ..... ***C. superata***
  4 Tallest culm 0.41-0.87× as tall as plant; perigynia 4.5-8.0 mm long; perigynium beaks 1.7-4.3 mm long; culms erect to spreading; peduncles usually widely spreading to nodding.
    5 Longest staminate portion of terminal spikes 12.7-25.6 mm long; perigynia 5.8-8.0 mm long; perigynium beaks 2.5-4.3 mm long; achenes (2.4-) 2.6-3.4 mm long ..... ***C. basiantha***
    5 Longest staminate portion of terminal spikes 4.9-5.7 (-6.5) mm long; perigynia 4.5-5.7 (-6.5) mm long; perigynium beaks 1.7-2.6 (-2.8) mm long; achenes 1.8-2.6 mm long ..... ***C. willdenowii***

[26mmm] Section 46 – section *Leptocephalae (Polytrichoidae)*

A monotypic section, of North America and the West Indies. References: Cochrane in FNA (2002b).

1 Perigynia 3.4-4.9 (-5.4) mm long; pistillate scales whitish ..... ***C. leptalea*** *var.* ***harperi***
1 Perigynia 2.5-3.5 mm long; pistillate scales pale brown, with green midrib ..... ***C. leptalea*** *var.* ***leptalea***

Section 47 – "*Cymophyllus*"

One species..... ***C. fraseriana***

Carex abscondita Mackenzie. Rich bottomlands and other forests. April-June. MA south to Panhandle FL, west to TX and OK, and scattered inland. See *C. magnifolia* for discussion of the two taxa. Naczi (1999b) reports a chromosome number of n = 24. [< *C. abscondita* – RAB, K (also see *C. cumberlandensis* and *C. magnifolia*); < *C. abscondita* – C, G, M, S, W (also see *C. cumberlandensis*); < *C. abscondita* – FNA, WH (also see *C. magnifolia*); >< *C. abscondita* var. *abscondita* – F; > *C. abscondita* var. *rostellata* Fernald – F]

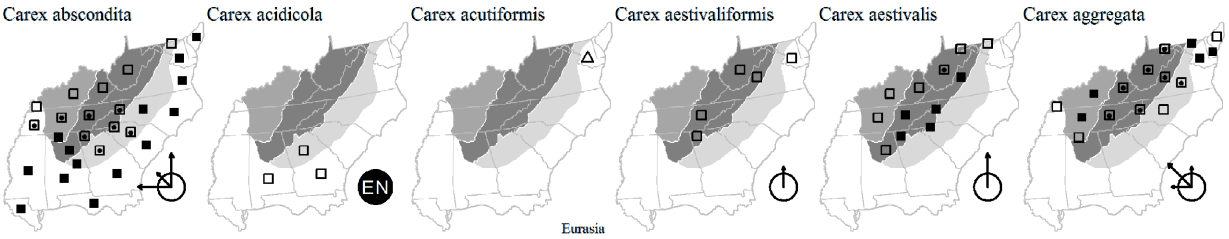
Carex acidicola Naczi (section *Griseae*). Mesic forests. Nc. GA and c. AL south to sw. GA (Naczi, Bryson, & Cochrane 2002). [= FNA] {not yet keyed; *Griseae*}

* ***Carex acutiformis*** Ehrhart. Introduced in MD, native of Eurasia (FNA, Kartesz 1999). [= FNA, K]

Carex aestivaliformis Mackenzie. Wet meadows (VA), upland submesic forests (GA). Considered by some to be a hybrid, but with little known documentation or evidence for or against its alleged hybrid status; further study is needed. [= C, G, M; = *C.* ×*aestivaliformis* – F, FNA, K]

Carex aestivalis M.A. Curtis ex A. Gray, Summer Sedge. Dry-mesic to mesic forests, moist rock outcrops at medium to high elevations. May-June. VT south to GA and AL, in or near the Appalachians. [= RAB, C, F, FNA, G, K, M, S, W]

Carex aggregata Mackenzie. Rich forests and woodlands. May-June. NY, ON, MN, and SD, south to nc. NC, n. AL, s. MS, and OK. Other useful characters include: culms relatively smooth; pistillate scales sharp-pointed, the tip reaching to about the base of the perynium; and perigynia nerveless. [= F, FNA, K, M; = *C. sparganioides* Muhlenberg ex Willdenow var. *aggregata* (Mackenzie) Gleason – C, G]



Carex alata Torrey. Bottomland forests, marshes. May-June. NH, MI, and MO south to c. peninsular FL and TX. [= RAB, C, F, FNA, G, GW, K, W, WH; < *C. alata* – S (also see *C. vexans*)]

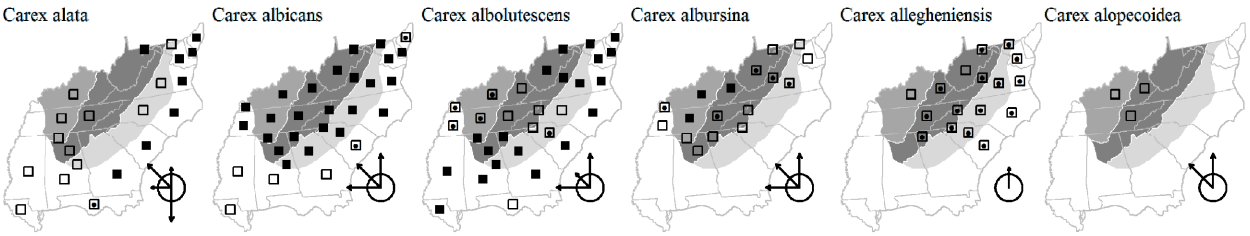
Carex albicans Willdenow ex Sprengel. Dry woodlands and forests. April-May. ME west to IL, and OK, south to DE, NC, SC, n. GA (Jones & Coile 1988), TN, and MO. [= *C. artitecta* Mackenzie – RAB, M, W; = *C. albicans* var. *albicans* – C, FNA, K; > *C. artitecta* var. *artitecta* – F; > *C. artitecta* var. *subtilirostris* F.J. Hermann – F; = *C. nigro-marginata* Schweinitz var. *muhlenbergii* (A. Gray) Gleason – G; < *C. varia* Muhlenberg ex Willdenow – S]

Carex albolutescens Schweinitz. Low fields, bottomlands. May-June. MA, NY, WI, and MO, south to Panhandle FL and TX. [= C, F, FNA, K, WH; < *C. albolutescens* – RAB, G, GW, W (also see *C. longii*); *C. straminea* misapplied]

Carex albursina Sheldon, White Bear Sedge. Nutrient-rich cove forests, over mafic or calcareous rocks. April-June. VT and s. QC west to MN, south to SC (P. McMillan pers. comm. 2003, specimen at CLEMS), nw. GA, and AR. Naczi (1999b) reports a chromosome number of n = 22. [= RAB, C, F, FNA, K, M, S, W; = *C. laxiflora* var. *latifolia* F. Boott – G]

Carex allegheniensis Mackenzie. Swamps, bogs, streamhead pocosins, other moist to wet habitats, boggy pools in floodplains. May-June. PA south to n. GA, mostly in the Appalachian Mountains. [= M, S; = *C. debilis* Michaux var. *pubera* A. Gray – RAB, C, G; < *C. debilis* var. *rudgei* L.H. Bailey – FNA; > *C. debilis* var. *pubera* – F, K; > *C. debilis* var. *intercursa* Fernald – F, K; < *C. debilis* – GW, W]

Carex alopecoidea Tuckerman. Seasonally saturated situations, typically over calcareous substrates. NS west to SK, south to DC, MD, WV, KY, TN, and IA (Standley in FNA 2002b). [= FNA, K] {synonymy incomplete; not yet keyed; *Vulpinae*}



Carex amphibola Steudel. Moist loamy forests, bottomlands, slopes, uplands. {distribution and abundance in our area needing additional herbarium investigation} May-June. MA, s. ON, MI, IL, MO, and OK, south to GA, AL, MS, LA, and TX. [= RAB, FNA, G, M, S; = *C. amphibola* var. *amphibola* – F, K; < *C. amphibola* – GW]

Carex annectens (Bicknell) Bicknell, Yellowfruit Sedge. Marshes, bottomland forests. July-August. S. ME west to MN, south to FL and TX. See Cusick (1996). [= RAB, FNA, K, S, W; = *C. vulpinoidea* var. *ambigua* – C; > *C. annectens* var. *annectens* – F, G; > *C. annectens* (Bicknell) Bicknell var. *xanthocarpa* (Kükenthal) Wiegand – F, G; < *C. vulpinoidea* – GW, WH; > *C. annectens* – M; > *C. brachyglossa* Mackenzie – M]

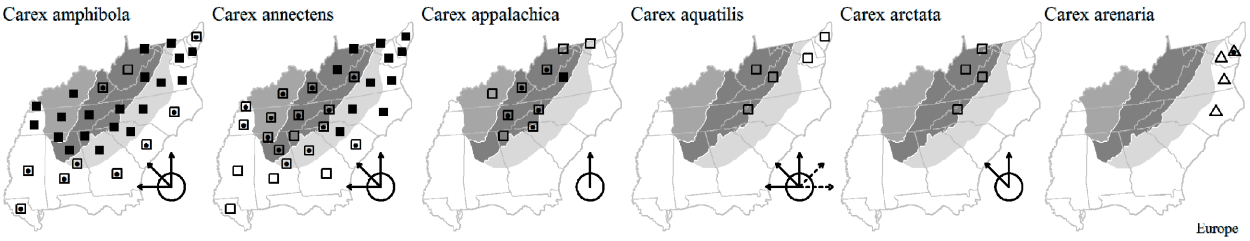
Carex appalachica J. Webber & P.W. Ball, Appalachian Sedge. Dry to mesic forests, rock outcrops. May-June. ME and ON south to w. SC, n. GA, and e. TN. First reported for South Carolina by Hill & Horn (1997). [= C, FNA, K; < *C. rosea* – RAB, G, W; = *C. radiata* – F, M, S, misapplied]

Carex aquatilis Wahlenberg, Aquatic Sedge. Mountaintop ponds (with *Dulichium arundinaceum, Vaccinium macrocarpon, Juncus canadensis*, and *Utricularia sp.*), mafic fen at high elevation. NL (Newfoundland) west to ND, south to NJ, s. PA, OH, IN, IA, and NE; disjunct in w. VA (Augusta County) and nw. NC (Ashe County); n. Eurasia. First reported for VA by Wieboldt et al. (1998). [= G; > *Carex aquatilis* Wahlenberg var. *substricta* Kükenthal – C, FNA; > *C. aquatilis* var. *altior* (Rydberg) Fernald – F; ?> *C. aquatilis* var. *aquatilis* – K; > *C. substricta* (Kükenthal) Mackenzie – M]

Carex arctata W. Boott, Black Sedge, Drooping Woodland Sedge. Northern hardwood and spruce forests, bog edges. NL (Newfoundland) west to MN, south to PA, w. VA, nw. NC (Long Hope Valley, Ashe County), and OH. First reported for VA (Highland County) by Fleming & Ludwig (1996). [= C, F, FNA, G, K, M]

* ***Carex arenaria*** Linnaeus, Sand Sedge. Moist to dry sandy hammocks; probably introduced from Europe. May-June. Fernald (1950) considers this plant native in se. VA, and populations of it in Carolina Beach State Park, New Hanover County,

NC, certainly appear native. In North America, known from DE south to se. NC; also on ballast in OR (Mackenzie 1931-1935). [= RAB, C, F, FNA, G, K, M]



Carex argyrantha Tuckerman, Silvery-flowered Sedge, Hay Sedge. Wet meadows or dry soils. NB west to ON, south to w. NC, e. TN (Unicoi County), and OH. June-August. [= RAB, C, F, G, K, W; *C. aenea*, misapplied]

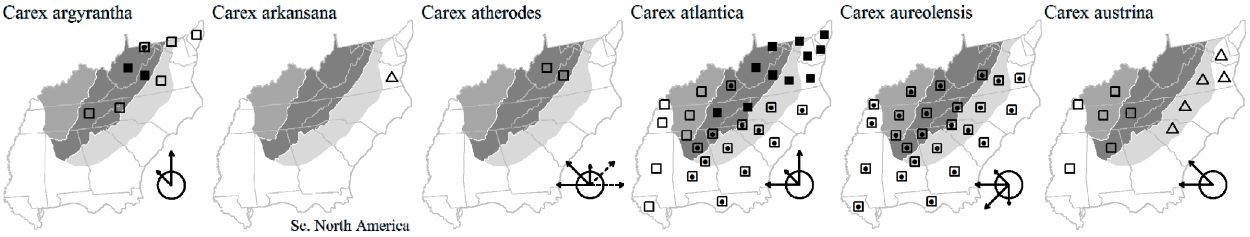
Carex arkansana (L.H. Bailey) L.H. Bailey, Arkansas Sedge. Seasonally wet meadow in former railroad yard. June. Native range from s. IL, n. MO, and e. KS south through AR and OK to e. TX. See Simmons, Strong, & Parrish (2008) for additional information on the Virginia occurrence. [= FNA] {not yet keyed}

Carex atherodes Sprengel, Awned Sedge. Marl fens. Circumboreal, south in North America to NY, n. VA, n. WV, MO, CO, UT, and OR. [= C, F, FNA, G, K, M]

Carex atlantica L.H. Bailey. Bogs and seepages. May-June. NS west to MI and nw. IN, south to ne. FL, Panhandle FL, and e. TX. Reznicek & Ball (1980) found the distinction of *C. incomperta* from *C. atlantica* to be untenable. Intermediates between *C. atlantica* and *C. howei* (often treated as *C. atlantica* ssp. *capillacea*) occur in portions of their ranges, especially in the southern Coastal Plain. In most other areas they are sharply distinct, and sometimes grow together (as in the mountains of our area and further north) with no evidence of intergradation or hybridization. I prefer to treat them at the species level. [= GW; > *C. atlantica* – RAB, F, G, M, S, W; = *C. atlantica* var. *atlantica* – C; > *C. incomperta* Bicknell – RAB, F, G, M, S, W; = *C. atlantica* ssp. *atlantica* – FNA, K, WH]

Carex aureolensis Steudel. Floodplain forests and marshes; uncommon. {separate from *C. frankii*} {Pd, Mt, Cp (NC, SC, VA): bottomland forests. May-July.} VA, KY, IL, and NE south to n. peninsular FL, Panhandle FL, TX, NM, Coahuila, and Nuevo León; South America. [= FNA; < *C. frankii* – RAB, C, F, G, GW, K, M, S, W, WH] {not yet mapped}

Carex austrina Mackenzie. Roadsides, apparently introduced with hay used for erosion control; native of sc. United States. May. Native from KY, IA, and NE south to AL and TX. First reported for areas further east by Bryson et al. (1996). [= F, FNA, K, M; = *C. muhlenbergii* var. *australis* Olney – C, G; < *C. muhlenbergii* – S; = *C. muhlenbergii* var. *austrina* Small]



Carex austrocaroliniana L.H. Bailey, South Carolina Sedge. Nutrient-rich, moist coves in the sw. mountains of NC and adjacent SC, often with some seepage. April-May. Endemic to the southern end of the Southern Appalachians, in Blue Ridge of sw. NC, ne. SC, n. GA, and e. TN, extending west to the Cumberland Plateau of TN. Naczi (1999b) reports a chromosome number of n = 28-30. [= FNA, K, W; = *C. austro-caroliniana* – RAB, M, S, orthographic variant]

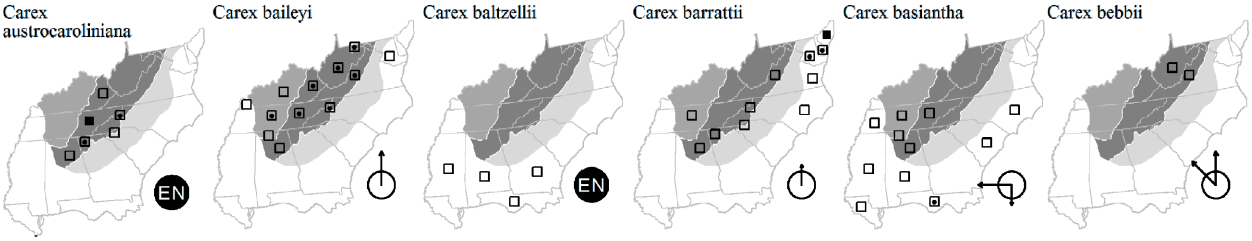
Carex baileyi Britton, Bailey's Sedge. Bogs, seeps. June-July. NH south to KY, NC, and TN, primarily Appalachian. [= RAB, C, F, FNA, G, K, M, S; = *C. lurida* Wahlenberg var. *gracilis* (F. Boott) L.H. Bailey]

Carex baltzellii Chapman, Baltzell's Sedge. Steepheads, beech-magnolia slopes, and mesic to dry-mesic hammocks. Sw. GA and Panhandle FL west to s. AL and s. MS. [= FNA, K, M, S, WH]

Carex barrattii Schweinitz & Torrey, Barratt's Sedge. Peaty bogs and marshes. April-May. CT south to NC (at least formerly), on the Coastal Plain, and disjunct inland in places with many Coastal Plain affinities, as in w. VA (Augusta County), sw. NC (Henderson County, where now extirpated), nw. SC, sc. TN (Coffee County), n. GA, and n. AL. This species flowers and fruits rarely. Reported for South Carolina by Hill & Horn (1997) and Horn (1999). [= RAB, C, F, FNA, G, K, M, S, W]

Carex basiantha Steudel, Southern Willdenow's Sedge. Mesic forests, bottomlands, and lower slopes, over calcareous rocks or sediments. April-June. Se. NC south to n. peninsular FL, Panhandle FL, west to e. TX, and north to nw. GA, c. TN, and c. AR. [= FNA, K, WH; < *C. willdenowii* Schkuhr ex Willdenow – RAB; < *C. willdenovii* – S (also see *C. superata* and *C. willdenowii*) and orthographic variant; *? C. willdenowii* var. *pauciflora* Olney ex L.H. Bailey in J.M. Coulter; < *C. willdenowii* Schkuhr ex Willdenow var. *megarrhyncha* Hermann, misapplied]

Carex bebbii Olney ex Fernald. Calcareous wetlands. NL (Newfoundland), NL (Labrador) and AK south to NJ, nw. VA (Big Meadows, VA; Townsend, pers. comm. 2004), OH, IN, IL, NE, CO, and OR. [= C, F, FNA, G, K]



Carex bicknellii Britton. Prairie-like openings and barrens over gabbro. ME west to SK, south to DE, OH, MO, OK, and NM; disjunct in nc. SC. First reported for South Carolina by Hill & Horn (1997). [= FNA; = *C. bicknellii* var. *bicknellii* – K; < *C. bicknellii* – C, F, G, M (also see *C. opaca*)]

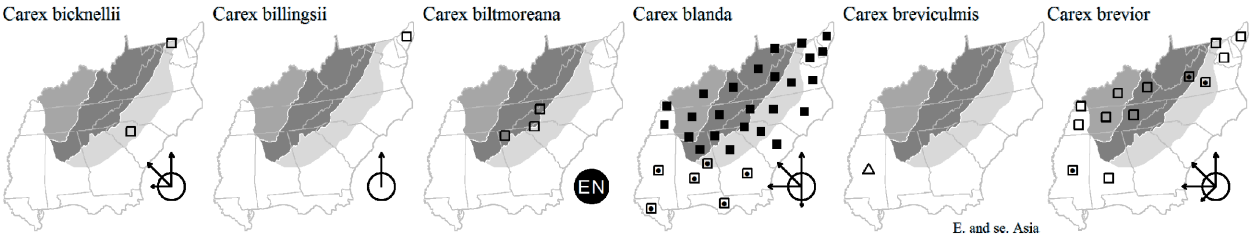
Carex billingsii (O.W. Knight) C.D. Kirschbaum. Wet, boggy areas. NL (Newfoundland) and ON south to s. NJ (Ocean County), PA, and MI. See Kirschbaum (2007). [= *C. trisperma* Dewey var. *billingsii* O.W. Knight – C, F, FNA, G, K, M]

Carex biltmoreana Mackenzie, Biltmore Sedge. In thin soils on medium to high elevation granitic domes and other sloping rock outcrops, often dominant in thin-soil herbaceous mats, but also occurring in adjacent woodlands under open to nearly closed canopy of *Quercus* spp., *Fraxinus americana, Carya glabra*, and *Juniperus virginiana var. virginiana*. May-June. Endemic to sw. NC, nw. SC, and ne. GA (Rabun and Towns counties). This distinctive endemic sedge may be recognized by its robust size (culms to a meter tall, to 5 mm in diameter at the base), habit (large clumps on sloping rock outcrops), and restricted habitat (in periodic seepage on exfoliation domes). Once considered very rare, *C. biltmoreana* proves to be limited to a narrow range and distinctive habitat, but regularly present and even locally dominant on the 50-100 granitic domes within 100 km of Brevard, NC. It often occurs with other endemic species, such as *Houstonia longifolia* var. *glabra, Krigia montana, Pycnanthemum montanum,* and *Packera millefolium*. An excellent illustration appears in Massey et al. (1983). [= RAB, FNA, K, M, S, W]

Carex blanda Dewey. Cove forests, bottomlands, and other mesic, nutrient-rich forests. April-June. ME and s. QC west to ND, south to c. GA (Jones & Coile 1988), n. peninsular FL, Panhandle FL, and TX. Naczi (1999b) reports chromosome numbers of n = 15-18. [= RAB, C, F, FNA, K, M, S, W, WH; = *C. laxiflora* var. *blanda* (Dewey) F. Boott – G]

Carex breviculmis R. Brown, Blue Sedge. Cemeteries, lawns, disturbed areas; native of e. Asia, se. Asia, and Australia. See Majure & Bryson (2008) for additional information.

Carex brevior (Dewey) Mackenzie ex Lunell. Dry forests and margins. May-June. MW west to BC, south to GA, c. TN, MS, TX, Tamaulipas, and AZ. [= F, FNA, G, K, W; < *C. festucacea* – RAB, GW; < *C. brevior* – C (also see *C. molesta* and *C. molestiformis*); < *C. festucacea* Schkuhr ex Willdenow var. *brevior* (Dewey) Fernald]



Carex bromoides Willdenow *ssp.* ***bromoides***, Common Brome Sedge. Swamp forests, bogs, seeps, hydric hammocks, other wetlands. May-July. Ssp. *bromoides* ranges from NB west to e. MN, south to c. peninsular FL and e. TX, and disjunct in Mexico. Naczi (1999b) reports a chromosome number of n = 32-34. [= FNA, K; < *C. bromoides* – RAB, C, F, G, GW, M, S, W, WH]

Carex bromoides Willdenow *ssp.* ***montana*** Naczi, Blue Ridge Brome Sedge. Mountain bogs in the Blue Ridge, seepages in the Blue Ridge Escarpment. June-July. Ssp. *montana* is known only from sw. VA, w. NC, and nw. SC. This taxon needs further study in order to better understand its habitats and distribution. Naczi (1999b) provided additional evidence for its recognition, in the form of different chromosome numbers (n=30-31 for ssp. *montana* and n= 32-34 for ssp. *bromoides*). [= FNA, K; < *C. bromoides* – RAB, C, F, G, GW, M, S, W]

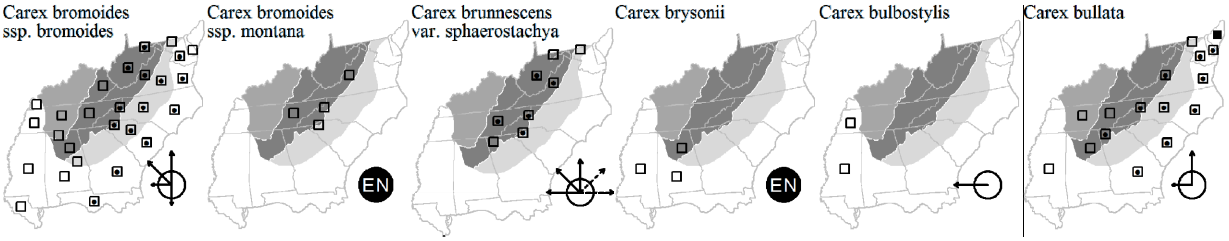
Carex brunnescens (Persoon) Poiret var. *brunnescens*. Reported for our area by FNA. [= F; < *C. brunnescens* – RAB, C, G, M, S, W; = *C. brunnescens* ssp. *brunnescens* – FNA, K] {rejected; not keyed}

Carex brunnescens (Persoon) Poiret *var.* ***sphaerostachya*** (Tuckerman) Kükenthal, Brown Sedge. Grassy balds, bogs, moist forests at moderate to high elevations. June-July. The species is circumboreal, in North America ranging south to NJ, OH, MI, and MN, south to w. NC, nw. SC, e. TN, and n. GA. Var. *sphaerostachya* is apparently the only infraspecific taxon (of four) to reach our area. See Gaddy (1981) for the report of this species in SC. [= F; < *C. brunnescens* – RAB, C, G, M, S, W; = *C. brunnescens* ssp. *sphaerostachya* (Tuckerman) Kalela – FNA, K]

Carex brysonii Naczi, Bryson's Sedge. Mesic forests. Endemic to the Cumberland Plateau of n. AL. See Naczi (1993) for additional information. [= FNA, K]

Carex bulbostylis Mackenzie. Moist deciduous forests. April-May. MS west to TX and OK; disjunct in sw. TN. Reports for GA in Jones & Coile (1988) are probably based on misidentifications. [= FNA, K; = *Carex amphibola* Steudel var. *globosa* (L.H. Bailey) L.H. Bailey] {add to synonymy}

Carex bullata Schkuhr ex Willdenow. Bogs. May-June. NS south to GA, primarily on the Coastal Plain, but with scattered occurrences inland (as in AR and the Eastern Highland Rim of sc. TN). [= RAB, C, F, FNA, GW, K, M, S; > *C. bullata* var. *bullata* – G; > *C. bullata* var. *greenii* (Böckler) Fernald – G]



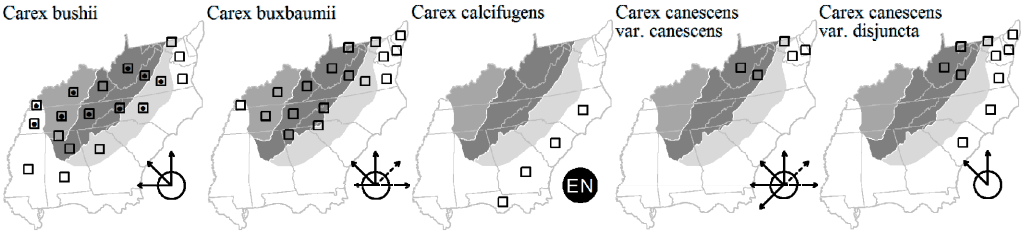
Carex bushii Mackenzie. Meadows. May-June. MA and s. NY west to MO and KS, south to NC, GA (Jones & Coile 1988), MS, and TX; disjunct in MI. [= RAB, C, F, FNA, G, K, M, S, W; *? C. caroliniana* Schweinitz var. *cuspidata* (Dewey) Shinners]

Carex buxbaumii Wahlenberg, Brown Bog Sedge, Buxbaum's Sedge. Bogs, fens, and seepages (especially over calcareous or mafic rocks). June-July. Circumboreal, in North America ranging from NL (Newfoundland) west to s. and w. AK, south to se. VA, w. NC, nw. SC, n. GA (Jones & Coile 1988), c. TN, KY, n. AR, CO, UT, and CA. Reported for South Carolina by Hill & Horn (1997) and Hill (1999). [= RAB, C, F, FNA, G, K, M, S, W]

Carex calcifugens Naczi. Rich bluff forests, evergreen maritime forests. Se. NC south to Panhandle FL. See Naczi, Bryson, & Cochrane (2002). [= FNA] {not yet keyed; synonymy incomplete; section *Griseae*}

Carex canescens Linnaeus *var.* ***canescens***, Silvery Sedge. Acidic bogs, other wetlands. Greenland and AK south to VA, IL, NM, and CA; South America, Eurasia; Australia. [= F, G; < *C. canescens* – C, M; = *C. canescens* ssp. *canescens* – FNA, K]

Carex canescens Linnaeus *var.* ***disjuncta*** Fernald, Silvery Sedge. Bogs, swamps, often in disturbed areas. June. NL (Newfoundland) west to MN, south to VA, NC, SC, OH, and IN. [= RAB, F, G; < *C. canescens* – C, M; = *C. canescens* ssp. *disjuncta* (Fernald) Toivonen – FNA, K]



Carex careyana Torrey ex Dewey, Carey's Sedge. Nutrient-rich moist forests, mostly over calcareous rocks. May-June. NY west to MI and IA, south to sw. NC, AL and MO. Naczi (1999b) reports a chromosome number of n = 34. [= C, F, FNA, G, K, M, W]

Carex caroliniana Schweinitz, Carolina Sedge. Forests. May-June. NJ, PA, MO, and OK south to SC, e. GA, and TX; apparently disjunct in Panhandle FL and adjacent sw. GA. [= RAB, C, F, FNA, G, GW, K, M, S, W, WH]

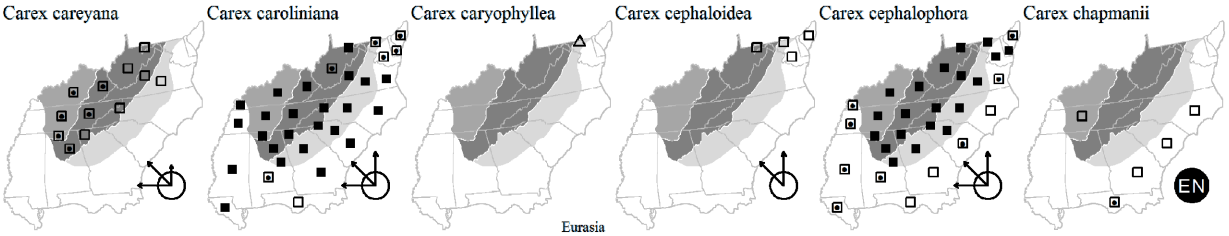
* ***Carex caryophyllea*** Latourette, Spring Sedge. Disturbed areas; native of Eurasia. [= C, F, FNA, G, K, M]

Carex castanea Wahlenberg, Chestnut Sedge. Calcareous sites. NL (Newfoundland) west to MB, south to NY, WI, MI, and MN. The alleged disjunct occurrence in TN cited in FNA is in error. [= C, F, FNA, G, K, M] {rejected; not keyed}

Carex cephaloidea (Dewey) Dewey. Basic forests. NB, ON, and MN south to MD, OH, IN, IL, and IA. [= F, FNA, K, M; = *C. sparganioides* Muhlenberg ex Willdenow var. *cephaloidea* (Dewey) Carey – C, G]

Carex cephalophora Muhlenberg ex Willdenow. Decisuous forests. May-July. ME west to MN, south to Panhandle FL and TX. [= F, FNA, K, M, S; < *C. cephalophora* – RAB, W (also see *C. mesochorea*); = *C. cephalophora* var. *cephalophora* – C, G]

Carex chapmanii Steudel, Chapman's Sedge. Edges of calcareous pine savannas, calcareous slopes and bottomlands, mesic hammocks, stream terraces. April-May. Se. NC south to c. peninsular FL, on the Coastal Plain; allegedly disjunct in nc. TN (Chester et al. 1993). The affinities of this species are questionable; it is usually placed in section *Paniceae*, but may actually belong to *Laxiflorae*. [= RAB, FNA, K, S; = *C. chapmannii* – M, WC, orthographic variant; = *C. styloflexa* Buckley var. *fusiformis* (Chapman ex Dewey) Wiegand]



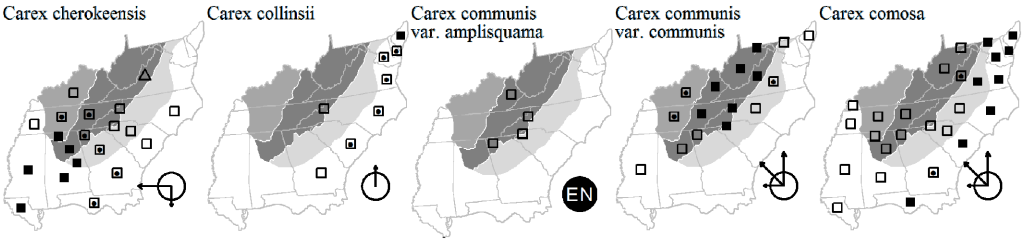
Carex cherokeensis Schweinitz, Cherokee Sedge. Moist, rich, calcareous forests. May-June. Se. NC, nw. SC, sw. NC, nc. TN, se. MO, and OK, south to n. peninsular FL, Panhandle FL, and west to e. TX and se. OK; disjunct in the Mountains of VA, where perhaps introduced (Belden et al. 2004). [= RAB, FNA, G, K, M, S, W, WH]

Carex collinsii Nuttall, Collins's Sedge. White cedar (*Chamaecyparis*) bogs and pocosins in the Coastal Plain, bogs in the southwest mountains of NC (where associated with other Coastal Plain disjuncts). June-July. RI to wc. GA on the Coastal Plain, disjunct in the mountains of nw. NJ, PA, sw. NC, and possibly TN (Chester et al. 1993). *C. collinsii* is a very distinctive species; the slender perigynia teeth are reflexed 180 degrees (thus appressed back against the perigynium). [= RAB, C, F, FNA, G, K, M, S, W; = *C. collinsiae* – GW, orthographic error]

Carex communis L.H. Bailey *var.* ***amplisquama*** (F.J. Hermann) J. Rettig. Dry, open woodlands. July-August. Endemic to n. GA, nw. SC, and sw. NC (Rabun, Towns, White, Union, Lumpkin, Fannin, Murray, and Gilmer counties, GA, Oconee and Greenville counties, SC, and Polk County, NC) (Rettig 1988, Hill & Horn 1997, Gaddy, pers. comm.). Following Rettig's (1988) determination that *C. amplisquama* is better treated as a variety of *C. communis*, the combination was made by Rettig & Crins (1996). The two taxa differ in achene micromorphology, flavonoid chemistry, and minor morphological characters (Rettig 1988). [= FNA, K; = *C. amplisquama* F.J. Hermann – W]

Carex communis L.H. Bailey *var.* ***communis***. Dry woodlands and forests. May-June. PE west to MN, south to n. SC, c. GA (Jones & Coile 1988), and AR. [= FNA, K; = *C. communis* – RAB, C, F, G, M, S, W]

Carex comosa F. Boott, Bottlebrush Sedge, Bristly Sedge. Swamps, marshes. April-June. QC west to MN, south to s. FL and LA; also in w. North America. [= RAB, C, F, FNA, G, GW, K, M, S, W, WH]



Carex complanata Torrey & Hooker. Forests. May-June. NJ and s. PA south to n. peninsular FL and Panhandle FL, west to TX and MO; apparently disjunct in AZ. [= F, FNA, K, M, S; = *C. complanata* var. *complanata* – C, G; < *C. complanata* – RAB, GW, W, WH (also see *C. hirsutella*)]

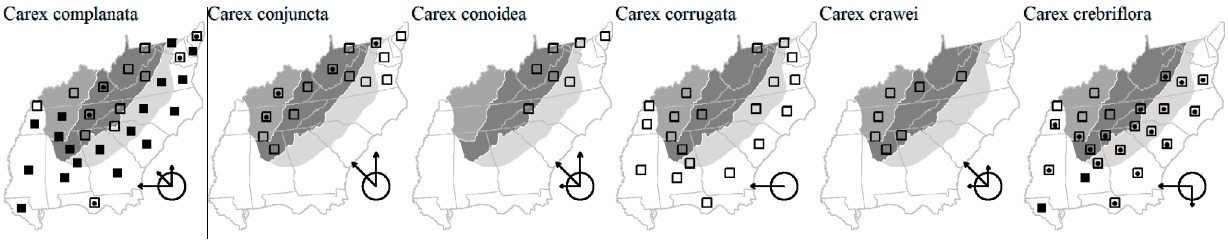
Carex conjuncta F. Boott, Soft Fox Sedge. Mesic forests. May-July. NY, NJ, MN, and SD, south to VA, sc. TN, and AR. [= C, F, FNA, G, K, M, W]

Carex conoidea Schkuhr ex Willdenow, Field Sedge. Seepage and fen over mafic rocks (amphibolite). May-June. NL (Newfoundland) west to MN, south to nw. NC (Ashe Co. and Alleghany Co.) and MO. First found in NC by a party led by Asa Gray in 1841; recently located at a second site by D.B. Poindexter. [= RAB, C, F, FNA, G, K, M, S]

Carex corrugata Fernald. Wet calcareous forests. {distribution and abundance needing additional herbarium investigation}. May-June. Se. VA and KY south to Panhandle FL and AL. See Hill (1992). [= F, FNA, K, WH; < *C. grisea* – RAB, G, M, S; < *C. amphibola* – GW; *? C. amphibola* Steudel var. *turgida* Fernald]

Carex crawei Dewey, Crawe's Sedge. Dry calcareous barrens. QC west to BC, south to NJ, w. VA, c. TN, AL, and AR. First reported for VA by Ludwig (1999). Naczi (1999b) reports a chromosome number of n = 30. [= C, F, FNA, G, K, M, S]

Carex crebriflora Wiegand. Bottomland and other nutrient-rich forests. April-June. VA, KY, and AR south to n. peninsular FL and Panhandle FL and TX. [= RAB, C, F, FNA, G, K, M, S, W, WH]



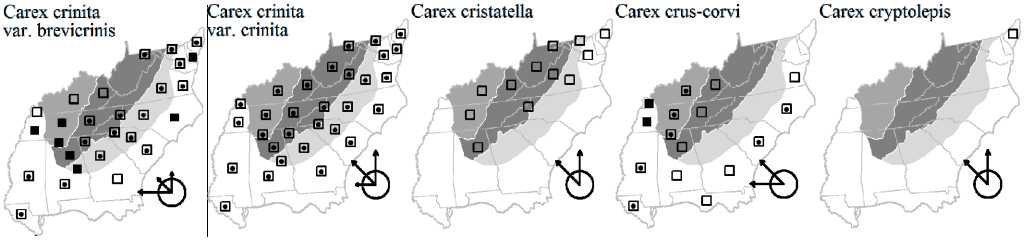
Carex crinita Lamarck *var.* ***brevicrinis*** Fernald. Swamps, wet forests. May-June. MA south to FL, west to TX, north in the interior to KY and MO. [= C, F, FNA, K; < *C. crinita* Lamarck var. *crinita* – RAB, G, GW; < *C. crinita* – M, S; < *C. crinita* – W (also see *C. gynandra* and *C. mitchelliana*)]

Carex crinita Lamarck *var.* ***crinita***. Swamps, wet forests, bogs. May-June. NL (Newfoundland) west to MN and AB, south to GA, TN, and AR. [= C, F, FNA, K; < *C. crinita* Lamarck var. *crinita* – RAB, G, GW; < *C. crinita* – M, S; < *C. crinita* – W (also see *C. gynandra* and *C. mitchelliana*)]

Carex cristatella Britton, Crested Sedge. Grassy balds, bogs, wet meadows. May-June. VT west to SK, south to NC, KY, MO, and KS. See Fox, Godfrey, & Blomquist (1952) for the first report from NC. [= RAB, C, F, FNA, G, K, W]

Carex crus-corvi Shuttleworth ex Kunze, Crowfoot Sedge, Ravenfoot Sedge. Swamp forests, especially over calcareous substrates. May-June. Se. VA south to Panhandle FL, west to TX, north in the interior to IN, s. ON, MI, and MN. [= RAB, C, FNA, G, GW, K, M, S; > *C. crus-corvi* var. crus-*corvi* – F; > *C. bayardii* Fernald – F; > *C. crus-corvi* var. *virginiana* Fernald]

Carex cryptolepis Mackenzie. Acid, boggy sites. June-August. NL west to MN, south to NJ, NY, NJ. [= FNA, K] {synonymy incomplete; section *Ceratocystis*}



Carex cumberlandensis Naczi, Kral, & Bryson, Cumberland Sedge. Rich, mesic, deciduous or mixed forests. May; June. Sw. PA, s. OH, s. IL south to c. NC, c. SC, c. GA, sc. AL, e. MS, and w. TN; disjunct in nw. AR. [= FNA; < *C. abscondita* – RAB, C, G, K, M, S, W; < *C. abscondita* var. *abscondita* – F]

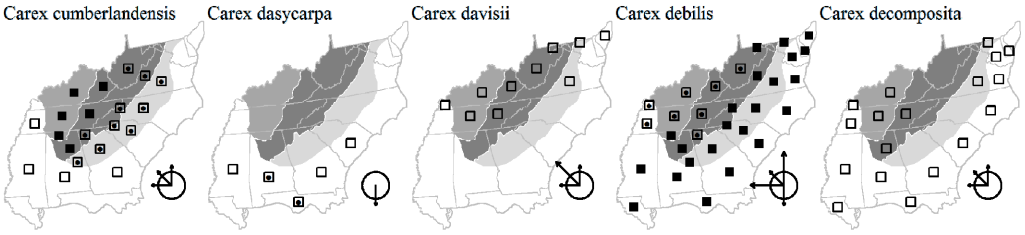
Carex cumulata (Bailey) Fernald. Dry to wet acid barrens and glades. NL west to SK, south to NJ, PA, IN, and IL. {not yet keyed; synonymy incomplete; not yet mapped; section *Ovales*}

Carex dasycarpa Muhlenberg, Velvet Sedge. Maritime forests, hammocks, other sandy forests. May-June. E. SC south to n. peninsular FL, west to MS. Gaddy & Rayner (1980) report this species from a number of barrier islands in Beaufort and Charleston counties, SC; it has since been found in Georgetown County, SC, as well. [= RAB, FNA, K, M, S, WH]

Carex davisii Schweinitz & Torrey, Davis's Sedge. Rich forests. VT, ON, and MN south to VA (Fairfax County) (Steury 2004b), e. WV, nc. TN (Chester et al. 1993), AR, and TX. First reported for VA by Steury (2004b). [= C, F, FNA, G, K, M]

Carex debilis Michaux. Swamps, bogs, other moist to wet habitats. May-August. MA west to s. IN, south to n. peninsular FL, Panhandle FL, and TX. For other taxa often treated as varieties of *C. debilis*, see *C. allegheniensis* and *C. flexuosa*. [= M, S; = *C. debilis* var. *debilis* – RAB, C, F, FNA, G, K; < *C. debilis* – GW, W, WH (also see *C. allegheniensis* and *C. flexuosa*)]

Carex decomposita Muhlenberg, Cypress-knee Sedge, Epiphytic Sedge. Blackwater swamp forests, often growing on cypress knees, cypress bases, or fallen logs (often at or near water level). NY west to MI, south to sw. GA (Jones & Coile 1988), Panhandle FL, and TX. See Gaddy & Rayner (1980). [= RAB, C, F, FNA, G, GW, K, M, S, WH]



Carex deflexa Hornemann *var.* ***deflexa***. Seepage at high elevations; rare. Greenland west to AK, south to MA, n. NY, n. MI, and n. MN; apparently disjunct in the high mountains of WV. Var. *boottii* L.H. Bailey of w. North America is of variable taxonomic treatment, included within *C. deflexa*, treated as varietally distinct, or as a full species. [= FNA; < C, F, G, K, M]

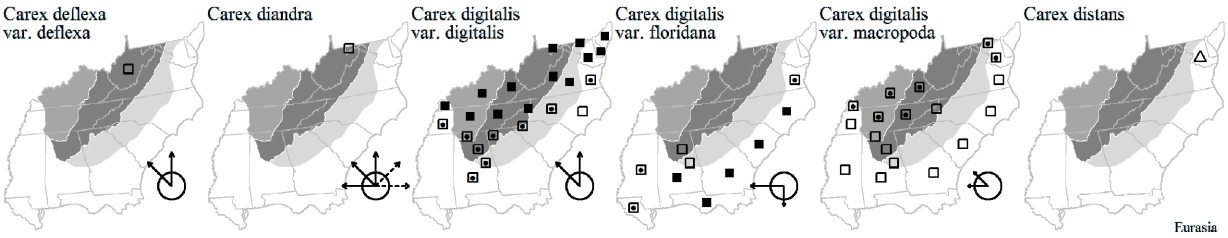
Carex diandra Schrank, Lesser Tussock Sedge. Swamps, bogs, especially over limestone. Circumboreal, south in North America to w. MD, PA, TN, OH, IL, CO, CA; also reported from TN on the basis of a destroyed specimen. [= C, F, FNA, G, K, M]

Carex digitalis Willdenow *var.* ***digitalis***. {Infraspecific taxa need separating: Cp (DE, FL), Pd (DE), Mt (WV), {Mt, Pd, Cp (GA, NC, SC, VA)}: rich forests; common in DE and WV. April-June. ME west to WI, south to FL and e. TX. Naczi (1999b) reports a chromosome number of n = 24. [= FNA, K; < *C. digitalis* – RAB, C, F, G, M, S, W, WH] {not yet mapped}

Carex digitalis Willdenow *var.* ***floridana*** (L.H. Bailey) Naczi & Bryson. Rich forests. April-June. MD south to FL, west to TX. Naczi (1999b) reports a chromosome number of n = 24. [= FNA; = *C. digitalis* var. *asymmetrica* Fernald – F, K; < *C. digitalis* – RAB, C, G, M, S, W, WH]

Carex digitalis Willdenow *var.* ***macropoda*** Fernald. {Infraspecific taxa need separating: Cp (FL), {Mt, Pd, Cp (GA, NC, SC, VA): rich forests; common.} April-June. PA and IL south to FL and TX. Naczi (1999b) reports a chromosome number of n = 24. [= F, FNA, K; < *C. digitalis* – RAB, C, F, G, M, S, W, WH] {not yet mapped}

* ***Carex distans*** Linnaeus. Disturbed areas. Introduced in MD and PA; native of Eurasia. [= FNA, K]



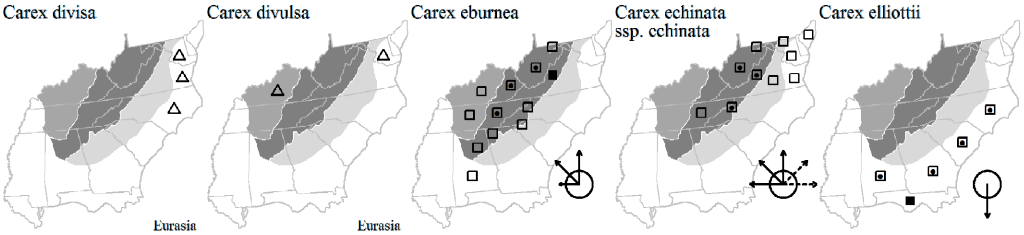
* ***Carex divisa*** Hudson, Divided Sedge. Brackish and oligohaline marshes; native of the Old World. May-June. [= RAB, C, F, FNA, G, K]

* ***Carex divulsa*** Stokes. Fields, pastures, disturbed areas; native of Europe and w. Asia. Reported for Washington, DC; MD, KY. [= C, F; *? C. divulsa* ssp. *divulsa* – FNA, K; *? C. virens* – G, M, misapplied]

Carex eburnea F. Boott, Bristle-leaf Sedge. Calcareous cliffs, bluffs, and outcrops. May. NL (Newfoundland) west to AK, south to w. VA, w. NC, nw. SC, c. AL, n. AR, NE, s. AB, and s. BC; early reports of this species from TX are referrable to a recently described species, *C. mckittrickensis* P.W. Ball. Locally abundant on limestone bluffs, easily recognized vegetatively by its wiry stems and leaves (ca. 0.5 mm wide). [= RAB, C, F, FNA, G, K, M, S, W]

Carex echinata Murray *ssp.* ***echinata***, Star Sedge. Bogs. May-June. Ssp. *echinata* is circumboreal, ranging in North America from NL (Newfoundland) west to SK, south to DE, PA, IN, IA, and ND, and in the mountains to w. NC and e. TN; also in w. North America from AK (Aleutians) and BC south to CO, UT, and s. CA. Ssp. *phyllomanica* (F. Boott) Reznicek occurs along the western coast of North America from s. AK south to n. CA. [= FNA, K; > *C. muricata* Linnaeus var. *angustata* (Carey) Carey ex Gleason – RAB, G, misapplied; = *C. echinata* var. *echinata* – C; > *C. muricata* var. *cephalantha* (L.H. Bailey) Wiegand & Eames – G; = *C. angustior* Mackenzie – M, S; > *C. angustior* – F; > *C. cephalantha* (L.H. Bailey) Bicknell – F; < *C. muricata* – W]

Carex elliottii Schweinitz & Torrey, Elliott's Sedge. Bogs. May-June. E. NC south to c. pen. FL and west to s. AL. [= RAB, FNA, GW, K, M, S, WH]



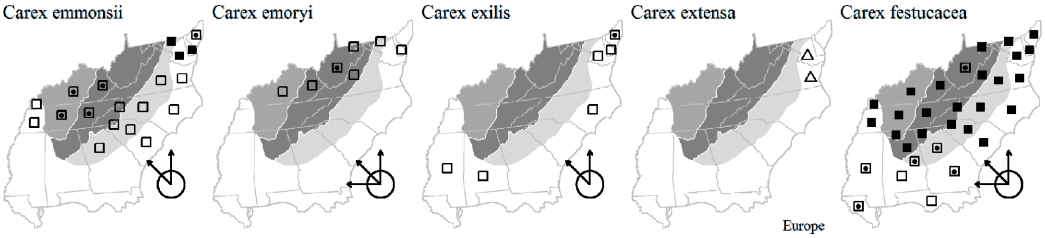
Carex emmonsii Dewey ex Torrey, Emmons's Sedge. Dry, sandy woodlands. April-May. NS west to WI, south to PA, NC, SC, and TN. [= RAB, F, W; = *C. albicans* Willdenow ex Sprengel var. *emmonsii* (Dewey ex Torrey) J. Rettig – C, FNA, K; = *C. nigro-marginata* Schweinitz var. *minor* (F. Boott) Gleason – G; < *C. varia* Muhlenberg ex Willdenow – S; = *C. albicans* – M, misapplied]

Carex emoryi Dewey in Torrey. Seepages, ditches, other wetlands. May-June. NY and ND south to w. VA, s. IL, n. AR, and TX. [= C, F, FNA, K, M; = *C. stricta* Lamarck var. *elongata* (Böckeler) Gleason – G]

Carex exilis Dewey, Coastal Sedge. Peaty seepage bogs. May-June. NL (Newfoundland) and NL (Labrador) west to ON and n. MN, south to NJ, DE, MD, NY, and n. MI; disjunct southward in sc. NC and in se. MS / sw. AL. The southern occurrences are remarkably disjunct from the Canadian, northern Coastal Plain, and Great Lakes distribution. [= RAB, C, F, FNA, G, K, M]

* ***Carex extensa*** Goodenough, Long-bracted Sedge. Salt marshes, introduced around seaports; native of Europe. [= C, F, FNA, G, K, M]

Carex festucacea Schkuhr ex Willdenow, Fescue Sedge. Bottomland forests. May-June. VT west to MN, south to GA, Panhandle FL, AL, MS, LA, and TX. [= C, F, FNA, K, WH; < *C. festucacea* – RAB, GW, W; < *C. festucacea* – G (also see *C. straminea*)]



Carex fissa Mackenzie *var.* ***aristata*** Hermann, Hammock Sedge. Wet savannas, roadside banks and ditches. Extreme se. SC (Jasper Co.), s. GA (Clinch County) (Carter, Baker, & Morris 2009; Sorrie 1998b) south to c. peninsular FL, west to FL Panhandle and s. MS (Bryson et al. 1996). The SC distribution is documented by a voucher (Crins 9848 & D. Brunton) at MICH. Probably a species distinct from *C. fissa*. [= FNA, GW, K, WH; < *C. fissa* – M]

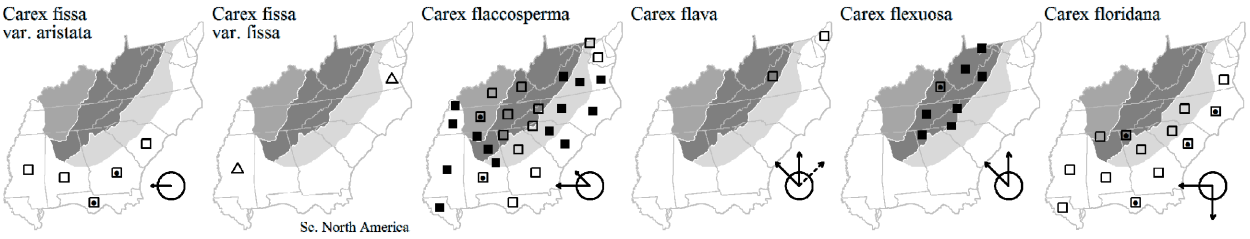
* ***Carex fissa*** Mackenzie *var.* ***fissa***. Disturbed areas, introduced at old railroad stockyard, well-established; native of sc. United States (MO and KS south to TX). See Simmons, Strong, & Parrish (2008) for additional information about the VA occurrence. [= FNA, K; < *C. fissa* – M]

Carex flaccosperma Dewey. {distribution and abundance needing additional herbarium investigation} May-June. Se. VA south to Panhandle FL, west to TX, north in the interior to s. MO. [= FNA, G, K, M, S; < *C. flaccosperma* – RAB, C, GW, WH (also see *C. glaucodea* and/or *C. pigra*); = *C. flaccosperma* var. *flaccosperma* – F]

Carex flava Linnaeus, Yellow Sedge. Calcareous seeps. June. Circumboreal, ranging south in North America to NJ, PA, IN, ID, and BC; disjunct in sw. VA (Giles County). First reported for VA by Wieboldt et al. (1998). [= C, K; > *C. flava* var. *flava* – F, G; > *C. flava* var. *laxior* (Kükenthal) Gleason – G]

Carex flexuosa Muhlenberg ex Willdenow. Dry to moist upland forests, openings, granitic domes, rock outcrops. May-July. NL (Newfoundland) west to MN, south to VA and MO, and in the Appalachian Mountains to w. NC and e. TN. [= M, S; = *C. debilis* var. *rudgei* L.H. Bailey – RAB, C, F, G, K; < *C. debilis* var. *rudgei* L.H. Bailey – FNA; < *C. debilis* – GW, W]

Carex floridana Schweinitz, Florida Sedge. Mesic hammocks, dry hammocks, maritime forests. March-May. E. NC (se. VA?) south to c. peninsular FL, west to TX. [= FNA, K, M, S; = *C. nigromarginata* Schweinitz var. *floridana* (Schweinitz) Kükenthal – RAB, F, WH]



Carex foenea Willdenow, Hay Sedge. NL (Labrador) and NL (Newfoundland) west to YT, south to CT, NY, s. NJ, PA, MI, and ID. [= C, FNA; > *C. aenea* Fernald – F, M; < *C. siccata* – G, K, misapplied; > *C. foenea* – M]

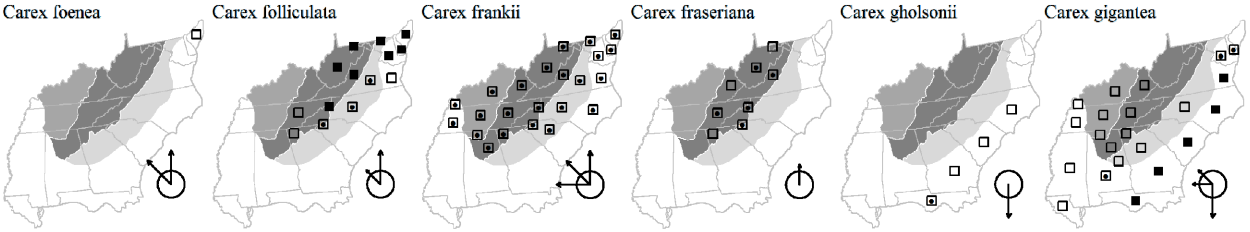
Carex folliculata Linnaeus. Bogs, boggy forests, high elevation forests (spruce-fir). May-July. NL (Newfoundland) west to WI, south to NC and e. TN. [= FNA, K, M, S, W; = *C. folliculata* var. *folliculata* – RAB, C, F, G; < *C. folliculata* – GW (also see *C. lonchocarpa*)]

Carex frankii Kunth. Bottomland forests. May-July. W. NY and s. ON west to MI and se. NE, south to GA, AR, and OK. [= FNA; < *C. frankii* – RAB, C, F, G, GW, K, M, S, W (also see *C. aureolensis*)] {not yet mapped}

Carex fraseriana Ker-Gawler, Fraser's Sedge, Lily-leaf Sedge. Cove forests, mostly rather acidic and associated with *Rhododendron maximum*, at moderate elevations. May-July. A Southern and Central Appalachian endemic: w. MD and s. PA south through w. VA and WV to w. NC, e. TN, nw. SC, and n. GA (Jones & Coile 1988). This species is a peculiar plant, often considered a relict species most closely related to *Carex*, but recent molecular evidence suggests that it is embedded within *Carex* and is best considered a component of that genus. The foliage slightly resembles some of the broader-leaved species of *Carex* (such as *C. platyphylla* or *C. plantaginea*) or genera of the Liliaceae; immediately distinctive, however, are the minutely undulate-scaberulous leaf margins. The odd leaves may be derived evolutionary from leaf sheaths (Reznicek in FNA 2002b). Kartesz & Gandhi (1991) have shown that the Ker-Gawler's epithet *fraseriana/fraserianus* has priority over Andrews's *fraseri*. [= *Cymophyllus fraserianus* (Ker-Gawler) Kartesz & Gandhi – FNA, K; = *Cymophyllus fraseri* (Andrews) Mackenzie – RAB, C, F, G, S, W; = *Carex fraseri* Andrews – WV]

Carex gholsonii Naczi & Cochrane, Gholson's Sedge. Moist calcareous forests, especially marl flats and bottomlands over coquina. E. NC south to c. peninsular FL, west to s. AL. See Naczi, Bryson, & Cochrane (2002). [= FNA, WH; presumably included in the concept of *C. granularis* by authors before 2002]

Carex gigantea Rudge, Giant Sedge. Swamps, bottomland forests, cypress depressions. June. DE south to s. FL, west to e. TX, north in the interior to nw. GA (Jones & Coile 1988), IN and OK. [= RAB, C, F, FNA, G, GW, K, M, S, WH]



Carex glaucescens Elliott, Blue Sedge, Southern Sedge. Blackwater swamps, pocosins, wet pine savannas, seepage bogs, depression ponds, pondcypress savannas, other acid and peaty situations. July-September. E. MD south to c. peninsular FL, west to e. TX; disjunct in nw. GA (Jones & Coile 1988) and c. TN. [= RAB, C, F, FNA, G, GW, K, M, S, WH]

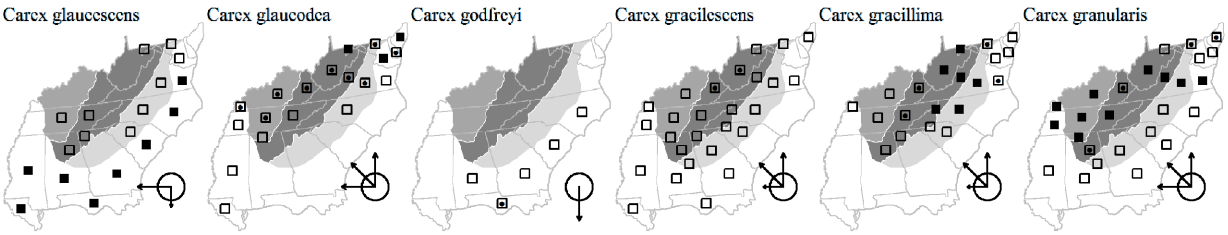
Carex glaucodea Tuckerman ex Olney. {distribution and abundance needing additional herbarium investigation}. May-June. MA and ON west to s. IN and MO, south to NC, sc. TN, and AR. [= FNA, K; < *C. flaccosperma* – RAB, C, GW; < *C. flaccosperma* Dewey var. *glaucodea* (Tuckerman ex Olney) Kükenthal – F; < *C. glaucodea* – G, M, S]

Carex godfreyi Naczi, Godfrey's Sedge. Calcareous swamps and bottomlands. May-June. Se. NC south to se. GA, c. peninsular FL and west to Panhandle FL, sw. GA, and s. AL. See Naczi (1993) for additional information. [= FNA, K, WH; < *C. grisea* – RAB, M, S; < *C. amphibola* – GW]

Carex gracilescens Steudel. Moist, nutrient-rich forests, calcareous hammocks. May-June. VT and s. QC west to WI, south to SC, AL, LA, and e. TX; disjunct in sw. GA and Panhandle FL. Naczi (1999b) reports a chromosome number of n = 17, 19, 20. [= RAB, F, FNA, K, M, S, W, WH; < *C. gracilescens* – C (also see *C. ormostachya*); = *C. laxiflora* var. *gracillima* F. Boott – G]

Carex gracillima Schweinitz, Graceful Sedge. Moist ravine and slope forests, floodplains of rivers and large creeks. April-June. NL (Newfoundland) west to MB, south to n. GA, AL, and AR. [= RAB, C, FNA, G, K, M, W; > *C. gracillima* var. *gracillima* – F]

Carex granularis Muhlenberg ex Willdenow. Moist, nutrient-rich forests, especially bottomlands, mostly over calcareous rocks (limestone, dolostone, coquina limestone) or mafic rocks (diabase. May-June. ME and QC west to SK, south to GA, OK, and ne. TX. *C. haleana* Olney [= *C. granularis* var. *haleana* (Olney) Porter] is alleged to differ primarily in its more slender perigynia (1.0-1.5 mm wide vs. 1.5-2.5 mm) (see F and M for additional information). Here interpreted to include *C. haleana* Olney. Naczi (1999b) found little correlation between the morphological and cytological variability of *C. granularis*, and also little correlation of that variability with geography; he concluded that there was little support for recognition of infraspecific taxa. [= RAB, C, FNA, G, GW, K, S, W; > *C. granularis* var. *granularis* – F; > *C. granularis* var. *haleana* (Olney) Porter – F; > *C. granularis* – M; > *C. haleana* Olney – M]



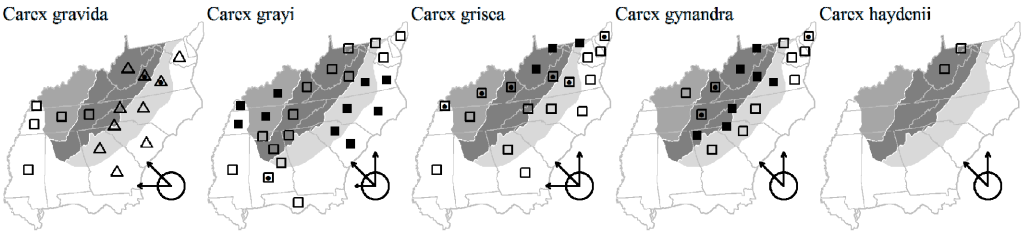
* ***Carex gravida*** L.H. Bailey. Fields. ON west to SK, south to TN, MS, AR, TX, and NM, rarely introduced eastward. Two varieties or species (see synonymy) are sometimes distinguished: var *gravida* with perigynia 4-5 mm long, 2× as long as wide, nerveless or very obscurely nerved on the dorsal face, and var. *lunelliana*, with perigynia 3-4.5 mm long, 1.3-1.5× as long as wide, strongly few-nerved on the dorsal face. Steury (1999) reported var. *lunelliana* as new to MD (Calvert County). [= FNA; > *C. gravida* var. *gravida* – C, F, G, K; > *C. gravida* L.H. Bailey var. *lunelliana* (Mackenzie) F.J. Hermann – RAB, C, F, G, K; > *C. lunelliana* Mackenzie – M; > *C. gravida* – M]

Carex grayi Carey, Asa Gray's Sedge. Bottomland forests. May-June. Sw. QC west to WI and IA, south to nw. GA and OK; disjunct in Panhandle FL. [= RAB, C, FNA, K, W; = *C. grayii* – G, GW, M, orthographic variant; > *C. grayii* var. *grayii* – F; > *C. grayii* var. *hispidula* A. Gray – F; = *C. asa-grayi* L.H. Bailey – S]

Carex grisea Wahlenberg. {habitats, distribution and abundance in our area needing additional herbarium investigation} May-June. NB west to MN and SD, south to VA, TN, MS, LA, and TX. [= FNA, K; < *C. grisea* – RAB, G, M, S (also see *C. corrugata* and/or *C. godfreyi*); < *C. amphibola* – C, GW; *? C. amphibola* var. *turgida*]

Carex gynandra Schweinitz. Mountain bogs, swamp forests, seepages. May-June. NL (Newfoundland) west to MN, south to WI, n. VA, w. NC, n. GA, e. TN, OH, and WI. This is the most montane and northern element of the *C. crinita* complex, and the usual one encountered in the Mountains of our area. [= C, FNA, K, M, S; = *C. crinita* Lamarck var. *gynandra* (Schweinitz) Schweinitz & Torrey – RAB, F, G, GW; < *C. crinita* – W]

Carex haydenii Dewey. Wet meadows, wet prairies. NL (Newfoundland) and QC west to SD, south to s. PA, MD (C. Frye, pers. comm. 2000), IL, and IA. [= C, F, FNA, G, K, M]



Carex hirsutella Mackenzie. Forests. May-June. ME, s. ON, and IA, south to GA and ne. TX. [= F, FNA, K, M, S; = *C. complanata* Torrey & Hooker var. *hirsuta* (L.H. Bailey) Gleason – C, G; < *C. complanata* – RAB, GW, W]

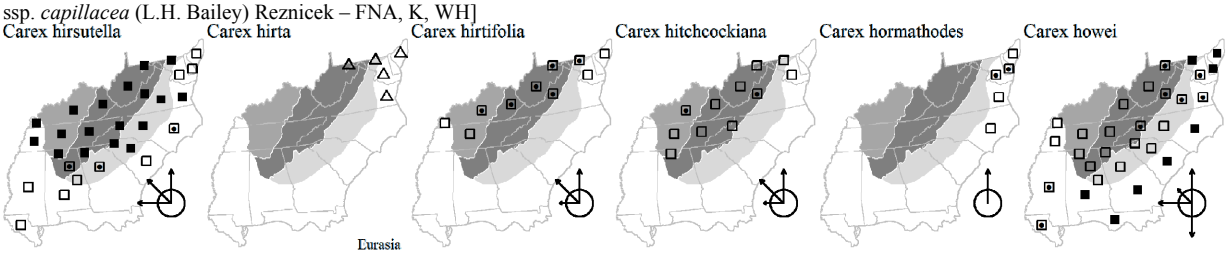
* ***Carex hirta*** Linnaeus. Dry sandy areas; native of Eurasia. The report of *C. hirta* for NC (Burk 1961, RAB) is based on a misidentification of *C. pumila* (Reznicek 1993). [= C, F, FNA, G, K, M]

Carex hirtifolia Mackenzie. Nutrient-rich, though often rather dry, forests and woodlands. May-June. NB west to MN, south to MD, sw. VA, c. TN, KY, MO, and e. KS. [= C, F, FNA, G, K, M, W]

Carex hitchcockiana Dewey. Rich moist forests, especially over limestone, other calcareous, or mafic rocks. June-July. MA west to MN, south to NC, sc. TN, and AR. [= C, F, FNA, G, K, M, W]

Carex hormathodes Fernald. Freshwater and slightly brackish tidal marshes. NL (Newfoundland) south to ne. NC, along the coast. [= F, FNA, K, M; = *C. straminea* Willdenow ex Schkuhr var. *invisa* W. Boott – C, G]

Carex howei Mackenzie, Howe's Sedge. Bogs and seepages. May-June. NS west to MI and nw. IN, south to c. peninsular FL and e. TX, predominantly (but by no means strictly) on the Coastal Plain. See *C. atlantica* for discussion of the relationship between the two taxa. [= RAB, F, G, GW, M, S, W; = *C. atlantica* var. *capillacea* (L.H. Bailey) Cronquist – C; = *C. atlantica* L.H. Bailey ssp. *capillacea* (L.H. Bailey) Reznicek – FNA, K, WH]



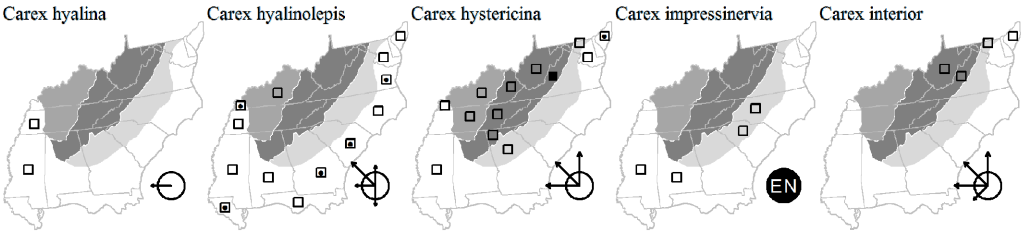
Carex hyalina F. Boott. Bottomland forests. TN, AR, and OK, south to MS, LA, and TX. [= FNA, K, M] {not yet keyed; synonymy incomplete; *Ovales*}

Carex hyalinolepis Steudel. Marshes, swamp forests. May-June. NJ south to Panhandle FL, west to TX, north in the interior to KS; disjunct around the Great Lakes in MI, IN, and s. ON. [= RAB, C, F, FNA, K, M, S, WH; = *C. lacustris* Willdenow var. *laxiflora* Dewey – G; = *C. hyalinolepsis* – GW, misspelling]

Carex hystericina Muhlenberg ex Willdenow, Porcupine Sedge. Calcareous marshes and wet meadows. June-July. NB west to BC, south to w. VA, sc. TN, w. TX, and n. CA. [= C, FNA, G, K; = *C. hystricina* – F, M, W, orthographic variant]

Carex impressinervia Bryson, Kral, & Manhart. Moist forests. April-May. Sc. NC south to AL and west to MS, apparently very rare and widely scattered. See Bryson, Kral, & Manhart (1987) for additional information on this species. [= FNA, K]

Carex interior L.H. Bailey, Inland Sedge. Calcareous seepage areas. May-June. NL (Newfoundland) and NL (Labrador) west to s. AK, south to w. VA, n. AR, n. AZ, and n. CA; disjunct in Mexico (Chihuahua). [= C, F, FNA, G, K, M, W]



Carex intumescens Rudge *var.* ***fernaldii*** L.H. Bailey. Spruce-fir forests, northern hardwood forests, grassy balds. June-July. NL (Newfoundland) west to MB, south to NY, n. PA, MI, MN, and, at higher elevations in the Appalachians, to w. VA, w. NC, and e. TN. See Uttal (1971) and Reznicek & Ball (1974) for different views on the validity of this variety. [= F; < *C. intumescens* – RAB, C, FNA, G, GW, K, M, S, W]

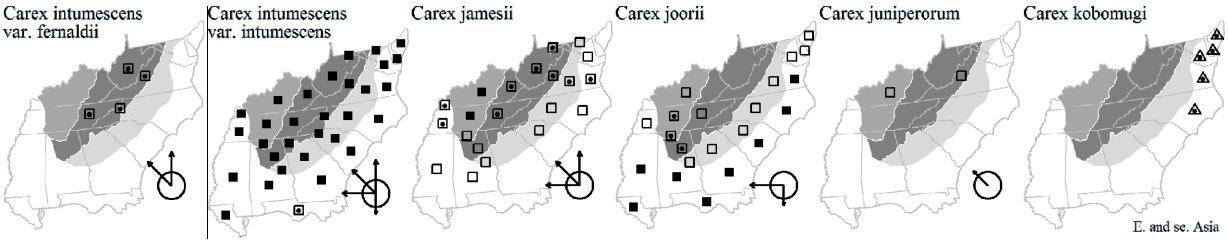
Carex intumescens Rudge *var.* ***intumescens***. Bogs, wet forests. May-July. NS west to WI, south to c. peninsular FL and e. TX. [= F; < *C. intumescens* – RAB, C, FNA, G, GW, K, M, S, W, WH]

Carex jamesii Schweinitz, James's Sedge. Nutrient-rich bottomlands and mesic slopes over calcareous or mafic rocks. May-June. MD and NY west to MI, MN, and e. NE, south to c. SC, GA, and LA. Naczi (1999b) reports chromosome numbers of n = 33, 35. [= FNA; < *C. jamesii* – RAB, C, F, G, K, M, W]

Carex joorii L.H. Bailey, Joor's Sedge, Hummock Sedge, Cypress-swamp Sedge. Swamps, upland depression swamps in the Piedmont, sphagnous wetlands. June-October. E. MD south to n. peninsular FL and Panhandle FL, west to e. TX, north in the interior to TN, MO, and OK. [= RAB, C, F, FNA, G, GW, K, M, S, WH]

Carex juniperorum Catling, Reznicek, & Crins. On edges of calcareous glades and barrens, in subxeric to submesic calcareous woodlands. This species was recently described, and is so far known only from alvars in s. ON, calcareous glades and barrens in s. OH and ne. KY, and has recently been found in Montgomery Co., VA (Belden et al. 2004) and Botetourt Co., VA (Townsend, pers. comm., 2008). [= FNA, K]

* ***Carex kobomugi*** Ohwi, Sea Isle Sedge, Japanese Sedge. Sand dunes; native of Japan. March-July. *C. kobomugi* is distinctive in its short stout culms, and its terminal, headlike, dioecious inflorescences. This species is planted as a stabilizer of coastal dunes. [= C, F, FNA, G, K]



Carex kraliana Naczi & Bryson, Kral's Sedge. Mesic forests, slightly acidic to circumneutral. MD, OH, and IN south to Panhandle FL and TX. See Naczi, Bryson, & Cochrane (2002). [= FNA; variously included in the concepts of other species in sect. *Laxiflorae* by authors before 2002]

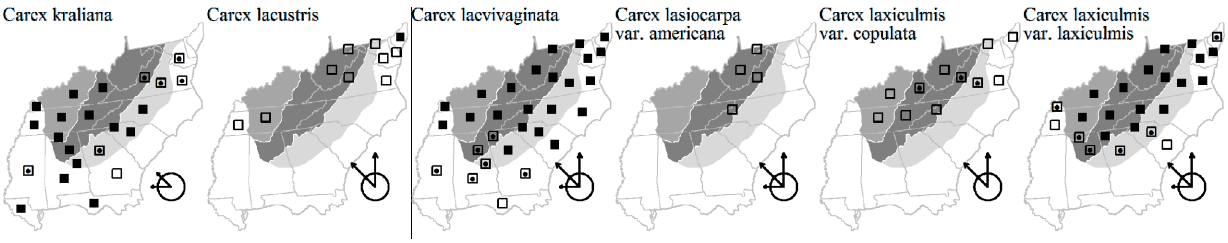
Carex lacustris Willdenow, Lakeshore Sedge. Marshes, swamp forests. QC west to SK, south to e. VA, w. VA, and NE. [= C, F, FNA, K, M; = *C. lacustris* var. *lacustris* – G]

Carex laevivaginata (Kükenthal) Mackenzie. Marshes, swamp forests, alluvial forests. May-June. MA, MI, and MN, south to Panhandle FL, AL, and MO. [= RAB, C, F, FNA, G, GW, K, M, W, WH; = *C. laevi-vaginata* – S, orthographic variant]

Carex lasiocarpa Ehrhart *var.* ***americana*** Fernald, Slender Sedge. In shallow water of alkaline spring seep, on hummocks in acidic basin marsh, and in high elevation fen over amphibolite. A circumboreal species; var. lasiocarpa is Eurasian, var. americana ranges from NL west to AK, south to NJ, WV, MD (C. Frye, pers. comm. 2000), VA, nw. NC, IA, CO, UT, and n. CA. First reported for VA by Wieboldt et al. (1998). Found for the first time in NC in the valley of Long Hope Creek (Ashe County, NC), in July 1999 by A.S. Weakley and P.D. McMillan. [= C, F, G, K; = *C. lasiocarpa* ssp. *americana* (Fernald) Hultén – FNA; < *C. lasiocarpa* – M, W]

Carex laxiculmis Schweinitz *var.* ***copulata*** (L.H. Bailey) Fernald. Mesic forests. April-June. VA, ON, and WI south to NC, AL, and AR. Var. *copulata* (L.H. Bailey) Fernald, has sometimes been considered the hybrid *C. digitalis* × *laxiculmis*; current evidence suggests that it is not a hybrid but is not consistently separable from *C. laxiculmis* (Manhart 1984). Naczi (1999b) reports chromosome numbers for the two varieties, n= 22, 23, 25 for var. *laxiculmis*, and n = 23-24 for var. *copulata*; normal pairing further suggests that var. *copulata* is not a hybrid. [= FNA, K; < *C. laxiculmis* – RAB, G, K, S, W; = *C.* ×*copulata* (L.H. Bailey) Mackenzie – F, M]

Carex laxiculmis Schweinitz *var.* ***laxiculmis***. Rich slope or alluvial forests. April-June. S. ME west to s. WI and s. IA, south to NC, nw. GA (Jones & Coile 1988), n. AL, and MO. [= FNA, K; < *C. laxiculmis* – RAB, G, S, W; = *C. laxiculmis* – F, M]



Carex laxiflora Lamarck. Bottomland and other nutrient-rich forests. May-June. Varieties have been recognized; their appropriate disposition is uncertain. Var. *laxiflora* ranges from ME and s. QC west to WI and IN, south to NC, TN, and AL; allegedly also in s. Mexico. Var. *serrulata* F.J. Hermann has been reported for our area by Hill & Horn (1997). Its range is stated by F to be NY and PA to MI, IN, and TN. It differs in being distinctly scabrous (vs. smooth to scaberulous), and in having the bract sheaths with serrulate angles (vs. entire or erose angles). [= RAB, C, FNA, M, W; > *C. laxiflora* var. *serrulata* F.J. Hermann – F, K; > *C. laxiflora* var. *laxiflora* – F, K; < *C. laxiflora* var. *laxiflora* – G; *? C. heterosperma* Wahlenberg – S]

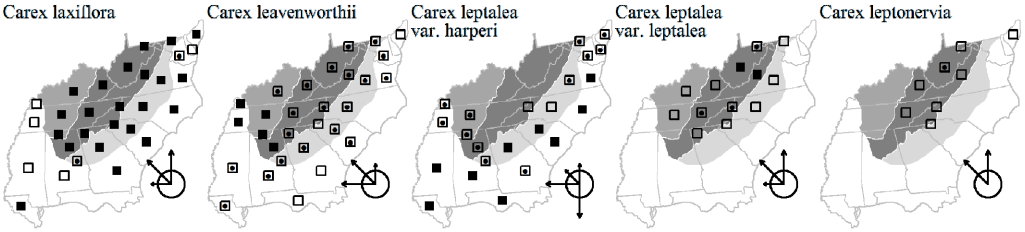
Carex leavenworthii Dewey. Dry forests. May-June. NY, ON, and NE south to Panhandle FL and TX. [= RAB, C, F, FNA, G, K, M, S, W; < *C. cephalophora* Muhlenberg ex Willdenow – WH]

Carex leptalea Wahlenberg *var.* ***harperi*** (Fernald) Weatherby & Griscom. Bogs, seeps, blackwater bottomlands, usually in saturated conditions with *Sphagnum spp*. May-June. NJ south to c. peninsular FL, west to TX, inland in the interior to IN and MO. Var. *harperi* is considered to differ from the typic variety in its larger perigynia, larger spikes, more aristate pistillate scales,

and more southern range; it needs additional study. [= F, G; < *C. leptalea* – RAB, C, GW, M, S, W, WH; = *C. leptalea* ssp. *harperi* (Fernald) W. Stone – FNA, K; = *C. harperi* Fernald]

Carex leptalea Wahlenberg *var.* ***leptalea***. Bogs, seeps, usually in saturated conditions with *Sphagnum spp*. May-June. NL (Labrador) west to AK, south to NC, TN, MO, SD, NM, and CA. [= F, G; < *C. leptalea* – RAB, C, GW, M, S, W; = *C. leptalea* ssp. *leptalea* – FNA, K]

Carex leptonervia (Fernald) Fernald. Nutrient-rich forests, such as rich, seepy northern hardwoods forests. May-June. NL (Newfoundland) west to MN, south to NJ, PA, IN, and WI, and in the Appalachians south to NC and SC (L.L. Gaddy, pers.comm., 2009). [= RAB, C, F, FNA, G, K, M, S, W]



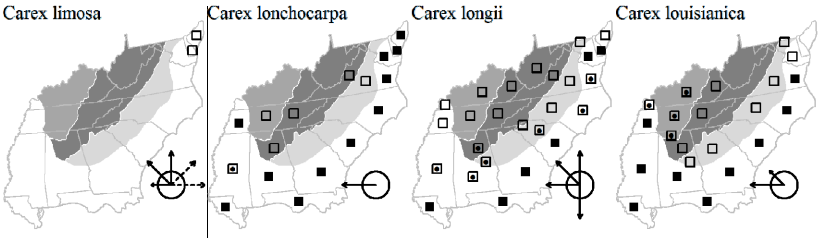
Carex limosa Linnaeus. Bogs, swamps, wet meadows. Circumboreal, south in North America to se. PA (Rhoads & Klein 1993), NJ, DE, OH, IN, NE, UT, and CA. [= C, F, FNA, G, K, M]

Carex livida (Wahlenberg) Willdenow. Bogs and fens. Circumboreal, south in Northg America to s. NJ, NY, MI, IN, MN, CO, and CA; also disjunct in Panama and South America. Material in NJ is described as being atypical and needing additional research (Rothrock & Reznicek in FNA 2002b). [= FNA; > *C. livida* var. *radicaulis* Paine – K] {add to synonymy; add to key; {not yet mapped; 26aa. *Paniceae*}

Carex lonchocarpa Willdenow. Pocosin margins, small blackwater stream swamps. May-July. S. MD south to ne. FL and Panhandle FL, west to LA; rarely inland, as in sc. TN. Recognition of *C. lonchocarpa* at the species level is supported by its distinctive achene micromorphology (Wujek & Menapace 1986). [= FNA, K, M, WH; = *C. folliculata* Linnaeus var. *australis* L.H. Bailey – RAB, C, F, G; < *C. folliculata* – GW; = *C. smalliana* Mackenzie – S]

Carex longii Mackenzie, Long's Sedge. Low fields, bottomlands. May-June. NS west to WI, south to s. FL and TX. [= C, F, FNA, K, WH; < *C. albolutescens* – RAB, G, GW, W]

Carex louisianica L.H. Bailey. Calcareous forests. May-July. S. NJ south to ne. FL, Panhandle FL, west to TX, north in the interior to KY, IN, and MO; disjunct in ne. OH. [= RAB, C, F, FNA, G, GW, K, M, S, W, WH]



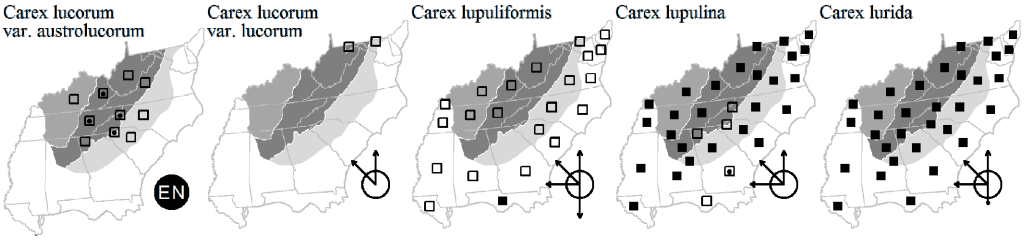
Carex lucorum Willdenow ex Link *var.* ***austrolucorum*** J. Rettig, Appalachian Woodland Sedge. Xeric to mesic wooded slopes, usually in oak forests and northern hardwood forests. *C. lucorum* var. *austrolucorum* is endemic to the Southern Appalachians, ranging from sw. VA and s. WV south through w. NC and e. TN to nw. SC and ne. GA. It has been reported from further north, in sc. WV (Boone County) (Cusick 1996). Var. *lucorum* differs in having the leaves broader (mostly 1.5-2.8 mm wide vs. mostly 1.1-1.3 mm), the beak averaging shorter (1.3 mm vs. 1.5 mm), chromosome number n = 20 (vs. n = 13), and various details of flavonoid chemistry and achene micromorphology (see Rettig 1988 for details). While the two taxa can be difficult to tell apart on morphological grounds, they are clearly separate taxa. *C. lucorum* var. *austrolucorum* was first reported for South Carolina by Hill & Horn (1997). [= FNA, K; < *C. pensylvanica* Lamarck var. *distans* Peck – RAB, F, G (the name misapplied as to our plants); < *C. lucorum* – C, M, S; < *C. pensylvanica* – W; = *C. lucorum* ssp. *austrolucorum* (J. Rettig) A. Haines]

Carex lucorum Willdenow ex Link *var.* ***lucorum***, Northern Woodland Sedge. Moist forests. NB west to MN, south to MD (Cecil County; C. Frye, pers. comm. based on specimen at DOV) and PA. [= FNA, K; < *C. pensylvanica* Lamarck var. *distans* Peck – F, G; < *C. lucorum* – C, M, S; < *C. pensylvanica* – W; = C. lucorum ssp. lucorum]

Carex lupuliformis Sartwell ex Dewey, False Hop Sedge. Wet forests, swamps, riverbanks, especially around ponds. June-July. VT and QC west to se. WI, south to s. FL and e. TX. [= RAB, C, F, FNA, G, K, M, WH; < *C. lupulina* – GW]

Carex lupulina Muhlenberg ex Willdenow, Hop Sedge. Bottomland forests. June-September. NS west to MN, south to ne. FL and e. TX. [= RAB, C, FNA, G, K, M, S, W, WH; < *C. lupulina* – GW (also see *C. lupuliformis*); > *C. lupulina* var. *lupulina* – F; > *C. lupulina* var. *pedunculata* A. Gray – F]

Carex lurida Wahlenberg. Bogs, marshes, ditches. June-September. NS west to MN, south to c. peninsular FL, Panhandle FL, and Mexico. [= RAB, C, F, FNA, G, GW, K, M, S, WH]



Carex lutea LeBlond, Golden Sedge. Wet savannas shallowly underlain by coquina limestone, with open canopy of *Taxodium ascendens, Pinus palustris*, and *Liriodendron tulipifera*. May. Endemic to Pender and Onslow counties, NC, where associated with other narrow endemics, such as *Thalictrum cooleyi* and *Allium species 1*, and other rare species, such as *Plantago sparsiflora*, *Parnassia caroliniana*, *Rhynchospora thornei*, and others. See LeBlond et al. (1994) for additional information. [= FNA, K]

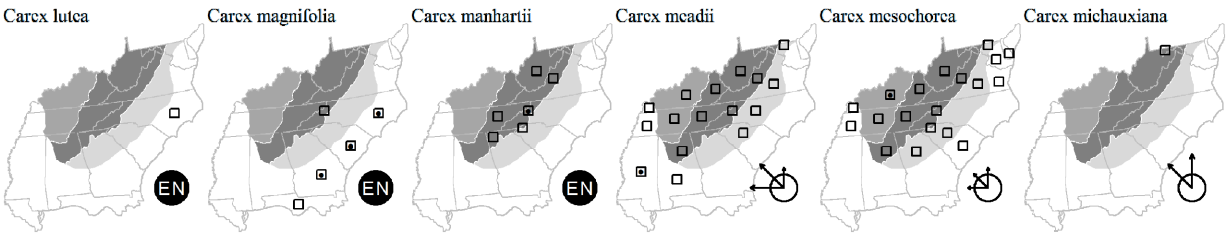
Carex magnifolia Mackenzie. Bogs, acid swamps. April-May. E. NC south to FL, and disjunct in mountain bogs with Coastal Plain affinities, as in Henderson County, NC. *C. magnifolia* differs morphologically from *C. abscondita* in its larger perigynia, longer leaves, and much more strongly glaucous leaves; it has a more southern distribution and occurs in wetter, boggier habitats. Manhart (1984) found that it differed chemically from *C. abscondita*. Further study is needed to verify its taxonomic status. [= M, S; < *C. abscondita* – RAB, FNA, K]

Carex manhartii Bryson, Blue Ridge Purple Sedge, Manhart's Sedge. Cove forests and montane oak-hickory forests, mostly at medium to fairly high elevations, especially over mafic rocks (such as amphibolite) and calcareous rocks (such as marble), but occurring on more acidic substrates as well. April-May. Endemic to w. NC, sw. VA, nw. SC, ne. GA, and se. TN, in the Blue Ridge Mountains. Once considered very rare, this species is now known to be locally common in portions of sw. NC and adjacent ne. GA. For more information on the Virginia occurrence, see Belden et al. (2004). [= FNA, K, W; < *C. purpurifera* Mackenzie – RAB, M, S]

Carex meadii Dewey, Mead's Sedge. Prairies, on low, moist clayey soils over mafic rocks (such as diabase) or calcareous rocks. May-June. NJ west to MI and SK, south to nc. NC, GA, AR, sw. LA, and TX. The species forms large clonal patches with a distinctive bluish cast at the time of flowering and fruiting. Naczi (1999b) reports a chromosome number of n = 28. [= RAB, C, F, FNA, G, K, M, S, W]

Carex mesochorea Mackenzie. Dry forests and woodlands. MA, ON, and NE south to GA, AL, and TX. First reported for South Carolina by Hill & Horn (1997). [= F, FNA, K, M, S; < *C. cephalophora* – RAB, W; = *C. cephalophora* Muhlenberg ex Willdenow var. *mesochorea* (Mackenzie) Gleason – C, G]

Carex michauxiana Böckeler, Michaux's Sedge. Bogs, seeps, usually in *Sphagnum*. NL (Labrador) and MB south to MD, MI, and MN. Closely related to an e. Asian species. [= C, F, FNA, G, K, M] {add to synonymy}



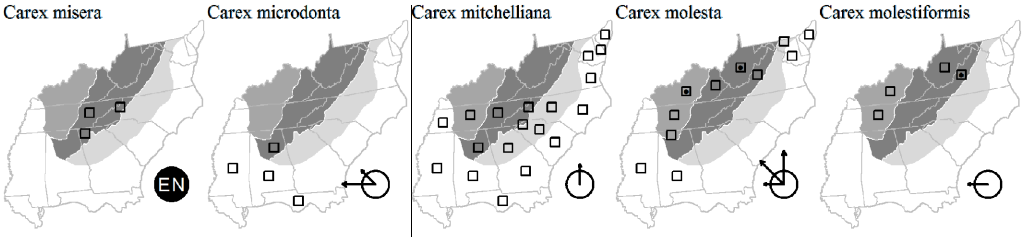
Carex microdonta Torrey & Hooker. Limestone glades, calcareous prairies. AL and Panhandle FL west to MO, KS, OK, TX, NM, and AZ. [= FNA, K, M, S]

Carex misera Buckley, Wretched Sedge. Moderate to high elevation cliffs and rock outcrops. June. A Southern Blue Ridge endemic: nw. NC and w. TN south to ne. GA (Rabun County). Schell & Waterway (1992) discuss interesting geographic patterns of allozyme diversity in this narrowly endemic species. [= RAB, FNA, K, M, S, W; = *C. juncea*, apparently misapplied]

Carex mitchelliana M.A. Curtis, Mitchell's Sedge. Swampy woodlands and forests. May-June. Se. MA west to PA and KY, south to Panhandle FL, n. AL, and sc. TN. This species has a scattered distribution throughout its range, and is apparently rare. Bruederle, Fairbrothers, & Hanks (1989) and Bruederle (1999) provide additional information about this species. Allozyme studies suggest that *C. mitchelliana* is less closely related to *C. gynandra*, *C. crinita* var. *crinita*, and *C. crinita* var. *brevicrinis* than they are to one another. [= C, F, FNA, K, M, S, WH; = *C. crinita* Lamarck var. *mitchelliana* (M.A. Curtis) Gleason – RAB, G, GW; < *C. crinita* – W]

Carex molesta Mackenzie ex Bright, Troublesome Sedge. Calcareous soils. NH west to ND, south to VA, AL, MS, and OK. [= F, FNA, G, K; < *C. brevior* (Dewey) Mackenzie ex Lunell – C]

Carex molestiformis Reznicek & P.E. Rothrock. {habitat}. Known distribution is w. VA, WV, KY, TN, MO, AR, and OK. [= FNA, K; < *C. brevior* (Dewey) Mackenzie ex Lunell – C, G] {synonymy incomplete}



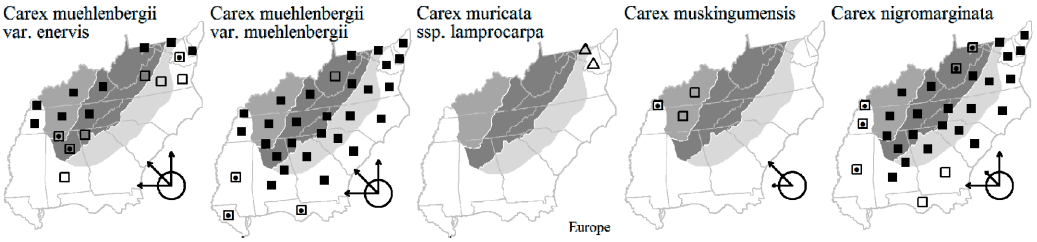
Carex muehlenbergii Schkuhr ex Willdenow *var.* ***enervis*** W. Boott. {habitats}. NH west to MN and NE, south to GA, AL, MS, and TX. [= FNA, K; < *C. muhlenbergii* – RAB, W; < *C. muhlenbergii* var. *muhlenbergii* – C; = *C. muhlenbergii* var. *enervis* – F, G, orthographic variant; = *C. plana* Mackenzie – M, S]

Carex muehlenbergii Schkuhr ex Willdenow *var.* ***muehlenbergii***. Dry to dry-mesic hammocks, {additional habitats}. ME, ON, and MN south to Panhandle FL and TX. [= FNA, K; < *C. muhlenbergii* – RAB, W, WH; < *C. muhlenbergii* var. *muhlenbergii* – C (also see var. *enervis*); = *C. muhlenbergii* var. *muhlenbergii* – F, G, orthographic variant; = *C. muhlenbergii* – M; < *C. muhlenbergii* – S (also see *C. austrina*)]

* ***Carex muricata*** Linnaeus *ssp.* ***lamprocarpa*** Čelakovský. A European alien, with known occurrences south to e. PA (Rhoads & Klein 1993) and MD. [= FNA; < *C. muricata* – C, K]

Carex muskingumensis Schweinitz. Floodplain forests. ON and MN south to KY, TN, AR, and OK. [= C, F, FNA, G, K, M]

Carex nigromarginata Schweinitz, Blackedge Sedge. Dry woodlands and forests. March-May. DE and NJ west to WI, south to SC, GA, and TX. [= C, FNA, K, M, W; = *C. nigromarginata* var. *nigromarginata* – RAB, F; = *C. nigro-marginata* var. *nigro-marginata* – G; = *C. nigro-marginata* – S]



Carex normalis Mackenzie. Mesic forests. May-June. ME, QC, and ON south to GA and AR. [= RAB, C, F, FNA, G, GW, K, W]

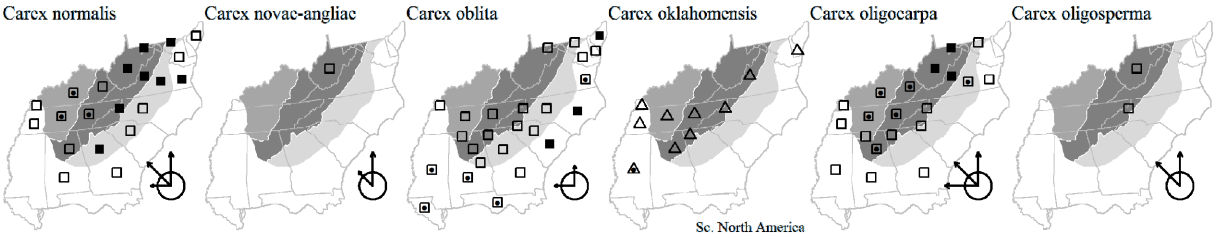
Carex novae-angliae Schweinitz, New England Sedge. Moist forests. NL (Newfoundland) and ON, south to e. PA, n. WV, and WI. [= C, F, G, K, M; < *C. novae-angliae* – FNA]

Carex oblita Steudel. Swamps and other wet habitats. NY (Long Island) and NJ south to sc. GA, west to w. LA, mostly on the Coastal Plain, but extending much less commonly inland to the Piedmont and Mountains. [= M, S; = *C. venusta* Dewey var. *minor* Böckler – C, F, G, K; < *C. venusta* – RAB, FNA, GW, W]

* ***Carex oklahomensis*** Mackenzie, Oklahoma Sedge. Seepages, disturbed wetlands; probably adventive from farther west. Se. MO west to KS, south to AR, and ne. TX; disjunct (and apparently adventive) in various scattered sites east of the Mississippi River, as in AL, MS, GA, w. NC (Graham County) and w. VA (Giles County). First reported for VA by Wieboldt et al. (1998). See Bryson & Rothrock (2010) for further discussion; they consider that this species is "introduced during highway and reservoir construction or maintenance in contaminated hay, grass seeds or on construction, maintenance, and mowing equipment." [= F, FNA, K, M; < *C. stipata* – S; = *C. stipata* Muhlenberg ex Willdenow var. *oklahomensis* (Mackenzie) Gleason – G]

Carex oligocarpa Schkuhr ex Willdenow, Few-fruited Sedge. Rich forests, over calcareous or mafic rocks. May-June. MA west to MN, south to FL and TX. *C. oligocarpa* sensu stricto in SC (P. McMillan, pers. comm., specimen at CLEMS). [= RAB, C, F, FNA, G, K, M, S, W]

Carex oligosperma Michaux. Bogs and seeps at high elevations. NL (Newfoundland) west to NT, south to CT, c. PA, n. IN, WI, and MN; disjunct in ne. OH, WV (Hardy County) and NC (Ashe, Avery, Mitchell, and Watauga counties). [= C, F, FNA, G, M; > *C. oligosperma* var. *oligosperma* – K]



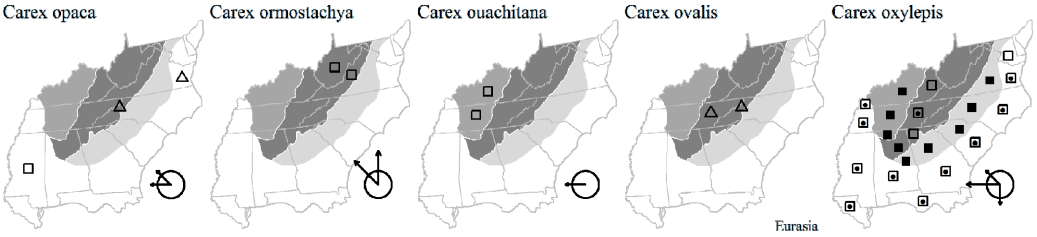
* ***Carex opaca*** (F.J. Hermann) P.E. Rothrock & Reznicek. Introduced at old railroad livestock yard, well-established; native of sc. United States. Native range in prairies, IL and KS south to MS, AR, and OK. [= FNA; = *C. bicknellii* Britton var. *opaca* F.J. Hermann – K; < *C. bicknellii* – M]

Carex ormostachya Wiegand, Necklace Spike Sedge. Northern hardwood forests. S. Canada south to ME, MA, PA, w. VA (Augusta County), n. OH, MI, and WI. [= F, FNA, K, M; < *C. gracilescens* – C; = *C. laxiflora* var. *ormostachya* (Wiegand) Gleason – G]

Carex ouachitana Kral, Manhart, & Bryson, Ouachita Sedge. Dry to dry-mesic slope and ridge forests. Disjunct in nc. TN and sc. KY from the Ouachita Mountains of sw. AR and se. OK. [= FNA, K] {not yet keyed; synonymy incomplete; *Griseae*}

* ***Carex ovalis*** Goodenough. Grassy balds, disturbed areas; native of Eurasia. Known to range in North America from NL (Newfoundland) and NY south to w. NC and ne. TN. The records reported in RAB and elsewhere of *C. aenea* are actually misidentified material of this species (A.A. Reznicek, pers. comm. 2005). [= FNA, K; = *C. aenea* – RAB, misapplied (based on misidentified material); < *C. leporina* Linnaeus – C, F, G, misapplied; *? C. tracyi* Mackenzie]

Carex oxylepis Torrey & Hooker. Bottomlands, calcareous forests. May-June. VA, KY, IL, MO, and OK south to c. peninsular FL and TX. A distinction is sometimes made between var. *oxylepis* and var. *pubescens*. Var. *oxylepis* is widespread in the Southeast; var. *pubescens* is more restricted, from KY and s. IL south to AL and MS. [= RAB, C, F, FNA, G, GW, M, S, W; > *C. oxylepis* var. *oxylepis* – K; > *C. oxylepis* var. *pubescens* J.K. Underwood – K]



Carex paeninsulae Naczi, E.L. Bridges, & Orzell, Peninsula Sedge. Mesic hammocks. Endemic to FL peninsula, north into ne. FL (Suwanee and Duval counties). [= FNA] {not yet keyed; *Griseae*}

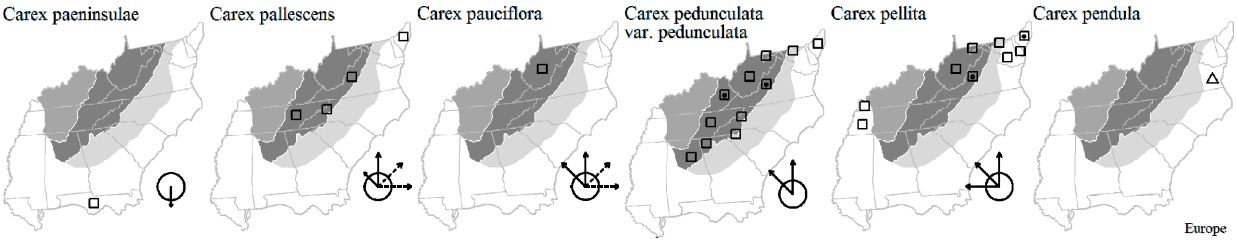
Carex pallescens Linnaeus, Pale Sedge. Grassy balds at high elevations, other grassy openings. June-July. Circumboreal (in ne. North America and n. Eurasia); in North America ranging from NL (Newfoundland), QC, and MN, south to w. NC, e. TN, and MI. *C. pallescens* is reported to occur on Big Bald, Unicoi County, TN, immediately adjacent to the NC line (Churchill et al. 1992). [= C, FNA, G, K, M, W; > *C. pallescens* var. *neogaea* Fernald – F]

Carex pauciflora Lightfoot, Few-flowered Sedge. Bogs. Circumboreal, south in North America to NY, WV (Grant, Randolph, and Tucker counties), WI, MN, and WA. [= C, F, FNA, G, K, M]

Carex pedunculata Muhlenberg ex Willdenow *var.* ***pedunculata***, Longstalk Sedge. Nutrient-rich dry to mesic forests, usually over calcareous or mafic rocks. April. Var. *pedunculata* ranges from NL (Newfoundland), SK, and ND, south to NJ, w. VA, sw. NC, nw. GA (Dade County) (Jones & Coile 1988), n. AL, c. IN, c. IL, and n. IA. Var. *erythrobasis* (Léveillé & Vaniot) Koyama occurs in Korea. It may well prove that these two widely disjunct taxa should be recognized at the species level. [= FNA; < *C. pedunculata* – C, F, G, K, M, W; = *C. pedunculata* ssp. *pedunculata*]

Carex pellita Muhlenberg. Wet meadows. NB west to BC, south to w. VA, w. TN, AR, and CA. McClintock & Waterway (1994) discuss the distinctiveness of *C. pellita* and *C. lasiocarpa*, as well as the misapplication of the name *C. lanuginosa* to the species now properly called *C. pellita*. [= C, FNA, K; = *C. lanuginosa* Michaux – F, M, misapplied; = *C. lasiocarpa* Ehrhart var. *latifolia* (Böckler) Gilly]

* ***Carex pendula*** Hudson, Pendulous Sedge. Disturbed areas; native of Europe. Introduced in VA (FNA, Kartesz 1999). [= FNA, K]



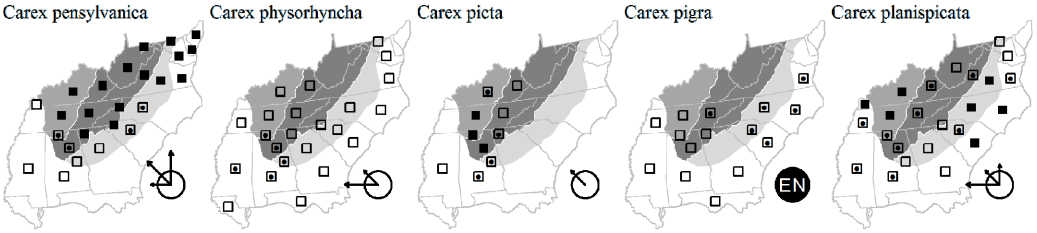
Carex pensylvanica Lamarck. Dry to moist woodlands and forests, grassy balds, shale barrens, rock outcrops. April-June. ME west to s, MB and ND, south to SC, n. GA, TN, and AR. [= FNA, K; = *C. pensylvanica* var. *pensylvanica* – RAB, C, F, G; = *C. pennsylvanica* – M, S, orthographic variant; < *C. pensylvanica* – W (also see *C. lucorum* var. *austrolucorum*)]

Carex physorhyncha Liebmann ex Steudel, Bellow's-beak Sedge. Dry woodlands. Se. VA south to ne. FL and FL Panhandle, west to AR, OK, TX, and Mexico. [= RAB, F, M, S, W; = *C. albicans* Willdenow ex Sprengel var. *australis* (L.H. Bailey) J. Rettig – FNA, K, WH]

Carex picta Steudel, Painted Sedge. Mesic forests. S. IN south through KY and c. TN to nc. GA (Jones & Coile 1988), c. AL, and LA. Reported (erroneously?) for VA (Kartesz 1999). Locally abundant and forming "doughnut clumps", sometimes aggregated to form a coarse turf. [= C, F, FNA, G, K, M, S]

Carex pigra Naczi, Lazy Sedge. Moist forests, bottomlands. May-June. Se. VA west to se. and sc. TN, south to n. FL, s. AL, and ne. MS. See Naczi (1997) for additional information. [= FNA, K; < *C. flaccosperma* – RAB, G, GW, WH; < *C. flaccosperma* Dewey var. *glaucodea* (Tuckerman ex Olney) Kükenthal – F; < *C. glaucodea* – S]

Carex planispicata Naczi. Rich to fairly acid mesic forests, on slopes and floodplains. C. NJ west to s. IN, se. MO, and se. OK, south to c. GA, s. MS, and se. TX. See Naczi (1999a) for additional information. [= FNA; = *C. grisea* Wahlenberg var. *rigida* L.H. Bailey; = *C. amphibola* var. *rigida* (L.H. Bailey) Fernald – F, K]



Carex plantaginea Lamarck, Plantainleaf Sedge. Rich cove forests, mostly over mafic or calcareous rocks, montane alluvial forests. April-May. NB west to MN, south to MD, NJ, VA, NC, ne. GA (Jones & Coile 1988), e. TN, c. TN, KY, and s. IN. [= RAB, C, F, FNA, G, K, M, S, W]

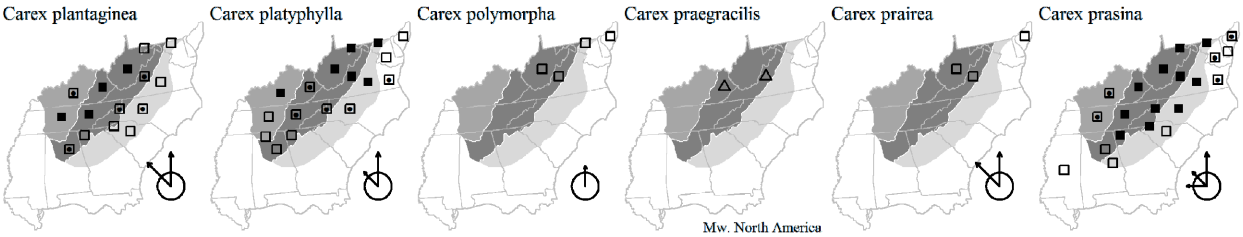
Carex platyphylla Carey, Broadleaf Sedge. Rich cove forests, mostly over mafic or calcareous rock. April-June. ME and s. QC west to WI, south to NC, e. TN, and MO. Naczi (1999b) reports a chromosome number of n = 35. [= RAB, C, F, FNA, G, K, M, S, W]

Carex polymorpha Muhlenberg, Variable Sedge. Dry, acidic ridgetop forests. May-June. ME south to MD, VA, and WV. Standley, Dudley, & Bruederle (1991) studied genetic variability in this species. [= C, F, FNA, G, K, M, W]

* ***Carex praegracilis*** W. Boott, Freeway Sedge. Medians of interstate highways; native of w. North America. May-June. This species is apparently spreading through ne. North America as the result of the winter salting of highways. [= C, F, FNA, G, K, M]

Carex prairea Dewey ex Wood, Prairie Sedge. Calcareous wetlands. QC west to YT, south to NJ, w. VA, OH, NE, MT, and BC. [= C, F, FNA, G, K, M]

Carex prasina Wahlenberg. Rich forests, especially in seepage. May-June. ME, ON, and WI south to GA, MS, and AR; in nearly all TN counties adjacent to NC and VA. [= RAB, C, F, FNA, G, GW, K, M, S, W]



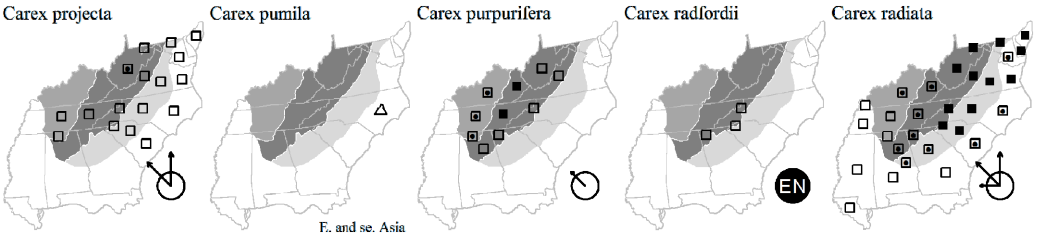
Carex projecta Mackenzie. Moist forests. May-June. NL (Newfoundland), NL (Labrador), and SK south to NC, IN, IL, and IA. [= RAB, C, F, FNA, G, K, M]

* ***Carex pumila*** Thunberg. Open disturbed sand flats; native of Asia. May. See Reznicek (1993) for additional information. [= FNA, K; >< *C. hirta* – RAB, misidentification]

Carex purpurifera Mackenzie, Limestone Purple Sedge. Moist, rich cove forests, at low elevations, over calcareous or mafic rocks. May-June. W. VA and KY south to n. GA and n. AL, mostly west of the Blue Ridge Mountains, but with scattered disjunct populations on calcareous or mafic sites in the Blue Ridge. Naczi (1999b) reports a chromosome number of n = 17-19. [= C, FNA, K, W; < *C. purpurifera* – RAB, M, S (also see *C. manhartii*); = *C. laxiflora* var. *purpurifera* (Mackenzie) Gleason – G]

Carex radfordii Gaddy, Radford's Sedge. Very nutrient-rich, moist cove forests in the Blue Ridge Escarpment region, over calcareous or mafic rocks (especially along the Brevard Fault). May-June. Endemic to the Blue Ridge Escarpment of sw. NC, nw. SC, and ne. GA. See Gaddy (1995) for additional information. Naczi (1999b) reports a different chromosome number for *C. radfordii* (n = 23) than for the related *C. purpurifera* (n = 17, 18, 19). [= FNA, K]

Carex radiata (Wahlenberg) Small. Mesic to wet-mesic forests. May-June. NS west to MB, south to SC, AL, LA, and OK. [= C, FNA, K; < *C. rosea* – RAB, G, W; = *C. rosea* – F, M, S, misapplied]



Carex reniformis (L.H. Bailey) Small, Kidney Sedge. Floodplain forests (including blackwater), marshes, ditches, other wet areas. VA, IL, and OK south to FL Panhandle and TX. [= RAB, C, F, FNA, G, GW, K, S, WH]

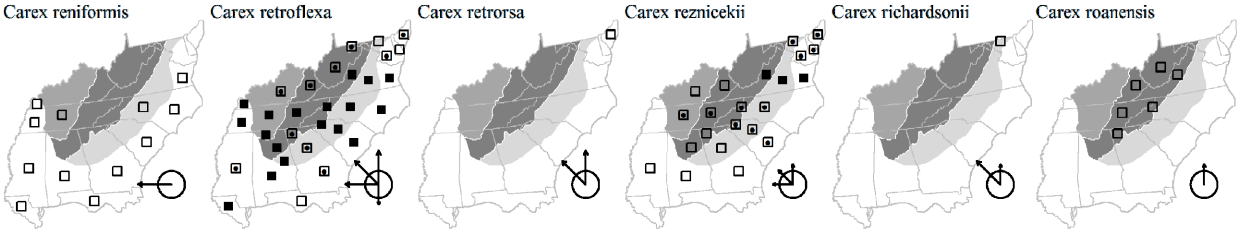
Carex retroflexa Muhlenberg ex Willdenow. Dry to mesic forests. ME, MI and IA, south to n. peninsular FL and TX. See Downer & Hyatt (2003). [= F, FNA, K, M, S; < *C. retroflexa* – RAB, W (also see *C. texensis*); = *C. retroflexa* var. *retroflexa* – C, G]

Carex retrorsa Schweinitz. Bottomland forests and nutrient-rich moist forests. NB and BC, south to n. NJ, sc. PA, IL, UT; reported, apparently erroneously, for DE and MD. [= C, F, FNA, G, K, M] {not yet mapped}

Carex reznicekii Werier, Reznicek's Sedge. Moist, forested slopes. RI, NY, PA, KY, and MO, south to SC, sw. GA, se. AL, n. MS and AR. To be expected in Panhandle FL and in WV. See Werier (2006) for detailed information. {add to synonymy; section *Acrocystis*}

Carex richardsonii R. Brown, Richardson's Sedge. Dry, rocky forests. VT west to AB, south to DC, MD, OH, IN, IA, and SD. This species ranges south to DC (according to C). [= C, F, FNA, G, K, M]

Carex roanensis F.J. Hermann, Roan Mountain Sedge. Cove forests, moderate to high elevation oak forests, northern hardwood forests. May-June. Sw. PA, w. VA, and e. WV south through e. KY, e. TN, w. NC to se. TN and nw. GA (Smith & Waterway 2008; Smith et al. 2006). See Smith & Waterway (2008), Smith et al. (2006), and Hermann (1947) for additional information; closely related to *C. virescens*. First reported for VA by Wieboldt et al. (1998). [= FNA, K, W]



Carex rosea Schkuhr ex Willdenow, Rosy Sedge. Dry to dry-mesic hardwood forests. May-June. NS west to MB, south to FL Panhandle and TX. [= C, FNA, K; < *C. rosea* – RAB, G, W, WH (also see *C. appalachica* and *C. radiata*); = *C. convoluta* Mackenzie – F, M, S; *? C. flaccidula* Steudel]

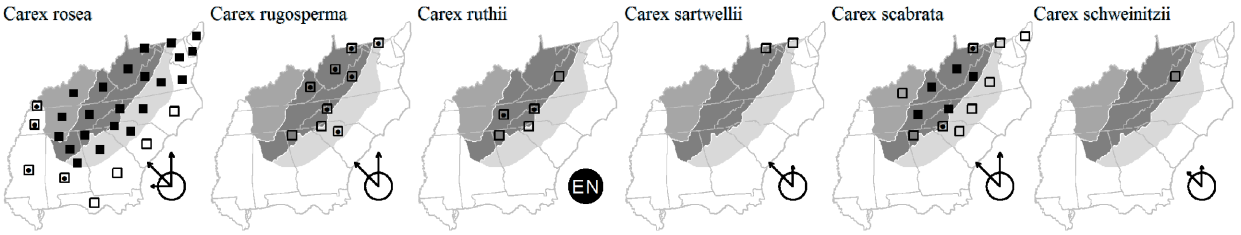
Carex rugosperma Mackenzie, Parachute Sedge. Old fields, shallow soils of rock outcrops, exposed forest margins. {Distribution and habitats in our area obscure} PE west to MN, south to MD, VA, IN, IL, and MO. See *C. umbellata* for discussion. Reported for South Carolina by Hill & Horn (1997). [= G, M; < *C. umbellata* – RAB, C, W; = *C. umbellata* – F, misapplied; = *C. tonsa* (Fernald) Bicknell var. *rugosperma* (Mackenzie) Crins – FNA, K]

Carex ruthii Mackenzie, Ruth's Sedge. Seepage areas, in forest or open areas. May-June. A Southern Appalachian endemic: sw. VA south through w. NC and e. TN to nw. SC and n. GA. [= C, F, FNA, K, M, S; = *C. muricata* Linnaeus var. *ruthii* (Mackenzie) Gleason – RAB, G; < *C. muricata* – W]

Carex sartwellii Dewey, Sartwell's Sedge. Wetlands. QC west to BC, south to MD, PA, OH, IN, IL, MO, CO, and ID. [= FNA, C, F, G, M; > *C. sartwellii* var. *sartwellii* – K]

Carex scabrata Schweinitz. Seepage slopes, brook-banks, often in shade. May-July. NS west to MI, south to NJ, n. GA, OH, and MO. [= RAB, C, F, FNA, G, GW, K, M, S, W]

Carex schweinitzii Dewey ex Schweinitz, Schweinitz's Sedge. Bogs. June. VT west to n. MI, south to NJ (and MO?); disjunct in NL (Newfoundland). The distribution of this species is local and fragmented. The alleged occurrences of *C. schweinitzii* in w. NC are based on misidentification of *C. utriculata*. [= C, F, FNA, G, K, M, S]



Carex scoparia Sckuhr ex Willdenow *var.* ***scoparia***. Bogs, swamp forests, marshes, seepy ledges, ditches. May-June. NL (Newfoundland) west to BC, south to GA, MS, and CA. Var. *tesselata* Fernald & Wiegnd is endemic to NB and ME. [= F, FNA, K; < *C. scoparia* – RAB, C, G, GW, W]

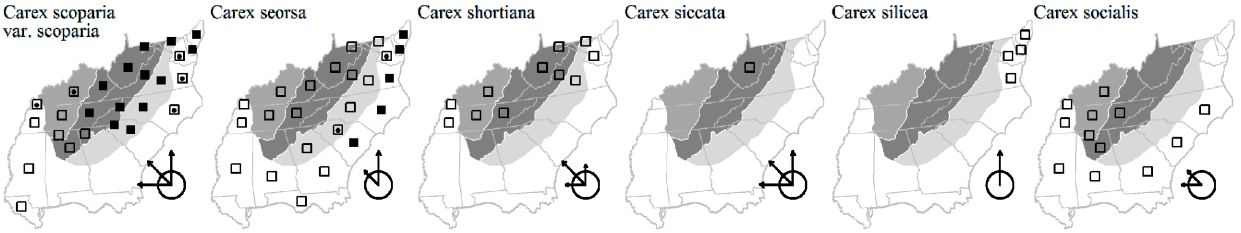
Carex seorsa Howe. Acidic swamp forests. May-June. MA south to GA and Panhandle FL in the Coastal Plain, scattered inland westward to NY, OH, MI, IN, AR, and TN. [= RAB, C, FNA, G, GW, K, M, S, W]

Carex shortiana Dewey, Short's Sedge. Calcareous bottomlands and meadows. May-June. PA, s. ON, IL, and IA, south to w. VA, e. TN, AR, and OK. [= C, F, FNA, G, K, M, W]

Carex siccata Dewey, Bronze Sedge. Dry upland habitats. May-July. ME and NT south to NJ, OH, IL, MN, and AZ. [= C, FNA, G, M; < *C. siccata* – K (also see *C. foenea*); = *C. foenea* Willdenow – F, misapplied]

Carex silicea Olney, Seabeach Sedge. Beaches and shores. NL (Newfoundland) south to VA, along the coast. [= C, F, FNA, G, K]

Carex socialis Mohlenbrock & Schwegman. Blackwater and brownwater swamp forests and bottomlands. Se. and sc. NC south to e. GA, west to e. TX, and north in the interior to s. IN, s. IL, and se. MO. [= C, FNA, K]



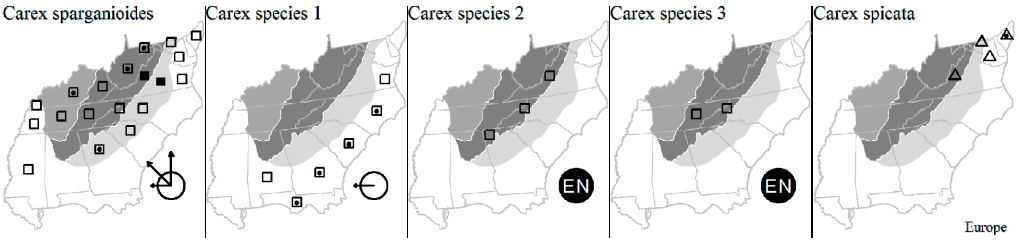
Carex sparganioides Muhlenberg ex Willdenow. Rich forests. May-June. ME, ON, MN, and SD south to GA, AR, and KS. Records entangled with *C. aggregata*. [= RAB, F, FNA, K, M, W; = *C. sparganioides* var. *sparganioides* – C, G]

Carex species 1, Canebrake Sedge. Canebrakes and acid swamps. February-May. Coastal Plain, from se. VA to Panhandle FL, west to w. LA. [< *C. novae-angliae* Schweinitz – FNA; = *Carex "austrodeflexa"*, in prep.] {section *Acrocystis*}

Carex species 2, Blue Ridge Sedge. Seepages over various substrates along the Blue Ridge Escarpment, including opn fen-like wetlands. Early April-early June. A Southern Blue Ridge endemic, from sw. VA through w. NC to ne. GA (Rabun County). Under study by D.B. Poindexter and T.F. Wieboldt. {section *Acrocystis*}

Carex species 3, Smoky Mountain Sedge. Seepages at moderate to high elevations. Endemic to the Great Smoky Mountains National Park. Under study by D. Estes. {not yet keyed; section *Phacocystis*}

* ***Carex spicata*** Hudson. Fields and lawns; native of Europe and w. Asia. Reported as south to s. NJ, n. DE, c. MD. VA reports said to be erroneous in FNA. [= C, F, FNA, G, K, M]



Carex sprengelii Dewey ex Sprengel, Sprengel's Sedge, Long-beaked Sedge. {habitats}. South to n. NJ, e. PA (Rhoads & Klein 1993), and n. DE (FNA). [= C, F, FNA, G, K, M]

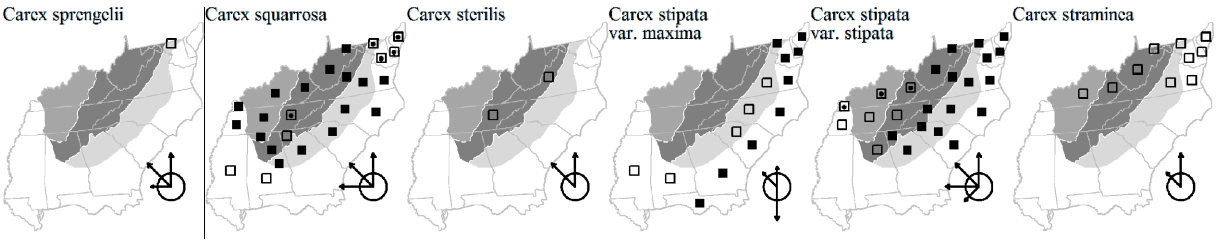
Carex squarrosa Linnaeus. Bottomland forests. June-July. CT west to se. ME and NE, south to NC, n. SC, and AR. [= RAB, C, F, FNA, G, GW, K, M, S, W]

Carex sterilis Willdenow, Sterile Sedge. Mafic fens. NL (Newfoundland) west to SK, south to sw. VA (Grayson County), ne. TN, IL, and MO. Outside of our area, *C. sterilis* is primarily a species of calcareous fens or seepages. First reported for VA by Wieboldt et al. (1998). [= C, F, FNA, G, K, M]

Carex stipata Muhlenberg ex Willdenow *var.* ***maxima*** Chapman. Marshes, ditches, alluvial forests. May-June. NJ south to c. peninsular FL, west to TX, north in the interior to s. MO, s. IN, and w. KY, primarily on the Coastal Plain. The validity of this variety needs additional study. [= RAB, C, F, FNA, G, K; < *C. stipata* – GW, W, WH; = *C. uberior* (C. Mohr) Mackenzie – M, S]

Carex stipata Muhlenberg ex Willdenow *var.* ***stipata***. Marshes, ditches, alluvial forests. May-June. NL (Newfoundland) west to AK, south to SC, TN, KS, NM, and Mexico. [= RAB, C, F, FNA, G, K; < *C. stipata* – GW, W; = *C. stipata* – M; < *C. stipata* – S]

Carex straminea Willdenow ex Schkuhr, Straw Sedge. Wetlands. MA west to WI, south to NC, KY, and MO. [= F, FNA, K; = *C. straminea* var. *straminea* – C, G; *? C. richii* (Fernald) Mackenzie – M]



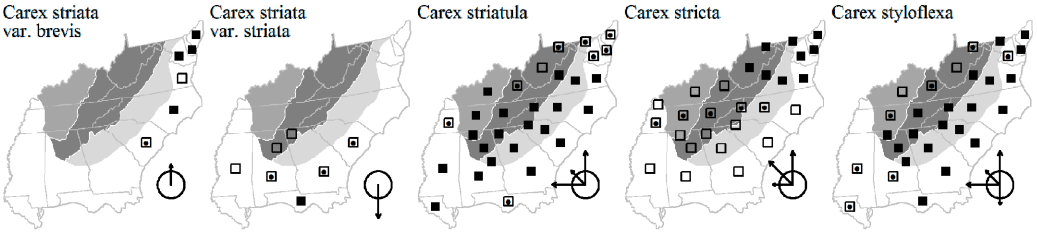
Carex striata Michaux *var.* ***brevis*** L.H. Bailey. Pocosins, limesink ponds, small depression ponds, clay-based Carolina bays, acid peaty swamps, wet savannas (dominated by *Pinus serotina* and/or *Taxodium ascendens*). May-June. E. MA south to SC. See Reznicek & Catling (1986) for discussion of the nomenclatural change. [= C, FNA, K; < *C. walteriana* L.H. Bailey – RAB, GW, M, S; = *C. walteriana* var. *brevis* (L.H. Bailey) L.H. Bailey – F, G]

Carex striata Michaux *var.* ***striata***, Pocosin Sedge. Pocosins, limesink ponds, small depression ponds, clay-based Carolina bays, acid peaty swamps, wet savannas (dominated by *Pinus serotina* and/or *Taxodium ascendens*). May-June. SC south to c. FL and Panhandle FL. [= C, FNA, K; < *C. walteriana* L.H. Bailey – RAB, GW, M, S; = *C. walteriana* var. *walteriana* – F, G; < *C. striata* – WH]

Carex striatula Michaux. Bottomland and other nutrient-rich forests. May-June. Se. NY and PA west to TN, south to n. FL, Panhandle FL, and TX. The distinction of this species as separate from *C. laxiflora* is problematic and requires additional study. Naczi (1999b) reports chromosome numbers of n = 18, 20. [= RAB, C, F, FNA, K, M, W, WH; = *C. laxiflora* var. *angustifolia* Dewey – G; *? C. laxiflora* – S, misapplied]

Carex stricta Lamarck. Bogs, sedge meadows, depression ponds, old beaver ponds. May-June. QC and NS west to MB, south to n. NC and TX. [= RAB, C, FNA, GW, K, W; > *C. stricta* var. *stricta* – F; > *C. stricta* var. *strictior* (Dewey) Carey – F; = *C. stricta* var. *stricta* – G; > *C. stricta* – M, S; > *C. strictior* Dewey – M, S]

Carex styloflexa Buckley. Bogs, wet forests. May-June. CT west to s. OH, south to c. peninsular FL and se. TX. [= RAB, C, F, FNA, G, K, M, S, W, WH]



Carex suberecta (Olney) Britton, Prairie Straw Sedge. Fens, calcareous wetlands. ON and MN south to sw. VA, WV, OH, IN, IL, AR, and TX. [= C, F, FNA, G, K]

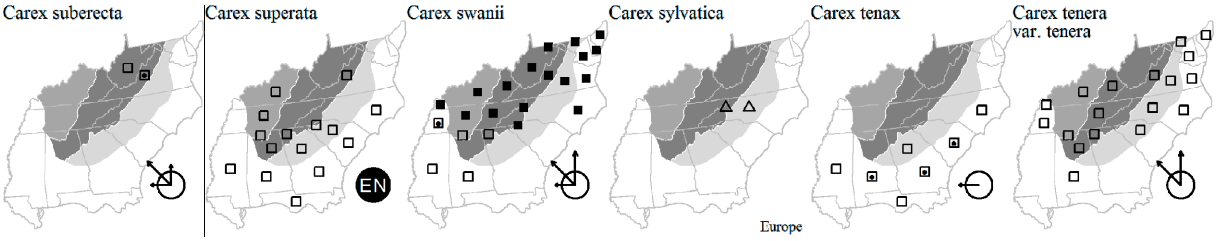
Carex superata Naczi, Reznicek, & B.A. Ford. Calcareous forests and woodlands. April-June. Sc. NC, nc. SC, sw. VA, sc. KY, and ne. MS, south to Panhandle FL and s. AL. Reported for sw. VA (as *C. willdenowii* var. *megarrhyncha*) by Wieboldt et al. (1998). [= FNA, K, WH; < *C. willdenowii* – RAB, F; < *C. willdenovii* – C, G, M, S (also see *C. basiantha* and *C. willdenowii*) and orthographic variant; < *C. willdenowii* Schkuhr ex Willdenow var. *megarrhyncha* Hermann]

Carex swanii (Fernald) Mackenzie. Nutrient-rich forests, woodlands, and openings. May-June. NS, s. MI, s. WI, south to nw. SC and ne. AR. [= RAB, C, F, FNA, G, K, M, S, W; = *C. virescens* Muhlenberg ex Willdenow var. *swanii* Fernald]

* ***Carex sylvatica*** Hudson. Pastures, lawns; native of Europe. [= C, F, FNA, G, K, M]

Carex tenax Chapman. Longleaf pine sandhills. May-June. Sc. NC south to Panhandle FL, west to MS; also in sw. LA and se. TX. [= RAB, FNA, K, M; *? C. validior* Mackenzie – S]

Carex tenera Dewey *var.* ***tenera***, Slender Sedge. Low forests. NS west to BC, south to VA, NC, n. GA, ne. TN, MO, KS, WY, and OR. Var. *echinodes* (Fernald) Wiegand is restricted to the northern Midwest. [= F, FNA; < *C. tenera* – RAB, C, G, K]



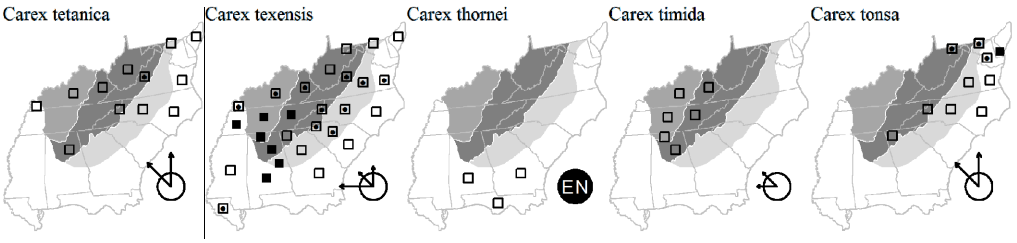
Carex tetanica Schkuhr, Rigid Sedge. Moist forests. May-June. MA west to MN, NE, and AB, south to NJ, VA, and NC. [= RAB, C, F, FNA, K, M; = *C. tetanica* var. *tetanica* – G]

Carex texensis (Torrey) L.H. Bailey. Dry to mesic forests. NY, OH, and KS south to FL and TX. See Downer & Hyatt (2003). [= F, FNA, K, M, S; < *C. retroflexa* Muhlenberg ex Willdenow – RAB; = *C. retroflexa* var. *texensis* (Torrey) Fernald – C, G]

Carex thornei Naczi (section *Griseae*). Mesic deciduous forests, often in the upper floodplain. Endemic to the drainage of the Apalachicola/Chattahoochee and Flint in s. GA and s. AL south to Panhandle FL. See Naczi, Bryson, & Cochrane (2002). [= FNA] {not yet keyed}

Carex timida Naczi & B.A. Ford. Calcareous, dry to mesic woodlands and forests. East to AL, TN, and KY. Related to *C. jamesii* and *C. juniperorum*, from which it was separated by Naczi & Ford (2001). [= FNA; < *C. jamesii* – C, F, G, K, M]

Carex tonsa (Fernald) Bicknell, Shaved Sedge. Xeric disturbed areas, old fields. {distribution and habitats in our area obscure}. QC west to AB, south to VA, IN, and WI. See *C. umbellata* for discussion. [= F, G, K, M; < *C. umbellata* – RAB, C, W; = *C. tonsa* var. *tonsa* – FNA, K]



Carex torta F. Boott in Tuckerman, Streambed Sedge, Twisted Sedge. Rocky streambeds, often dominant in patches in mountain streams. April-May. NS west to ON, south to sc. NC, SC, nc. GA (Jones & Coile 1988), AL, TN, and OH. See Gaddy (1981) for the first report of this species in SC. [= RAB, C, F, FNA, G, K, M, S, W]

Carex triangularis Böckler. Moist forests, ditches, other wet sites. April-June. SC and GA west to KS and TX. [= RAB, F, FNA, G, K, M, S; < *C. vulpinoidea* var. *vulpinoidea* – C; < *C. vulpinoidea* – GW]

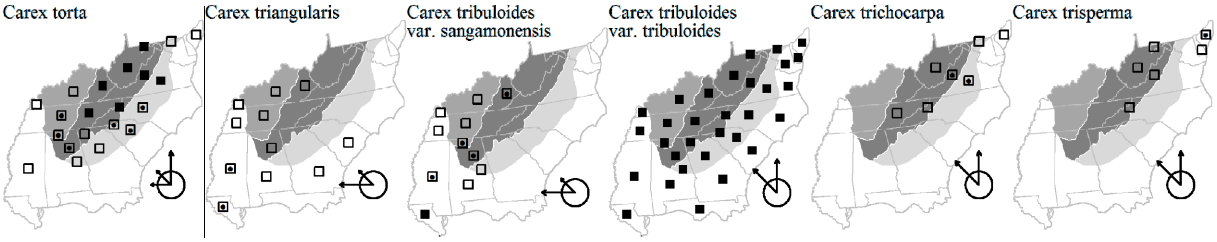
Carex tribuloides Wahlenberg *var.* ***sangamonensis*** Clokey. Bottomland forests. May-June. OH, IL, and KS, south to SC, AL, LA, and TX. [= FNA, G, K; < *C. tribuloides* – RAB, C, F, GW, W]

Carex tribuloides Wahlenberg *var.* ***tribuloides***. Bottomland forests. May-June. NB west to MN and NE, south to c. peninsular FL, GA, TN, MO, and KS. [= FNA, G, K; < *C. tribuloides* – RAB, C, F, GW, W]

Carex trichocarpa Muhlenberg ex Willdenow. Wet meadows, marshes. May-July. QC west to MN, south to DE, nw. NC, WV, IN, and MO. [= RAB, C, F, FNA, G, K, M, W]

Carex trisperma Dewey, Three-seeded Sedge. Bogs and swamps at high elevations (in NC and VA), usually growing in living *Sphagnum*, in shaded situations under shrubs or trees in montane wetlands, northward in bogs at low elevations. June. NL (Labrador) west to SK, south to NJ, MD, OH, n. IN, IL, and MN; and in the mountains to w. NC and WV. See Kirschbaum

(2007) for additional information about *C. trisperma* and *C. billingsii*. [= *C. trisperma* var. *trisperma* – C, F, FNA, G, K, M; < *C. trisperma* – RAB, W]



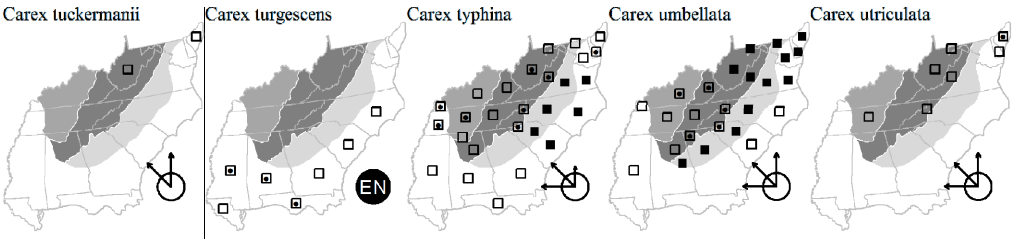
Carex tuckermanii F. Boott. Calcareous swampy forests and wet meadows. NB and MN south to WV, sc. PA, NJ, MD, and IL. A reported for Alleghany County, NC appears to be erroneous. [= C, F, FNA, K; = *C. tuckermani* – G, M, orthographic variant]

Carex turgescens Torrey, Pinebarren Sedge. Sandhill seepage bogs, streamhead pocosins, pocosin-sandhill ecotones, canebrakes, cypress domes and stringers, in highly acidic, sandy-peaty soils. May-June. Sc. NC south to Panhandle FL, west to se. LA, a Southeastern Coastal Plain endemic. [= RAB, FNA, GW, K, M, S, WH]

Carex typhina Michaux. Bottomland forests. June-July. ME and QC west to WI and se. MN, south to GA, Panhandle FL, and LA. [= RAB, C, F, FNA, G, GW, K, M, S, W, WH]

Carex umbellata Schkuhr ex Willdenow, Parasol Sedge. Old fields, other habitats. {distribution and habitats in our area obscure. NL (Newfoundland) west to SK, south to VA, TN, IL, and MN. It seems very possible that southern members of the *C. umbellata* complex may not correspond to the taxa "distinguished" in the northeastern United States. *C. tonsa, C. rugosperma,* and *C. umbellata* are circumscribed by various authors in different ways. This group needs critical study. [= FNA, G, K, M; < *C. umbellata* – RAB, C, W (also see *C. rugosperma* and *C. tonsa*); = *C. abdita* Bicknell – F]

Carex utriculata F. Boott, Beaked Sedge. Wet meadows. Boreal American, ranging south to DE, w. VA, nw. and sw. NC, ne. TN (Johnson County), IN, NE, NM, and CA. Recently verified for NC. [= C, FNA, K; = *C. rostrata* Stokes var. *utriculata* (F. Boott) L.H. Bailey – F, G; < *C. rostrata* – M, misapplied as to our material; = *C. schweinitzii* – RAB, by misidentification]



Carex venusta Dewey. Bay swamps, peat bogs, mossy wetlands, and other wet habitats. Se. VA south to Panhandle FL, on the Coastal Plain. [= M, S; = *C. venusta* var. *venusta* – C, F, G, K; < *C. venusta* – RAB, FNA, GW, W, WH (also see *C. oblita*)]

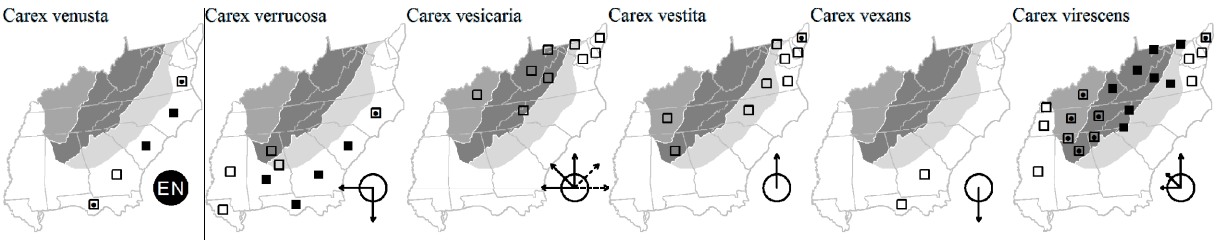
Carex verrucosa Muhlenberg. Pocosins, wet pinelands, pond cypress ponds, domes, and stringers. July-September. Se. NC south to south to s. FL, west to w. LA and e. TX. [= RAB, FNA, GW, K, M, S, WH; = *C. glaucescens* Elliott var. *androgyna* M.A. Curtis]

Carex vesicaria Linnaeus, Inflated Sedge. Bogs. Circumboreal, ranging south in North America to DE, w. VA, nw. NC, KY, IN, MO, NM, and CA. [= FNA, G; > *C. vesicaria* var. *vesicaria* – C, F, K; > *C. vesicaria* var. *monile* (Tuckerman) Fernald – F, K; *? C. vesicaria* – M; > *C. monile* Tuckerman]

Carex vestita Willdenow. Low forests. April-May. S. ME south to se. VA and nc. NC. [= RAB, C, F, FNA, G, K, M]

Carex vexans F.J. Hermann, Florida Hammock Sedge. Marshes, distches, swamps, hydric hammocks. E. Panhandle FL south to s. FL. [= FNA, K, WH; < *C. alata* – S]

Carex virescens Muhlenberg ex Willdenow. Nutrient-rich forests, woodlands, and openings. May-June. S. ME, NY, and s. MI, south to e. VA, w. NC, nw. SC, and MO. [= RAB, C, F, FNA, G, K, M, S, W]



Carex vulpinoidea Michaux. Wet sites. NL (Labrador) west to BC, south to FL, TX, Sonora, and CA. [= RAB, F, FNA, G, M, S, W; < *C. vulpinoidea* var. *vulpinoidea* – C, K; < *C. vulpinoidea* – GW (also see *C. annectens* and *C. triangularis*)]

Carex willdenowii Schkuhr ex Willdenow. Calcareous mesic forests, but also in more acidic dry-mesic upland oak forests. May-June. MA, VT, NY, s. ON, and c. IN, south to nc. SC, n. AL, and s. IL; disjunct in c. AR. Naczi (1999b) reports chromosome numbers of n = 31, 39. [= FNA, K; < *C. willdenowii* – RAB, F, W (also see *C. basiantha* and *C. superata*); < *C. willdenovii* – C, G, M, S (also see *C. basiantha* and *C. superata*) and orthographic variant]

Carex woodii Dewey, Wood's Sedge. Moist slopes and cove forests over mafic rocks (such as amphibolite), ultramafic rocks (such as olivine), or felsic rocks. May-June. NY west to MB, south to NC, nw. SC, n. GA, and MO. This species forms clonal patches reminiscent of *C. pensylvanica*, but has perigynia glabrous and filled by the achene at maturity; the foliage also has a paler green cast. It has probably been much overlooked in the past. Naczi (1999b) reports chromosome numbers of n = 22, 26. [= RAB, C, F, FNA, K, M, W; = *C. tetanica* var. *woodii* (Dewey) Wood – G]

Cladium P. Browne (Sawgrass, Twig-rush)

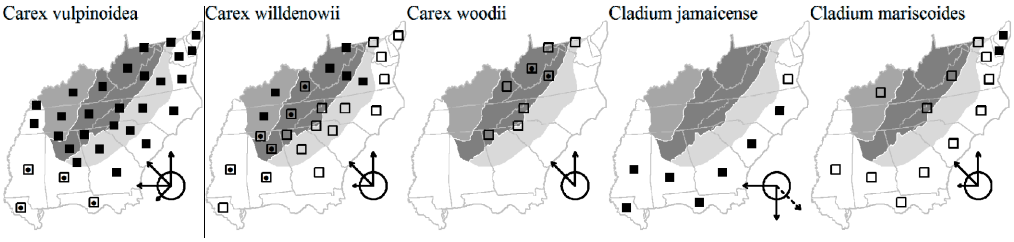
A genus of 3-4 species, herbs, subcosmopolitan. References: Bridges, Orzell, & Burkhalter (1993); Tucker in FNA (2002b); Goetghebeur in Kubitzki (1998b). Key based closely on Bridges, Orzell, & Burkhalter (1993).

1 Plants 1-3 m tall, coarse, from short rhizomes, forming dense tussocks; leaves 3-15 dm long, 5-12 mm wide, stiff and flat (or broadly V-shaped), the margins and midrib (beneath) harshly serrate (saw-toothed); inflorescence a narrow panicle 3-9 dm long, the branches bearing several fascicles of spikelets; achene base broadly rounded to truncate; [of tidal freshwater to brackish marshes or outer coastal plain calcareous savannas] ..... ***C. jamaicense***

1 Plants 0.4-1 m tall, relatively delicate, from creeping rhizomes, forming loosely tufted colonies; leaves 1-3 dm long, 1-3 mm wide, flat to channeled (terete apically), margins only slightly scabrous; inflorescence 0.5-3 dm long, of 2-4 umbelliform cymes, the branches rigidly ascending and bearing simple glomerules of spikelets; achene base squarely truncate to slightly flaring; [of Coastal Plain acidic seepages and tidal freshwater to slightly brackish marshes, Mountain fens or bogs] ..... ***C. mariscoides***

Cladium jamaicense Crantz, Sawgrass. In circumneutral to alkaline situations, including brackish marshes, and rarely somewhat inland in savannas underlain by coquina limestone. July-October. Se. VA south to s. FL, west to e. TX, and in the West Indies. This is, of course, the famous sawgrass which dominates many square miles in the Everglades of s. FL (where underlain by oolite). The leaves can cut flesh or clothing. *C. jamaicense* is sometimes treated as one component (ssp. *jamaicense*) of a multi-continental *C. mariscus* complex. [= RAB, C, F, FNA, G, GW, WH; = *C. mariscus* (Linnaeus) Pohl ssp. *jamaicense* (Crantz) Kükenthal – K; = *Mariscus jamaicensis* (Crantz) Britton – S]

Cladium mariscoides (Muhlenberg) Torrey, Twig-rush, Fen-sedge, Smooth Sawgrass. In strongly acidic to circumneutral situations, including acidic seepage at the margins of brackish marshes, in wet flats under *Pinus serotina* and *Taxodium ascendens* (Gaddy & Rayner 1980), in mucky seepage bogs in the fall-line sandhills, in peaty fens and bogs in the Mountains (especially over mafic or ultramafic rocks, such as amphibolite). July-September. NL (Newfoundland) west to SK Widespread and rather common north of the glacial boundary, with scattered and disjunct occurrences southward in VA, NC, SC, GA, Panhandle FL, n. KY (Clark et al. 2005), s. AL, se. MS (Sorrie & Leonard 1999), and e. TX. Bridges, Orzell, & Burkhalter (1993) discuss in detail the phytogeography of this plant, particularly in reference to its southern occurrences, which are curiously fragmented and disjunct. [= RAB, C, F, FNA, G, K, W, WH; = *Mariscus mariscoides* (Muhlenberg) Kuntze – S]



Cyperus Linnaeus 1753 (Umbrella Sedge)

A genus of about 500-550 species, herbs, of tropical and warm temperate areas. References: Goetghebeur in Kubitzki (1998b); Tucker, Marcks, & Carter in FNA (2002b). [also see *Kyllinga*]

This treatment is closely adapted from Tucker, Marcks, & Carter in FNA (2002b) and other sources. It needs substantial customization and revision prior to publication. Key lead 4 in the main key is problematic.

1 Inflorescences unbranched (the spikes sessile); spikelets 1-2-flowered; rachilla not or only slightly elongate; scales conspicuously keeled; lowest 2 scales of spikelet greatly reduced ..... [see ***Kyllinga***]

1 Inflorescences branched (the spikes pedunculate); spikelets 1-many-flowered; rachilla elongate; scales generally broadly rounded; lowest 2 scales of spikelet not greatly reduced.

2 Stigmas 2; achenes lenticular.

3 Achenes dorsiventrally flattened, borne with a flattened face toward the rachillas; [subgenus *Juncellus*] ..... **Key A**

3 Achenes laterally flattened, borne with an edge toward the rachilla; [subgenus *Pycreus*] ..... **Key B**

2 Stigmas 3; achenes trigonous.

4 Spikelets borne in digitate clusters (rarely singly), or in umbellate or glomerulate heads; [subgenus *Pycnostachys*] ..... **Key C**

4 Spikelets borne in spikes on a conspicuous rachis.

5 Rachilla articulate at the base of each scale, the mature spike therefore disarticulating into segments consisting of a scale, an achene, and a cartilaginously thickened section of the rachilla (and its wings); [subgenus *Diclidium*] ..... **Key D**

5 Rachilla continuous, or articulate only at the base; [subgenus *Cyperus*] ..... **Key E**

Key A – subgenus *Juncellus* – stigmas 2; achenes lenticular; achenes dorsiventrally flattened, borne with a flattened face toward the rachillas

1 Plants 1-3 (-6) dm tall; leaf blades 0-7 cm long ..... ***C. laevigatus***
1 Plants to 10 dm tall; leaf blades 20-40 cm long ..... ***C. serotinus***

Key B – subgenus *Pycreus* – stigmas 2; achenes lenticular; achenes laterally flattened, borne with an edge toward the rachilla

1 Scales with excurved awn 0.3-0.5 mm long; stamens 1-2; achenes ca. 0.6 mm long ..... ***C. pumilus***
1 Scales entire or minutely mucronate; stamens 2-3; achenes (0.7-) 1.0-1.6 mm long.
2 Achenes oblong with a truncate apex, subcylindric, only slightly compressed laterally.
3 Scales 2.7-3.6 mm long, 1.6-1.8 mm wide; achenes 1.2-1.6 mm long, 0.6-0.9 mm wide ..... ***C. filicinus***
3 Scales 1.5-2.4 mm long, 1.0-1.4 mm wide; achenes 0.8-1.2 mm long, 0.4-0.6 mm wide ..... ***C. polystachyos***
2 Achenes ovoid, obovoid, or ellipsoid, with a rounded or subacute apex, biconvex or strongly laterally flattened.
4 Scales membranous, ovate, loosely imbricate, each barely overlapping the next scale on the same side of the rachilla, the spikelets thus appearing serrate-margined to the unaided eye; annual, 30-75 cm tall ..... ***C. flavicomus***
4 Scales firm, oblong, closely imbricate, thus the spikelets appearing smooth-margined to the unaided eye; perennial or annual, 5-75 cm tall.
5 Achene reticulations rectangular, elongate; achenes broadly obovoid, black; stamens 3 ..... ***C. flavescens***
5 Achene reticulations isodiametric or square; achenes ellipsoid or obovoid, brown or black; stamens 2-3.
6 Scales yellow or yellowish brown; culms 15-75 cm tall ..... ***C. lanceolatus***
6 Scales brown or clear; culms 3-25 (-30) cm tall.
7 Plants perennial from slender rhizomes ..... ***C. sanguinolentus***
7 Plants annual from fibrous roots.
8 Scales 1.9-2.7 mm long, 1.8-2.3 mm wide; styles 0.6-1.0 mm long; stigmas 1.0-1.5 mm long ..... ***C. bipartitus***
8 Scales 2.5-3.0 mm long, 1.6-1.9 mm wide; styles 0.3-0.5 mm long; stigmas 2.2-3.1 mm long ..... ***C. diandrus***

Key C – subgenus *Pycnostachys* – stigmas 3; achenes trigonous; spikelets borne in digitate clusters (rarely singly), or in umbellate or glomerulate heads

1 Scales folded in half their entire length (conduplicate).
2 Plant a perennial.
3 Achenes with a granular or papillose surface; leaves often bladeless; bracts 2 (-3).
4 Rays 5-15; anthers 0.3-0.5 mm long ..... ***C. haspan***
4 Rays 100-250; anthers 1.0-1.2 mm long ..... ***C. prolifer***
3 Achenes with a smooth surface; leaves with blades; bracts 3-5.
5 Plants with tubers and stolons; spikelets commonly proliferous ..... ***C. dentatus***
5 Plants with stolons only; spikelets not proliferous ..... ***C. lecontei***
2 Plant an annual.
6 Scales cuspidate, with a cusp 0.6-1.2 mm long ..... ***C. cuspidatus***
6 Scales blunt or slightly mucronate.
7 Spikelets 30-20 per head; styles ca. 0.1 mm long ..... ***C. difformis***
7 Spikelets 3-12 per head; styles 0.3-0.4 mm long ..... ***C. fuscus***
1 Scales 2-keeled in the lower third to half (bicarinate).
8 Leaves bladeless; inflorescence bracts ca. 20, borne horizontally; stamens 3 ..... ***C. involucratus***
8 Leaves with leaf blades; inflorescence bracts 2-10, borne variously; stamens 1 (-2).
9 Stems sharply 3-angled, the faces concave, the angles harshly scabrous; leaf blades and inflorescence bracts with conspicuous cross-veins
10 Rays of the inflorescence 3-5; scales ovate, 1.4-1.6 mm long; achenes 1.0-1.2 mm long ..... ***C. drummondii***
10 Rays of the inflorescence 6-12; scales oblancolate, 1(1.3-) 1.5-2.0 (-2.4) mm long; achenes 1.2-1.5 mm long ..... ***C. virens***
9 Stems rounded, obscurely 3-faced, or 3-angled, the faces flat or convex, smooth or slightly scabrous; leaf blades and involucral bracts lacking conspicuous cross-veins.
11 Stems slightly scabrous, the prickles pointing downward (retrorse) ..... ***C. surinamensis***
11 Stems smooth or if rough, the prickles pointing upward (antrorse) or outward (extrorse).
12 Achene bases swollen, spongey ..... ***C. distinctus***
12 Achene bases not swollen and spongey.
13 Achenes narrowly ellipsoid to linear, about 3-6× as long as wide.
14 Longest bract erect (appearing as a continuation of the culm); spikelets red-tinged ..... ***C. reflexus***
14 Longest bract ascending (not appearing as a continuation of the culm); spikelets pale green.
15 Achenes ellipsoid to narrowly ellipsoid, 0.9-1.1 mm long, 0.3-0.4 mm wide, about 3× as long as wide; style 0.2-0.4 mm long; stigmas 0.4-0.6 mm long ..... ***C. entrerianus***
15 Achenes linear, 1.2-1.4 mm long, 0.2 (-0.3) mm wide, about 5-6× as long as wide; style 0.5-0.8 mm long; stigmas 0.6-1.0 mm long ..... ***C. pseudovegetus***
13 Achenes broadly ellipsoid, about 2-2.5× as long as wide (the stipe or cuneate base typically conspicuous).
16 Annual; longest inflorescence bract erect or strongly ascending; anther ca. 0.5 mm long ..... ***C. acuminatus***
16 Perennial; longest inflorescence bract horizontal or slightly ascending (< 30 degrees); anther 0.8-1.2 mm long.
17 Scales declined 3-45 degrees from the rachilla; achenes with a stipe ..... ***C. eragrostis***
17 Scales declined (45-) 60-90 degrees from the rachilla; achenes cuneate at the base ..... ***C. ochraceus***

Key D – subgenus *Diclidium* – stigmas 3; achenes trigonous; spikelets borne in spikes on a conspicuous rachis; rachilla articulate at the base of each scale, the mature spike therefore disarticulating into segments consisting of a scale, an achene, and a section of the rachilla (including its wings)

1 Tip of each scale not reaching above the base of the next distal scale on the same side of the rachilla, and usually ending short of it; achene linear oblong, 1.5-2 mm long, about 3× as long as wide ..... ***C. odoratus*** *var.* ***engelmannii***
1 Tip of each scale reaching above the base of the next distal scale on the same side of the rachilla; achene ellipsoid, obovoid-oblong, or slenderly obovoid, 1-1.5 mm long, about 2× as long as wide ..... ***C. odoratus*** *var.* ***odoratus***

Key E – subgenus *Cyperus* – stigmas 3; achenes trigonous; spikelets borne in spikes on a conspicuous rachis; rachilla continuous, or articulate only at the base

1 Upper scales of the spikelet with a straight or excurved mucronate or cuspidate apex 0.4-1.2 mm long.
2 Floral scales persistent, appressed, 2.6-3.9 mm long; spikelets nearly cylindrical in ×-section; rachilla winged ..... ***C. retroflexus***
2 Floral scales deciduous, spreading, mostly < 3 mm long; spikelets quadrangular in ×-section; rachilla wingless, or wings < 0.4 mm wide.
3 Plant a rhizomatous perennial, culms single ..... ***C. schweinitzii***
3 Plant an annual, culms several, cespitose.
4 Achenes 0.2-0.6 mm wide; stamen 1; culms 2-16 cm tall.
5 Achenes 0.5-0.6 mm wide, < 2× as long as wide, cuneate to the base; scales 1.0-2.0 mm wide, 9-13-nerved; filaments ca. 2.5 mm long; anthers 0.4-0.8 mm long ..... ***C. granitophilus***
5 Achenes (0.2-) 0.3-0.4 (-0.5) mm wide, > 2× as long as wide, with a minute stipe at the base; scales 0.5-1.0 mm wide, (5-) 7-9 (-11)-nerved; filaments ca. 1.5 mm long; anthers 0.3-0.4 mm long ..... ***C. squarrosus***
4 Achenes 0.5-1.1 mm wide; stamens 3; culms (2-) 6-50 cm tall.
6 Achenes obovoid, truncate at the apex; leaves flat to V-shaped; live plants not viscous to the touch ..... ***C. compressus***
6 Achenes elipsoid, with a beak 0.5-1.2 mm long; leaves involute; live plants viscous to the touch ..... ***C. oxylepis***
1 Upper scales blunt, or with a mucro <0.3 mm long.
7 Spikelets linear, 0.8-1.6 (-1.9) mm wide.
8 Spikelet 1.2-1.6 mm wide; scales deciduous; rachilla persistent, wingless or very narrowly winged, not clasping achene ..... ***C. distans***
8 Spikelet 0.8-1.3 (-1.9) mm wide; scales persistent; rachilla breaking into segments with a scale and achene attached, the wing prominent and clasping the achene
9 Tip of each scale not reaching above the base of the next distal scale on the same side of the rachilla, and usually ending short of it; achene linear oblong, 1.5-2 mm long, about 3× as long as wide ..... ***C. odoratus*** *var.* ***engelmannii***
9 Tip of each scale reaching above the base of the next distal scale on the same side of the rachilla; achene ellipsoid, obovoid-oblong, or slenderly obovoid, 1-1.5 mm long, about 2× as long as wide ..... ***C. odoratus*** *var.* ***odoratus***
7 Spikelets oblong-ovate to linear-oblong, (1.5-) 2.0-3.0 (-4.0) mm wide.
10 Spikelets strongly compressed, >2×as wide as thick (in cross-section); scales spreading or appressed.
11 Scales obovate-orbiculate, notched at the tip; styles < 0.1 mm long.
12 Rachilla wingless; scales scarcely mucronate ..... ***C. iria***
12 Rachilla narrowly winged; scales distinctly mucronate ..... ***C. microiria***
11 Scales elliptic to oblong or ovate, acute to obtuse, not notched at the tip; styles 0.3-1.3 mm long.
13 Rachilla with hyaline, whitish, or straw-colored wings 0.2-0.5 mm wide.
14 Culms terete (at least toward the base), nodose-septate; inflorescence bracts 2 (-4), all erect; leaf blades generally absent ..... ***C. articulatus***
14 Culms trigonous, not nodose-septate; inflorescence bracts 3-7, horizontal, ascending, or reflexed; leaf blades present.
15 Scales persistent; rachilla persistent; elongate stolons up to 15 cm long present, bearing tubers.
16 Scales purplish red to reddish brown, with green midveins; base of culm indurate; stolons wiry, springy when dried ..... ***C. rotundus***
16 Scales yellowish brown to brown; base of culm soft; stolons spongy, flexible when dried.
17 Style and stigma combined < 4.2 mm long ..... ***C. esculentus*** *var.* ***leptostachyus***
17 Style and stigma combined > 4.2 mm long ..... ***C. esculentus*** *var.* ***macrostachyus***
15 Scales deciduous; rachilla deciduous; rhizomes up to 5 cm long present, not bearing tubers.
18 Scales 3.2-4.5 (-6) mm long; anthers 0.3-0.5 mm long; stigmas 3-4 mm long; achenes narrowly oblong ..... ***C. strigosus***
18 Scales 1.5-2.5 (-3.1) mm long; anthers 0.7-1.8 mm long; stigmas 1-2 (-3) mm long.
19 Achenes coarsely punctate ..... ***C. planifolius***
19 Achenes smooth ..... ***C. grayi***
13 Rachilla wingless, or with wings 0-0.2 mm wide.
20 Longest inflorescence bract erect or strongly ascending ..... ***C. schweinitzii***
20 Longest inflorescence bract horizontal, weakly ascending, or reflexed.
21 Longest inflorescence bract weakly ascending.
22 Rachis (to which the spikelets are attached) glabrous; achenes 1.5-2.0 mm long; spikes subglobose to broadly ovoid; [of upland sites, of NC northward] ..... ***C. houghtonii***
22 Rachis hispidulous; achenes 1.0-1.2 mm long; spikes loosely oblong-ovoid; [of wetland sites, of SC southward] ..... ***C. pilosus***
21 Longest inflorescence bract horizontal to reflexed.
23 Anthers 0.8-1.0 mm long ..... ***C. filiculmis***
23 Anthers 0.3-0.6 mm long.
24 Scales 2.5-3.8 mm long, usually fitting loosely over the mature achene, the margins spreading or loosely clasping it; spikelet with 5-22 scales ..... ***C. lupulinus*** *ssp.* ***lupulinus***
24 Scales 1.8-2.5 mm long, usually fitting tightly over the achene, the margins tightly clasping it; spikelets with 3-7 scales ..... ***C. lupulinus*** *ssp.* ***macilentus***
10 Spikelets subterete or quadrangular, 1-1.5×as wide as thick (in cross-section); scales appressed.

25 Scales deciduous; rachillas persistent; rachilla wings deciduous, but remaining firmly attached at the base even after the achenes fall; spikelets with (6-) 12-20 (-40) scales ..... ***C. erythrorhizos***
25 Scales persistent; rachillas **either** deciduous (the mature spikelets generaly falling as a single unit from the rachis) **or** persistent; rachilla wings persistent; spikelets with 2-8 scales.
26 Spikelets reflexed (some of the uppermost spreading to ascending).
27 Culms glabrous; leaves and inflorescence bracts nearly glabrous ..... ***C. hystricinus***
27 Culms (at least the upper portion) scaberulous or puberulent; leaves and inflorescence bracts puberulent on the upper surface.
28 Inflorescence rays scaberulous; leaves and inflorescence bracts pubescent on the upper and lower surfaces; culm obtusely trigonous to nearly terete ..... ***C. plukenetii***
28 Inflorescence rays smooth (or with a very few hairs); leaves and inflorescence bracts pubescent on the upper surface and on the midvein only on the lower surface; culm sharply 3-angled ..... ***C. retrofractus***
26 Spikelets ascending to spreading (some of the lowermost reflexed).
29 Spikes cylindrical, 2-5× as long as wide.
30 Spikelets ellipsoid, 2-3×as long as wide; spikelets with 1-2 (-3) fertile scales ..... ***C. aggregatus***
30 Spikelets lanceolate to linear, 4-10× as long as wide; spikelets with 3-8 fertile scales.
31 Scales greenish to light brown, the tips overlapping the lower 1/4 to 1/3 of the next scale ..... ***C. strigosus***
31 Scales reddish brown or tawny, the tips barely reaching the base of the next scale ..... ***C. thyrsiflorus***
29 Spikes ovoid, globose, or obovoid, 1-2× as long as wide.
32 Scales >4 mm long; achenes >2 mm long.
33 Spikes tightly globose ..... ***C. echinatus***
33 Spikes ellipsoid to obovoid.
34 Spikelets subquadrangular, the terminal scale elongate, forming a subulate tip to the spikelet; leaves and inflorescence bracts 3-6 mm wide, smooth ..... ***C. hystricinus***
34 Spikelets subterete, the terminal scale not elongate, the spikelet therefore acute; leaves and inflorescence bracts mostly >10 mm wide, scabrous on the upper surfaces.
35 Spikes dense, with 50-90 spikelets, each with 3-6 (-7) fertile scales; achenes conspicuously falcate-curved, 3-4× as long as wide ..... ***C. lancastriensis***
35 Spikes loose, of 13-75 spikelets, each with 4-8 (-11) fertile scales; achenes straight, 5-6× as long as wide ..... ***C. refractus***
32 Scales <4 mm long; achenes <2 mm long.
36 Spikes with parallel sides, mostly > 25 mm long; spikelets quadrate.
37 Spikelets narrowly ellipsoid, 1.5-2.0 mm wide ..... ***C. tetragonus***
37 Spikelets linear, 0.5-1.0 mm wide ..... ***C. thyrsiflorus***
36 Spikes with curved (convex) sides, mostly < 20 mm long; spikelets somewhat compressed.
38 Scales ascending; achenes oblong-fusiform, gradually narrowed to both ends ..... ***C. ovatus***
38 Scales appressed; achenes elongate, abruptly constricted at the tip.
39 Spikes loose, globose to hemispheric; spikelets angular in cross-section, with 3-8 fertile scales; scales yellow-greenish ..... ***C. croceus***
39 Spikes tight, globose, oblong, or oblong-cylindric; spikelets subterete in cross-section, with 1-3 (-4) fertile scales; scales straw-colored or brown on the sides.
40 Spikes globose; spikelets (3.5-) 4.0-7.0 mm long; scales membranous, straw-colored, 3.5-4.5 mm long; achenes 1.7-2.3 mm long ..... ***C. echinatus***
40 Spikes oblong to oblong-cylindrical; spikelets 2.2-4.0 (-4.5) mm long; scales firm, brown or straw-colored, 1.8-2.6 mm long; achenes 1.2-2.0 mm long ..... ***C. retrorsus***

Cyperus acuminatus Torrey & Hooker ex Torrey. Wetlands, especially over limestone. IL west to ND, south to w. LA, TX, and n. Mexico; disjunct from WA to s. CA; disjunct eastward at scattered localities in VA, NC, GA (Echols 2007), TN, KY, and OH (where probably native), and NY and NH (where probably introduced). [= C, F, FNA, G, GW, K, W]

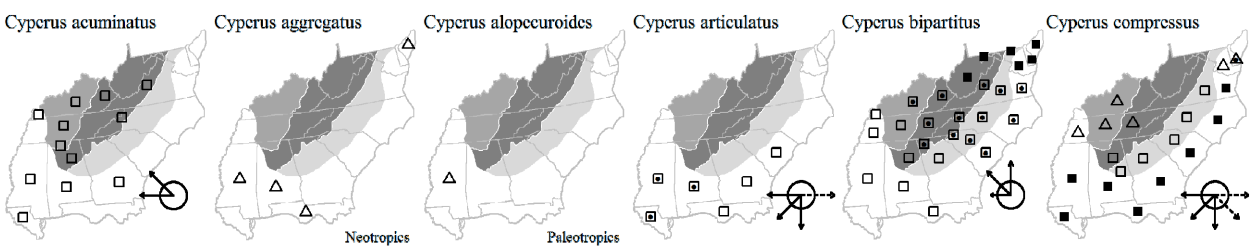
* ***Cyperus aggregatus*** (Willdenow) Endlicher. Disturbed areas in ports, apparently introduced on ballast, perhaps only a waif and no longer present; native of tropical America. [= FNA, K, WH; = *C. cayennensis* (Lamarck) Britton – S; = *C. flavus* (Vahl) Nees; = *C. huarmensis* (Kunth) M.C. Johnston, misapplied]

* *Cyperus alopecuroides* Rottbøll. Disturbed wet areas; native of Old World tropics. Reported for FL in FNA and for MS in Kartesz (2010). [= FNA, WH] {not yet keyed}

Cyperus articulatus Linnaeus. Marshes, especially tidal. July-September. Se. SC south to s. FL west to e. TX, and south into tropical America. [= RAB, FNA, GW, K, S, WH]

Cyperus bipartitus Torrey. Low fields, ditches, marshes, along streams. July-October. ME and QC west to MN and WA, south to FL (Wakulla County) (Kunzer et al. 2009), GA, LA, TX, NM, AZ, and CA. [= C, FNA, GW, K, W; ? *C. rivularis* Kunth – RAB, F, G, S, WV]

Cyperus compressus Linnaeus. Sandy fields, disturbed areas. July-September. Pantropical and warm temperate, north in North America to s. NY, s. OH, s. IL, and e. TX. [= RAB, C, F, FNA, G, GW, K, S, W, WH]



Cyperus croceus Vahl. Savannas, pine flatwoods, disturbed areas. July-October. NJ and MO south through the New World tropics. {problems in circumscription; check specimens} [= C, FNA, WH; = *C. globulosus* Aublet – F, G, GW, W, misapplied; >

C. croceus – K; > *C. globosus* – S?; > *C. multiflorus* (Britton) Small – S; > *C. globosus* – RAB; > *C. retrorsus* Chapman var. *robustus* (Böckler) Kükenthal – RAB, K; > *C. plankii* Britton – S?]

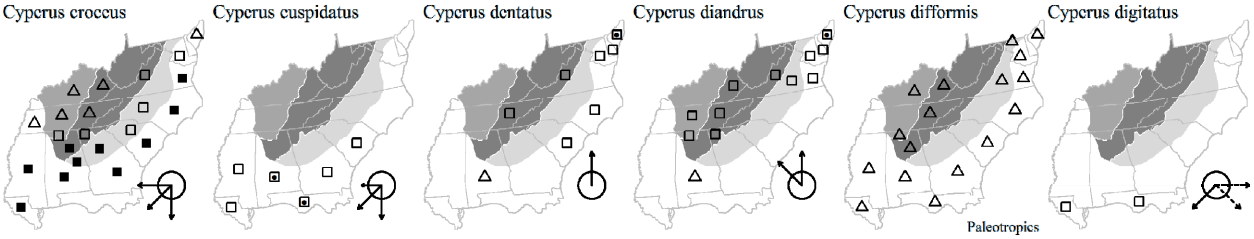
Cyperus cuspidatus Kunth. Sandy fields, disturbed areas. July. S. SC south to FL, west to LA; New World tropics. [= RAB, FNA, GW, K, S, WH]

Cyperus dentatus Torrey, Toothed Flatsedge. Low sandy areas. July-October. NS and QC south to e. SC; disjunct inland in WV, s. TN, and nw. IN. [= RAB, C, F, FNA, G, GW, K, S, W]

Cyperus diandrus Torrey. {habitat}. ME west to ND, south to VA, c. TN, n. AL, IL, MO, and IA. [= C, F, FNA, G, GW, K, S, W]

* ***Cyperus difformis*** Linnaeus, Smallflower Umbrella Sedge. Disturbed areas; native of Old World tropics. See Bryson et al. (1996), Carter, Baker, & Morris (2009). [= C, F, FNA, G, GW, K, WH]

Cyperus digitatus Roxburgh. Disturbed wet areas. Pantropical, north in North America to FL Panhandle, LA, and TX. [= FNA] {not yet keyed; add to synonymy}



* ***Cyperus distans*** Linnaeus f. Marshes; probably introduced from tropical America. July-September. [= RAB, FNA, K, S, WH]

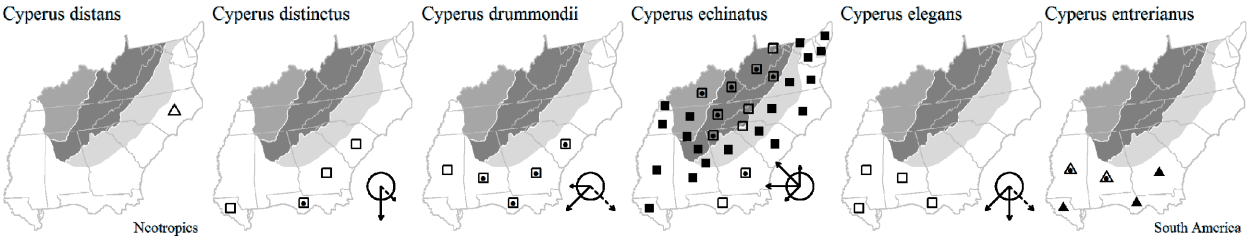
Cyperus distinctus Steudel. Marshes, wet flatwoods, wet hammocks, ditches. July-September. E. SC south to Panhandle FL and s. FL; se. LA; Bahamas (New Providence Cay). [= RAB, FNA, GW, K, WH]

Cyperus drummondii Torrey & Hooker in Torrey. Flatwoods ponds, savannas, coastal prairies, ditches, disturbed depressions. June-September. SC south to Panhandle FL, west to e. TX; West Indies; Central America; South America. Reported for several counties in the GA Coastal Plain (Carter, Baker, & Morris 2009). Reported for SC, GA, FL, AL, MS, LA, and TX (USDA Plants 2009). [= FNA, WH; = *C. virens* Michaux var. *drummondii* (Torrey & Hooker in Torrey) Kükenthal; < *C. virens* – GW, K, RAB, S]

Cyperus echinatus (Linnaeus) Wood. Sandy woodlands, forests, and fields. July-September. CT and NY west to s. OH, IL, and se. KS, south to n. FL, TX, and ne. Mexico. [= C, FNA, K, WH; = *C. ovularis* (Michaux) Torrey – RAB, G, GW, S, W, WV; > *C. ovularis* var. *ovularis* – F; > *C. ovularis* var. *sphaericus* Böckler – F]

Cyperus elegans Linnaeus, Royal Flatsedge. FL. July-August. FL, AL, MS, TX, and NM, south to South America. [= FNA, WH] {not yet keyed; add to synonymy}

* ***Cyperus entrerianus*** Böckler. Bottomland hardwood forests, coastal grasslands, marshes, vacant lots, disturbed areas; native of temperate South America. Established from E. GA south to s. FL and west to e. and s. TX. Rosen, Carter, & Bryson (2006) and Carter, Baker, & Morris (2009) discuss the spread of this noxious weed in the Southeastern United States. [= FNA, K, WH]



* ***Cyperus eragrostis*** Lamarck. Disturbed wetlands; native of tropical America. See Bryson et al. (1996), Brown & Marcus (1998), Kunzer et al. (2009). [= FNA, K]

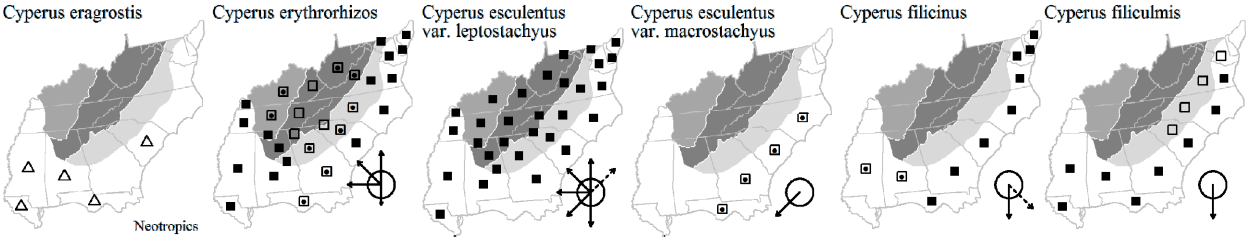
Cyperus erythrorhizos Muhlenberg, Redroot Flatsedge. Marshes, ditches. July-September. MA west to ND and WA, south to n. FL, LA, TX, AZ, and CA. [= RAB, C, F, FNA, G, GW, K, W, WH, WV; > *C. erythrorhizos* – S; > *C. halei* Torrey ex Britton – S]

Cyperus esculentus Linnaeus *var.* ***leptostachyus*** Böckler, Yellow Nutsedge, Yellow Nutgrass, Wild Chufa, Earth-almond. Fields, roadsides, disturbed areas. July-October. The species is pantropical and warm temperate. [= FNA; > *C. esculentus* var. *leptostachyus* – K; > *C. esculentus* var. *sativus* Böckler– K; < *C. esculentus* – RAB, C, F, G, GW, W, WH, WV; > *C. esculentus* – S; > *C. lutescens* Torrey & Hooker – S]

Cyperus esculentus Linnaeus *var.* ***macrostachyus*** Böckler, Yellow Nutsedge, Yellow Nutgrass, Wild Chufa, Earth-almond. July-October. The species is pantropical and warm temperate. [= FNA; < *C. esculentus* var. *esculentus* – K; < *C. esculentus* – RAB, C, F, G, GW, S, W, WH, WV; < *C. lutescens* Torrey & Hooker – S]

Cyperus filicinus Vahl. Brackish marshes. July-September. ME to s. FL, west to LA; West Indies. [= RAB, C, F, FNA, G, K, S; = *C. polystachyos* Rottbøll var. *filicinus* (Vahl) C.B. Clarke; < *C. polystachyos* – GW, WH]

Cyperus filiculmis Vahl. Sandy or rocky woodlands, forests, and fields. July-October. Se. MD south to s. peninsular FL, west to e. TX. [= FNA, RAB, WH; < *C. lupulinus* ssp. *lupulinus* – K (also see *C. lupulinus*]



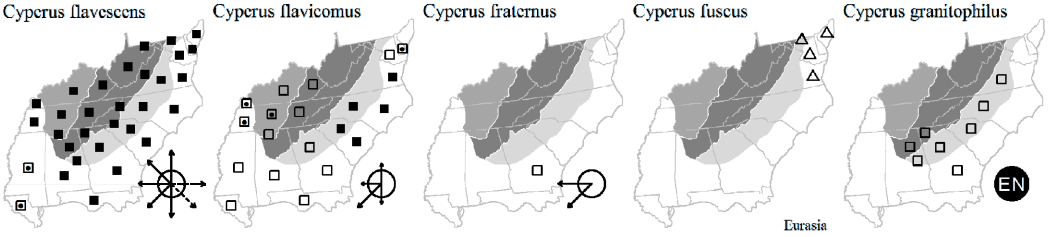
Cyperus flavescens Linnaeus. Low fields, ditches, marshes. July-September. Pantropical and warm temperate, north in North America to MA, MI, MO, and KS. [= RAB, C, FNA, G, GW, K, S, W, WH, WV; > *C. flavescens* var. *poiformis* (Pursh) Fernald – F]

Cyperus flavicomus Michaux. Ditches, marshes, natural or artificial ponds; common (uncommon in DE, rare in GA). July-October. Se. VA and KY south through the New World tropics. [= C, FNA, K, W, WH; = *C. albomarginatus* (Martius & Schrader ex Nees) Steudel – RAB, F, G, GW; *? C. sabulosus* (Martius & Schrader ex Nees) Steudel – S]

Cyperus fraternus Kunth. Disturbed depressions, ditches. Reported for several counties in the GA Coastal Plain (Carter, Baker, & Morris 2009). [< *C. reflexus* – FNA; = *C. reflexus* Vahl var. *fraternus* (Kunth) Kuntze] {add synonymy; not yet keyed; not yet mapped}

* ***Cyperus fuscus*** Linnaeus, Black Galingale, Brown Galingale. Wet, disturbed areas; native of temperate Eurasia. See McKenzie et al. (1998). [= C, F, FNA, G, K]

Cyperus granitophilus McVaugh, Granite Flatsedge. Granitic flatrocks, rarely on diabase flatrocks and Altamaha Grit glades. Sc. VA south to ec. AL in the Piedmont; disjunct in se. and c. TN on sandstone and limestone and in sc. GA on Altamaha Grit. [= FNA, GW, K; < *C. aristatus* Rottbøll – G, RAB, W; < *C. inflexus* Muhlenberg – F, S]



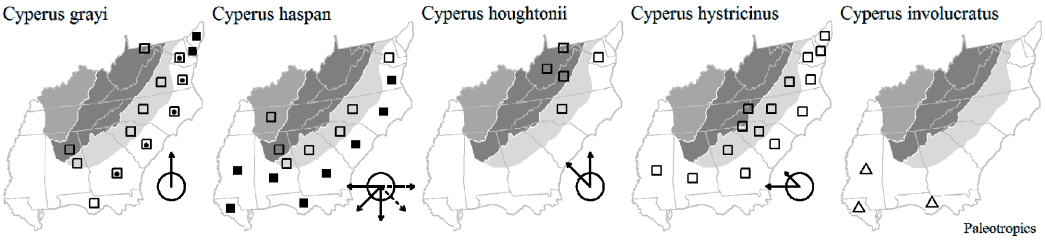
Cyperus grayi Torrey. Dry soils. July-September. NH south to GA and Panhandle FL (Liberty County) (Sorrie & LeBlond 2008). [= RAB, C, FNA, K, W; = *C. grayii* – G, orthographic variant; > *C. grayii* – F; > *C. filiculmis* var. *oblitus* Fernald & Griscom – F]

Cyperus haspan Linnaeus. Marshes, low fields, ditches. July-September. Pantropical in distribution, north in North America to se. VA. [= RAB, C, FNA, G, GW, K, S, WH; > *C. haspan* var. *americanus* Böckler – F]

Cyperus houghtonii Torrey, Houghton's Flatsedge. Dry upland sites. July. MA, VT, and QC west to MN, south to w. VA, WV, nc. NC, and nw. IN. [= RAB, C, F, FNA, G, K, W]

Cyperus hystricinus Fernald. Dry woodlands and forests. July-September. NJ south to n. FL, west to e. TX, mostly on the Coastal Plain. {check specimens of this and relatives – discrepancy between mapped and stated ranges} [= C, FNA, K, S, WH; < *C. retrofractus* – RAB, W, misapplied; = *C. retrofractus* (Linnaeus) Torrey var. *hystricinus* (Fernald) Kükenthal – F, G]

* ***Cyperus involucratus*** Rottbøll. Disturbed areas; native of Africa. Naturalized north at least to Panhandle FL (Kunzer et al. 2009). [= FNA, K, WH; ? *C. alternifolius* Linnaeus, misapplied]



* ***Cyperus iria*** Linnaeus. Marshes, ditches, disturbed wet areas; native of Old World. July-October. [= RAB, C, F, FNA, G, GW, K, S, WH]

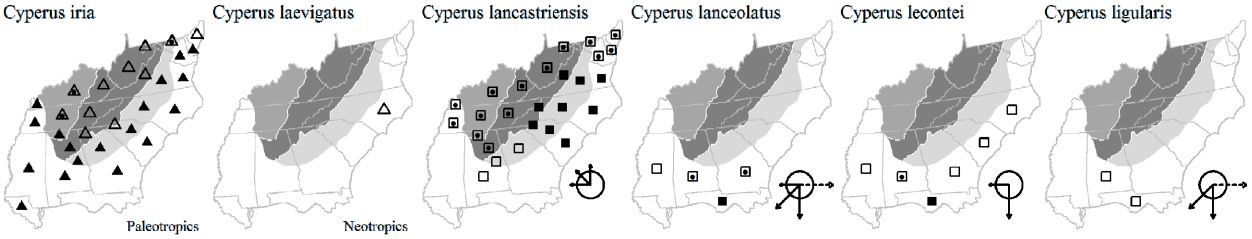
* ***Cyperus laevigatus*** Linnaeus. Brackish marshes; native of sw. North America and New World tropics. [= RAB, FNA, K; > *C. laevigatus* – S; > *C. careyi* Britton – S]

Cyperus lancastriensis Porter ex A. Gray. Dry woodlands, forests, and fields. July-September. NJ west to WV, OH, and MO, south to GA and AR. [= RAB, C, F, FNA, G, K, S, W, WV]

Cyperus lanceolatus Poiret. Wet places. Se. GA and ne. FL west to LA and c. TX (?), south into the Neotropics; also Africa. [= FNA, GW, K, WH; ? *C. densus* Link – S]

Cyperus lecontei Torrey ex Steudel. Limesink ponds, low pinelands. July-September. Se. NC south to s. FL, west to w. LA. Sorrie (1998b) reports it for e. GA (Glynn County). [= RAB, FNA, GW, K, S, WH]

Cyperus ligularis Linnaeus, Swamp Flatsedge. Brackish marshes, beaches, disturbed wetlands. FL and AL south into Mexico, Central America. South America; Africa. [= FNA, WH] {not yet keyed; add to synonymy}



Cyperus lupulinus (Sprengel) Marcks *var.* ***lupulinus***. Dry sterile soils. MA and VT west to MN, south to NC, n. SC, TX; disjunct in ID, WA, and OR. [= *C. lupulinus* ssp. *lupulinus* – FNA, K; < *C. filiculmis* Vahl – RAB, W; < *C. lupulinus* – C, WH; = *C. filiculmis* Vahl var. *filiculmis* – F, G, WV; >< *C. filiculmis* – S; > *C. martindalei* Britton – S]

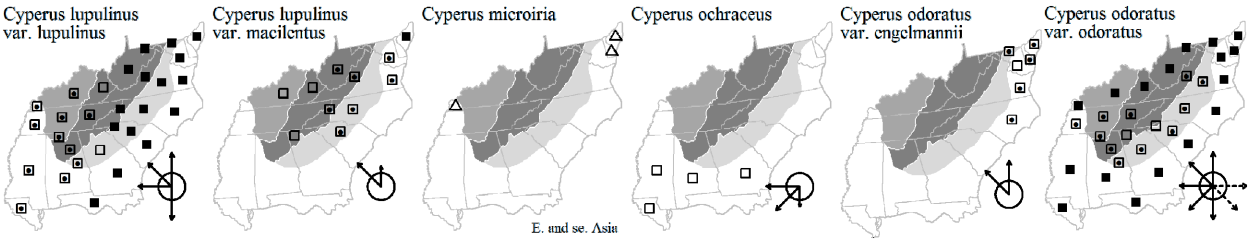
Cyperus lupulinus (Sprengel) Marcks *var.* ***macilentus*** (Fernald) A. Haines. Dry sterile soils. ME, QC, and MN south to w. VA, w. NC, nw. GA, and MO. [= *C. lupulinus* ssp. *macilentus* (Fernald) Marcks – FNA, K; < *C. filiculmis* Vahl – RAB, S, W; = *C. filiculmis* Vahl var. *macilentus* Fernald – F, G, WV; < *C. lupulinus* – C]

* ***Cyperus microiria*** Steudel. {habitats}; native of e. Asia. Naturalized in DE, PA, NJ, and NY. [= C, F, FNA; = *Cyperus amuricus* Maximowicz – G, K, misapplied]

Cyperus ochraceus Vahl. Marshes, ditches, wet disturbed areas. Se. GA (Jones & Coile 1988), s. FL, s. AL, s. MS, LA, TX, south into Mexico, Cenbtral America, and South America. [= FNA, GW, K, S, WH]

Cyperus odoratus Linnaeus *var.* ***engelmannii*** (Steudel) R. Carter, S.D. Jones, & J. Wipff. Alluvial and other damp to wet soils. July-October. North-central and northeastern North America, MA west to s. ON, MN and NE, south to se. NC and MO. Distribution in our region is poorly known. [= *C. engelmannii* Steudel – RAB, F, G, GW, S; < *C. odoratus* – C, FNA, K, W, WH]

Cyperus odoratus Linnaeus *var.* ***odoratus***. Low fields, marshes, ditches. July-September. Pantropical, north in North America to MA, se. ME, ON, MN, KS, NM, AZ, and CA. [= *C. odoratus* – RAB, F, G, GW; < *C. odoratus* – C, FNA, K, W, WH; > *C. ferruginescens* Böckler – RAB, F; > *C. ferax* L.C. Richard – S; > *C. longispicatus* J.B.S. Norton – S; > *C. speciosus* Vahl – S]



Cyperus ovatus Baldwin. Sandy beaches, maritime forests, and pinelands. July-October. Se. NC south to s. FL, west to s. AL. [= FNA, K; ? *C. retrorsus* Chapman var. *cylindricus* (Elliott) Fernald & Griscom; > *C. retrorsus* var. *deeringianus* (Britton ex Small) Fernald ex Griscom – RAB; < *C. retrorsus* – C, G, GW, W; > *C. deeringianus* Britton ex Small – S]

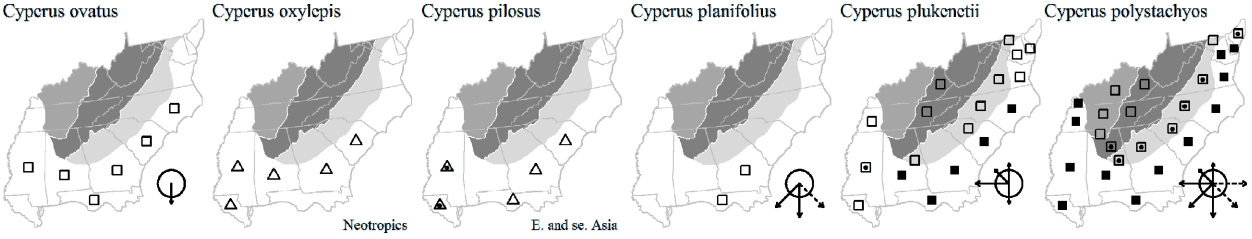
* ***Cyperus oxylepis*** Nees ex Steudel. Disturbed wet areas, marshes, saline areas; native of South America. See Bryson et al. (1996). [= FNA, GW, K, WH]

* ***Cyperus pilosus*** Vahl. Rice fields, ditches; native of e. Asia. See Carter, Baker, & Morris (2009). [= FNA, K, WH]

Cyperus planifolius L.C. Richard. Brackish marshes. Se. GA (Jones & Coile 1988) south to s. FL; West Indies; Central and South America. [= FNA, GW, K, WH; ? *C. brunneus* Swartz – S]

Cyperus plukenetii Fernald. Sandhills, sandy woodlands, and dry, disturbed areas. July-October. NJ, KY, MO, and se. OK, south to c. peninsular FL and e. TX. [= RAB, C, F, FNA, K, W, WH; = *C. retrofractus* var. *retrofractus* – G, misapplied; = *C. retrofractus* – S, misapplied]

Cyperus polystachyos Rottbøll. Low fields, ditches, and marshes. July-October. Pantropical and warm temperate, north in North America to ME, MA, KY, MO, and OK. [= FNA; > *C. polystachyos* Rottbøll var. *texensis* (Torrey) Fernald – RAB, C, F, G, K, W; > *C. polystachyos* var. *paniculatus* (Rottbøll) C.B. Clarke; > *C. microdontus* Torrey – S; > *C. odoratus* – S, misapplied; > *C. paniculatus* Rottbøll – S; < *C. polystachyos* – GW, WH]



* ***Cyperus prolifer*** Lamarck. Pond shores, marshes; native of tropical e. Africa. July-August. Also reported for se. VA (Kartesz 2010). [= FNA, WH; ? *C. isocladus* Kunth]

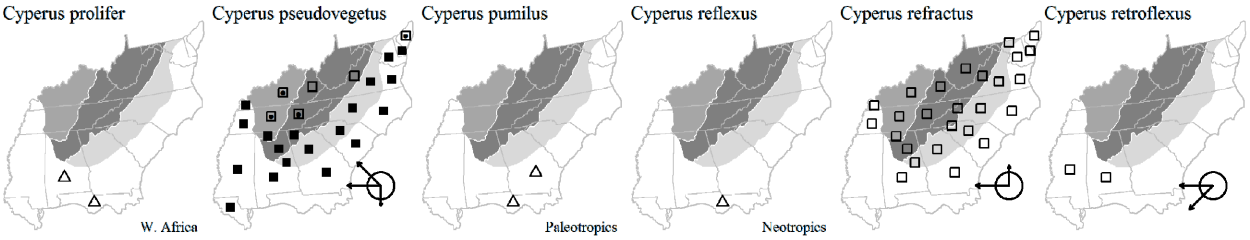
Cyperus pseudovegetus Steudel, Marsh Flatsedge. Marshes, ditches, depressions. July-October. NJ and MA, west to s. IL, s. MO, and OK, south to FL and TX. [= RAB, C, FNA, G, GW, K, S, W, WH; = *C. virens* – F, misapplied]

* ***Cyperus pumilus*** Linnaeus. Disturbed wet areas; native of the Old World, occurring in n. FL and se. GA. [= FNA, GW, K, WH]

* ***Cyperus reflexus*** Vahl. Disturbed wet areas; native of sw. United States south to tropical America. July-August. [= FNA, WH]

Cyperus refractus Engelmann ex Böckler. Dry sandy or rocky woodlands and forests. July-September. NJ west to OH and MO, south to SC, GA, AL, and AR. [= RAB, C, F, FNA, G, K, S, W]

Cyperus retroflexus Buckley. Cropped fields, damp disturbed areas. July-September. AL west to NM, south to Mexico. [= FNA, K]



Cyperus retrofractus (Linnaeus) Torrey. Dry sandy or rocky woodlands and fields. July-September. NJ west to s. OH, and se. MO, south to GA. AL, and AR. [= C, FNA, K, WH; = *C. dipsaciformis* Fernald – RAB, F, S, W; = *C. retrofractus* (Linnaeus) Torrey var. *dipsaciformis* (Fernald) Kükenthal – G]

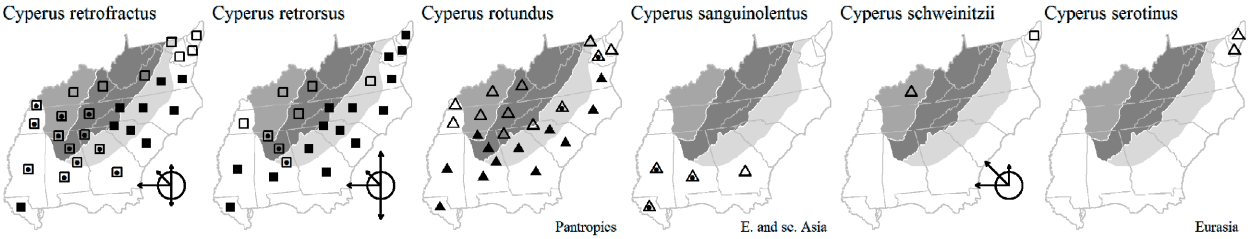
Cyperus retrorsus Chapman, Pinebarren Flatsedge. Dry woodlands, forests, and rock outcrops. July-October. S. NY south to FL, west to TX, mostly on the Coastal Plain, but north in the interior to KY and se. OK. [= C, FNA, G, GW, W, WH; = *C. retrorsus* Chapman var. *retrorsus* – RAB, K; > *C. retrorsus* var. *retrorsus* – F; > *C. retrorsus* var. *nashii* (Britton) Fernald – F; > *C. retrorsus* – S; > *C. nashii* Britton – S; > *C. torreyi* Britton – S]

* ***Cyperus rotundus*** Linnaeus, Purple Nutsedge, Nutgrass, Cocograss. Gardens, fields, disturbed areas. June-October. Pantropical and warm temperate in distribution (though extending less far north than *C. esculentus*). [= RAB, C, F, FNA, G, GW, K, S, WH]

* ***Cyperus sanguinolentus*** Vahl. Ditches, disturbed wet areas; native of Asia, known in North America from e. GA west to LA. See Carter & Bryson (2000) for detailed information. [= FNA; > *Cyperus louisianensis* Thieret – K]

Cyperus schweinitzii Torrey, Sand Flatsedge. Sandy soils. VT, MA, MN, and Albert, south to s. NJ, e. PA, n. KY, OH, MO, TX, NM, UT, and Mexico. It occurs in se. PA (Rhoads & Klein 1993) and NJ. [= FNA, C, F, G, K]

* ***Cyperus serotinus*** Rottbøll, Tidalmarsh Flatsedge. Tidal marshes; native of Eurasia. June-August. Reported as naturalized in s. NJ, DE, and PA (FNA, Kartesz 1999). [= FNA, K]



Cyperus squarrosus Linnaeus. Moist depressions and seepages on granitic and other rocks, drawdown riverbanks, moist disturbed sites. July-September. Nearly cosmopolitan in distribution, in Old World and New World. Similar to the closely related *C. granitophilus*. [= C, FNA, K, WH; = *C. aristatus* Rottbøll – GW; = *C. inflexus* Muhlenberg – WV; < *C. aristatus* Rottbøll – G, RAB, W; < *C. inflexus* Muhlenberg – F, S]

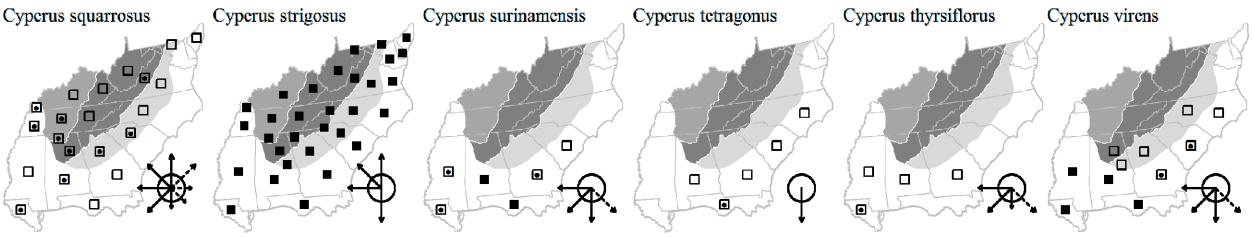
Cyperus strigosus Linnaeus, False Nutsedge. Marshes, ditches, wet flatwoods, wet disturbed areas. July-October. QC west to SD, south to FL and TX; also in w. North America. [= RAB, C, FNA, GW, K, W, WV; > *C. strigosus* var. *strigosus* – F, G; > *C. strigosus* var. *robustior* Britton – F; > *C. strigosus* var. *stenolepis* (Torrey) Kükenthal – G; > *C. strigosus* – S; > *C. praelongatus* Steudel – S; > *C. stenolepis* Torrey – S]

Cyperus surinamensis Rottbøll. Marshes, pond edges, disturbed wet areas. September-October. Se. SC south to s. FL, west to KS, OK, TX, and south into Mexico and tropical America. [= RAB, FNA, GW, K, S, WH]

Cyperus tetragonus Elliott, Four-angled Flatsedge. Maritime forests and dunes, edges of brackish marshes. July-September. E. NC south to s. FL; FNA treats *C. pringlei* of AZ and NM as conspecific, but this seems unlikely. [= RAB, FNA, K, S, WH]

Cyperus thyrsiflorus Junghuhn. Swamps and streambanks. Se. GA and FL peninsula west to se. TX; West Indies; South America. [= FNA, K, WH; = *C. hermaphroditus* (Jacquin) Standley – S, misapplied]

Cyperus virens Michaux. Marshes and ditches. July-September. Se. NC south to c. peninsular FL, west to TX; Mexico to Argentina. [= FNA, WH; < *C. virens* – GW, K, RAB, S]



Dulichium Persoon (Threeway Sedge)

A monotypic genus, an herb, North American (known as fossils from Europe). References: Goetghebeur in Kubitzki (1998b); Mastrogiuseppe in FNA (2002b).

Identification notes: The combination of the distichous *Cyperus*-like spikelets and numerous, distinctly 3-ranked, short, cauline leaves makes *Dulichium* distinctive.

Dulichium arundinaceum (Linnaeus) Britton *var.* ***arundinaceum***, Threeway Sedge. Streambanks, marshes, bogs, ditches. July-October. Var. *arundinaceum* ranges from NL (Newfoundland) west to MN, south to FL and TX; also from MT and BC south to CA. A second variety, var. *boreale* Lepage, is endemic in QC. [= FNA; < *D. arundinaceum* – RAB, C, F, G, GW, K, S, W, WV]

Eleocharis R. Brown 1810 (Spikerush)

[by Bruce A. Sorrie and Alan S. Weakley]

A genus of about 120-200 species, herbs, cosmopolitan. A molecular study supported the monophyly of subgenus *Limnochloa* (Roalson & Friar 2000). References: Smith et al. in FNA (2002b); Socorro González-Elizondo & Peterson (1997); Roalson & Friar (2000); Goetghebeur in Kubitzki (1998b).

Identification notes: "Scale" refers to the flower scales. "Sheath" refers to leaf sheaths. "Bristle" refers to perianth bristles.

subgenus *Eleocharis*
- section *Eleocharis*
  - series *Eleocharis*
    - subseries *Eleocharis*: erythropoda, fallax, halophila, palustris, smallii
    - subseries *Truncatae*: bifida, compressa, elliptica, intermedia, montevidensis, tenuis, tricostata, verrucosa
  - series *Albidae*: albida
  - series *Melanocarpae*: melanocarpa
  - series *Rostellatae*: rostellata
  - series *Tenuissimae*
    - subseries *Chaetariae*: baldwinii, brittonii, microcarpa, nigrescens, setifolia, tortilis, tuberculosa, vivipara
- section *Eleogenus*
  - series *Ovatae*: engelmannii, obtusa, ovata
  - series *Maculosae*
    - subseries *Ocreatae*: flavescens, olivacea
    - subseries *Rigidae*: atropurpurea, geniculata
- section *Parvulae*: parvula

subgenus *Limnochloa*
- section *Limnochloa*: cellulosa, elongata, equisetoides, interstincta, quadrangulata, robbinsii

subgenus *Scirpidium*
- section *Scirpidium*: acicularis, radicans

1 Culms producing vegetative proliferations rather than normal fertile spikelets ..... **Key A**
1 Culms producing at least some fertile spikelets (vegetative proliferations may or may not also be present).
- 2 Spike 1-2 (-2.5)× as thick as the culm immediately below the spike, gradually expanded from the culm, the base of the spike narrowly cuneate; spike (3-) 4-8× as long as wide; [subgenus *Limnochloa*] ..... **Key B**
- 2 Spike > 2× as thick as the culm immediately below the spike, abruptly expanded from the culm, the base of the spike broadly cuneate, rounded, or truncate; spike 1-3 (-4)× as long as wide.
  - 3 Achenes with several distinct longitudinal ribs or low ridges, the intervening spaces with abundant, very narrow, horizontally elongate cells; [subgenus *Scirpidium*] ..... **Key C**
  - 3 Achenes without longitudinal ribs, the surface smooth, granular, or honeycomb-like (*E. tortilis* and *E. tuberculosa* have indistinct ribs, but intervening cells are honeycomb-like, not thin horizontally; *E. tricostata* has 3 keel-like ribs, but achene surface appears granular).
    - 4 Achenes lenticular or biconvex; styles 2-branched ..... **Key D**
    - 4 Achenes trigonous or nearly terete; styles 3-branched ..... **Key E**

Key A – spikerushes proliferating vegetatively, with no fertile spikelets present

{key provisional and needing additional testing}

1 Each culm producing secondary or tertiary whorls.
- 2 Base of whorl abruptly widened from culm, forming a distinct shoulder; whorl divisions many per whorl (commonly 20 or more); whorl divisions usually 0.2 mm or less wide, finely capillary (often < 0.1 mm, but same may apperoach 0.3 mm); surface texture of divisions obviously beaded (under dissecting microscope) ..... ***E. confervoides***
- 2 Base of whorl gradually widened from culm, vase-shaped, not forming a istinct shoulder; whorl divisions fewer per whorl (commonly 15 or less); whorl divisions usually 0.3 mm or more wide (0.5 mm or more, but the finest secondary or tertiary divisions as slender as 0.15 mm); surface texture of divisions not beaded (under dissecting microscope) ..... ***E. vivipara***

1 Each culm producing a single whorl of proliferations.
- 3 Upper portion of sheath firm, the edge closely red-dotted; sheath tip < 1 mm long ..... ***E. vivipara***

3 Upper portion of sheath thin and scarious, the edge not differently colored; sheath tip 1-2 mm long; plants usually more filiform and capillary than *E. vivipara*.
4 Spikelet proliferations distichous; lowest scale much shorter than the others ..... ***E. baldwinii***
4 Spikelet proliferations polystichous or spirally disposed; lowest scale longer than others ..... ***E. brittonii*** or ***E. microcarpa***

Key B – spikerushes with the spike about as thick as the culm (subgenus *Limnochloa*)

1 Culm transversely nodose-septate (appearing jointed), about 5-9.5 mm in diameter.
2 Achene with longitudinal rows of enlarged linear cells separated by obscure longitudinal lines; perianth bristles narrow and weak, rudimentary to equaling achene; [widespread in our area] ..... ***E. equisetoides***
2 Achene with longitudinal rows of enlarged rectangular cells separated by distinct longitudinal lines; perianth bristles broad and stout, exceeding achene; [of Panhandle FL and s. AL]..... ***E. interstincta***
1 Culm not transversely nodose-septate, 1-5.5 mm in diameter.
3 Spike 3-5 mm in diameter, to 5 cm long, rounded to obtuse at the tip, densely flowered, the flowers (scales) 50-100 per spike, arranged in obvious spiral rows; culm 2-5 mm in diameter; [of estuarine and riverine marshes, or brackish interdune swale ponds on barrier islands].
4 Culms 3-5 mm in diameter, live culms terete when fresh; tubercle base confluent with the summit of the achene..... ***E. cellulosa***
4 Culms 2-4 mm in diameter, sharply 3-4-angled when fresh; tubercle base distinctly constricted, forming a "waist"..... ***E. quadrangulata***
3 Spike 1-2 mm in diamater, to 2.5 cm long, sharply pointed at the tip, loosely flowered, the flowers (scales) 10-25, few enough that the spiral arrangement is not readily apparent; culm 0.5-1.5 (-2) mm in diameter; [of limesink (doline) ponds and Carolina bay lakes of the mainland].
5 Achene body 0.8-1.5 mm long; scales mostly ca. 3.5 mm long; culms terete when fresh ..... ***E. elongata***
5 Achene body 1.5-2.5 mm long; scales mostly ca. 5 mm long; culms 3-angled when fresh ..... ***E. robbinsii***

Key C – spikerushes with achenes with several distinct longitudinal ribs with very narrow horizontal cells between (subgenus *Scirpidium*)

1 Culms about 0.5 mm thick, firm, not wrinkling in drying; spikes 3-6 mm long; [widespread] ..... ***E. acicularis***
1 Culms 0.6-1.0 mm thick, becoming wrinkled in drying; spikes 2-4 mm long; [of the Coastal Plain, known from Virginia Beach in 1934] ..... ***E. radicans***

Key D – spikerushes with achenes lenticular or biconvex and styles 2-branched

1 Apex of sheath thin, membranous, hyaline, often with a torn edge.
2 Culms 0.1-0.3 mm in diameter; achenes whitish to pale brown; leaf sheaths of the upper culm closely sheathing the stem, not wrinkled, the apex acute..... ***E. bicolor***
2 Culms 0.3-0.6 mm in diameter; achenes rufous- or olivaceous-brown to black; leaf sheaths of the upper culm usually prominently wrinkled, inflated, membraneous, and disintegrating.
3 Achenes rufous-brown to reddish-purple to black, (0.3-) 0.4-0.6 mm wide; longer bristles retrorsely barbed, shorter than to equaling achene body ..... ***E. flavescens***
3 Achenes olivaceous-brown to black, 0.5-0.7 (-0.8) mm wide; longer bristles either retrorsely barbed and equaling to exceeding the tubercle, or smooth and shorter than the tubercle.
4 Bristles retrorsely barbed, the longer equaling to exceeding the tubercle; [wet sandy or peaty habitats, widespread]..... ***E. olivacea*** *var.* ***olivacea***
4 Bristles smooth, the longer shorter than the tubercle; plants of [tidal rivers, in s. NJ] ..... ***E. olivacea*** *var.* ***reductiseta***
1 Apex of sheath firm, somewhat thickened, opaque, with a definite edge.
5 Rhizomatous perennials growing from thick horizontal rhizomes.
6 Basal (sterile) scales 2-3, the lowest not encircling the base of the spike; [of the Mountains, rarely the Piedmont]..... ***E. palustris***
6 Basal (sterile) scale solitary and spathiform, encircling the base of the spike; [of either the Mountains, upper Piedmont, or outer Coastal Plain].
7 Achenes prominently reticulate-pitted; [of the outer Coastal Plain]..... ***E. fallax {ambigens* phase*}***
7 Achenes smooth to faintly reticulate; [of the Mountains, rarely Piedmont, or outer Coastal Plain].
8 Culms slender to filiform; scales obtuse, 30-40 per spike; [of basic soils, of the Mountains and rarely Piedmont] .... ***E. erythropoda***
8 Culms thicker, somewhat inflated; scales acute, 5-30 per spike; [of brackish habitats of the outer Coastal Plain]..... ***E. halophila***
4 Tufted or cespitose annuals without thick horizontal rhizomes.
9 Tubercle nearly or actually as broad as the achene, and appearing confluent with it, broader than high.
10 Tubercle flat-deltoid, 1/4 as high as the the achene; bristles shorter than the achene body; [plants of clay soils only].... ***E. engelmannii***
10 Tubercle short-conic, 1/3-1/2 as high as the achene; bristles much exceeding the tubercle; [plants of a variety of soils]..... ***E. obtusa***
9 Tubercle < 2/3 as broad as the achene, conic, taller than broad.
11 Achene body pale brown, about 1 mm long..... ***E. ovata***
11 Achene body black, 0.5-1.0 mm long.
12 Spikes lance-ovoid to subcylindric; achene body -.5-0.6 mm long ..... ***E. atropurpurea***
12 Spikes ovoid to subglobose; achene body 0.7-1.0 mm long ..... ***E. geniculata***

Key E – spikerushes with achenes trigonous or nearly terete and styles 3-branched

1 Achenes roughly and coarsely honeycomb-reticulate; plants usually forming dense, broad tussocks.
2 Tubercle much narrower than the achene; culms 'lazy', often reclining, distinctly 3-angled, twisted ..... ***E. tortilis***
2 Tubercle as broad or broader than the achene; culms ascending to erect, subterete, not twisted..... ***E. tuberculosa***

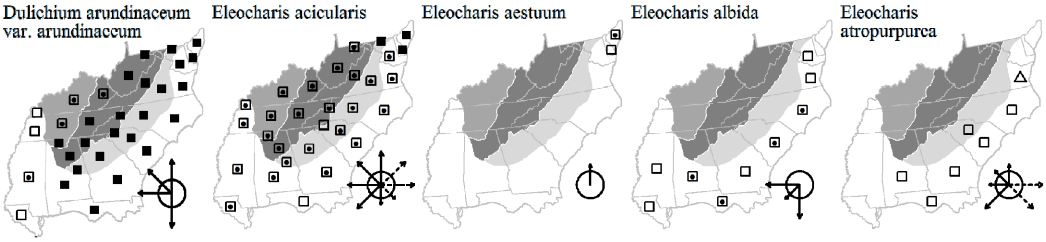
1 Achenes smooth to finely honeycomb-reticulate.
3 Tubercle confluent with the achene summit, not constricted at the base.
4 Achenes bicolored, body black, tubercle whitish, depressed; [plant of freshwater ponds and Carolina bays] ..... ***E. melanocarpa***
4 Achenes unicolored, body and tubercle light brown or olive brown; [plants of brackish to saline marshes].
5 Plants diminutive, culms slender, rounded, 1-7 cm long, not arching and rooting ..... ***E. parvula***
5 Plants robust, culms broad, flattened, 20-80 (or more) long, at least some arching and rooting at tips ..... ***E. rostellata***
3 Tubercle not confluent with the achene summit, constricted at the base.
6 Achenes with prominent keel-like angles or ribs..... ***E. tricostata***
6 Achenes with rounded angles.
7 Scales 2-ranked; spikes usually 2-4-flowered ..... ***E. baldwinii***
7 Scales spirally imbricate; spikes many-flowered.
8 Achenes white or very pale gray.
9 Bristles present.
10 Tubercle depressed-deltoid; scales rounded, appressed ..... ***E. brittonii***
10 Tubercle conic or deltoid; scales acute to attenuate, the tips free ..... ***E. microcarpa***
9 Bristles none.
11 Sheath base pinkish to straw-colored; spikes lane-ovate to oblong, 1.5-5 mm long ..... ***E. brittonii***
11 Sheath base purple-red; spikes ovoid, 2-3 mm long; [plant very rare, Santee Canal, SC, late 1800's]..... ***E. nigrescens***
8 Achenes yellowish, brown, or olive.
12 Horizontal rhizomes absent.
13 Achene body 1.2-1.5 mm long; tubercle slender-conic with narrow base; [of basic soils inland]..... ***E. intermedia***
13 Achene body 0.6-0.8 mm long; tubercle braod-conic with wide base; [of the Coastal Plain] ..... ***E. vivipara***
12 Horizontal rhizomes present.
14 Achenes not honeycomb-reticulate.
15 Bristles present; culms rounded; [of coastal brackish soils]..... ***E. albida***
15 Bristles absent; culms strongly flattened; [of inland basic soils]..... ***E. compressa***
14 Achenes honeycomb-reticulate.
16 Achenes 1.2-1.7 mm long, at maturity normally with bristles..... ***E. fallax {fallax* phase*}***
16 Achenes 0.7-1.2 mm long, with or without bristles.
17 Mature achenes with bristles; achenes yellow or brown; culms 0.6-1.0 mm thick; [rare, on outer Coastal Plain of NC and SC]..... ***E. montevidensis***
17 Mature achenes without bristles (present when immature, but drop off); achenes olive (yellow in *E. elliptica*); culms slender-wiry, 0.2-0.4 mm wide (0.4-0.8 in *E. tenuis* var. *pseudoptera*); [collectively widespread].
18 Culms 6-8-angled; mature achenes yellow to orange, with prominent transverse bands ..... ***E. elliptica***
18 Culms 4 (-5) angled; mature achenes olive, without transverse bands.
19 Culms 0.4-0.8 mm wide, prominently wing-angled; tubercle depressed..... ***E. tenuis** var. **pseodoptera***
19 Culms 0.2-0.4 mm wide, angles not wing-like; tubercle broadly conic or depressed.
20 Tubercle broadly conic, about 1/4-1/5 as high as the achene body..... ***E. tenuis** var. **tenuis***
20 Tubercle depressed, about 1/8 as high as the achene body..... ***E. tenuis** var. **verrucosa***

Eleocharis acicularis (Linnaeus) Roemer & J.A. Schultes. Marshes, ditches. July-September. Greenland, NL (Newfoundland), NU, and AK south to GA, TX, CA; Mexico, Central America, n. South America, Eurasia. [= RAB, C, FNA, G, GW, K, S; > *E. acicularis* var. *acicularis* – F]

Eleocharis aestuum Hines ex A. Haines. Freshwater tidal rivers. ME south to DE, PA, and NJ. [= FNA]

Eleocharis albida Torrey, White Spikerush. Brackish marshes. July-September. MD south to s. FL, west to TX and Mexico. [= RAB, C, F, FNA, G, GW, K, S]

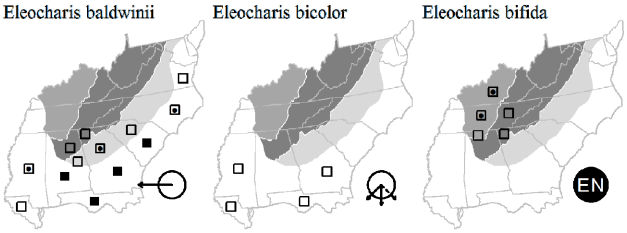
Eleocharis atropurpurea (Retz.) J. & K. Presl. Clay-based Carolina bays, other pineland ponds, disturbed wetlands. Widely scattered in North America; Mexico, West Indies, Central America, South America, Asia, Africa. Reported for South Carolina by Hill & Horn (1997). [= C, F, FNA, G, GW, K, S]



Eleocharis baldwinii (Torrey) Chapman, Baldwin Spikerush. Bogs, pools, acid shores. July-September. VA south to FL, west to AR and TX. [= RAB, C, FNA, GW, K; > *E. capillacea* Kunth – S, misapplied; > *E. prolifera* Torrey – S; > *E. baldwinii* – S]

Eleocharis bicolor Chapman. Moist sites, wet savannas. AL and GA west to LA; West Indies; Nicaragua. [= FNA, K, S]

Eleocharis brittonii Svenson ex Small. Bogs, pine savannas. NC south to FL, west to TX, north in the interior to TN and MO; disjunct in DE. [= F, FNA, K, S; < *E. microcarpa* Torrey – RAB, C, G, GW]



Eleocharis cellulosa Torrey. Cp (GA, NC, SC): fresh to brackish interdune swale ponds on barrier islands; rare (NC Rare). July-September. E. NC south to s. FL, west to TX and Mexico; also in the West Indies, Bermuda, and Central America (Nicaragua). See Gaddy & Rayner (1980) for the report of this species in SC and Carter, Baker, & Morris (2009) for discussion of its occurrence in GA. [= RAB, FNA, GW, K, S]

Eleocharis compressa Sullivant *var.* ***compressa***, Flattened Spikerush. Mt (GA, VA, WV), Pd (VA): limestone glades and barrens, riverside scours; rare. QC, MN, SD, and CO south to VA, nw. GA, AL, MS, AR, and KS. Var. *acutisquamata* (Buckley) S.G. Smith is midwestern. See Brown & Marcus (1998). In nw. GA (Jones & Coile 1988). [= F, FNA; < *E. compressa* – C, G, GW, K, WV; ? *E. elliptica* – Harvill, misapplied]

Eleocharis confervoides (Poiret) G. Tucker. Cp (GA): submersed in lakes and ponds; rare. GA and FL; West Indies; Central and South America; Asia; Africa; n. Australia. This taxon, often segregated into the monotypic genus *Websteria*, is widely distributed in tropical and subtropical regions of both hemispheres. Its retention in *Eleocharis* is supported by a molecular phylogenetic study (Roalson & Friar 2000). [= *Websteria confervoides* (Poiret) S. Hooper – FNA, GW, K; = *Websteria submersa* (C. Wright) Britton – S; = *Scirpus confervoides* Poiret]

Eleocharis elliptica Kunth. Mt (VA, WV): calcareous prairies, fens, shores, riverside scours; rare. NL (Labrador) west to BC, south to PA, NJ, WV, TN, IA, and ID. [= F, FNA, K, WV; = *E. tenuis* (Willdenow) J.A. Schultes var. *borealis* (Svenson) Gleason – C, G]

Eleocharis elongata Chapman. Cp (GA, NC): quiet waters of limesink (doline) ponds; rare (NC Rare). July-August. Se. NC south to FL, west to s. AL, s. MS, and TX (Sorrie & Leonard 1999); Jamaica, Mexico, Central America, South America. [= FNA, GW, K, S]

Eleocharis engelmannii Steudel, Engelmann Spikerush. Cp (DE, NC, SC, VA), Pd (DE, GA, NC, VA), Mt (VA, WV): freshwater shores, marshes, disturbed wet places; uncommon (rare in WV)). July-September. MA, ON, and British Clumbia south to GA, MS (Sorrie & LeBlond 2008), TX, and CA. [= RAB, F, FNA, G, K, S, WV]

Eleocharis equisetoides (Elliott) Torrey, Horsetail Spikerush. Cp (DE, GA, NC, SC, VA): quiet waters of limesink (doline) ponds, natural lakes, borrow pits, ditches, artificial millponds; uncommon (rare in DE and VA). June-September. MA south to c. peninsular FL, west to se. TX; also near the Great Lakes from NY west to MI and MO. [= RAB, C, F, FNA, G, GW, K; < *E. equisetoides* – S]

Eleocharis erythropoda Steudel, Bald Spikerush. Mt (GA, NC, VA, WV), Cp (DE, NC, VA), Pd (DE, VA): streambanks, marshes, ponds, swamps; rare. July-September. NS and AK south to NC, MS, TX, AZ, and OR. [= RAB, FNA, GW, K; < *E. palustris* – C; > *E. calva* Torrey – F, G, S, WV, invalid name]

Eleocharis fallax Weatherby. Cp (DE, GA, NC, SC, VA): fresh to brackish tidal marshes; rare. July-September. MA south to FL, west to TX. [= RAB, C, GW, K; > *E. fallax* – F, FNA, G; > *E. ambigens* Fernald – F, FNA, G]

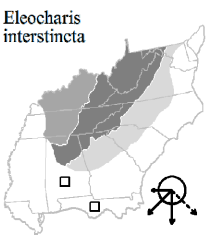
Eleocharis flavescens (Poiret) Urban. Cp (DE, FL, GA, NC?, SC?, VA?): Coastal Plain ponds, pools; rare. June-September. DE or VA (?) south to FL, west to se. OK and TX; also scattered in the Rocky Mountain states; West Indies; South America. [= K; = *E. flavescens* var. *flavescens* – C, FNA, G; < *E. flavescens* – RAB, F, GW]

Eleocharis geniculata (Linnaeus) Roemer & J.A. Schultes. Cp (SC), [GA?, NC?]: marshes; rare. July. Widespread but scattered across much of the United States; West Indies, Central America, South America, Asia, Africa. [= F, FNA, G, GW, K; > *E. caribaea* (Rottbøll) S.F.Blake – RAB, C, S]

Eleocharis halophila (Fernald & Brackett) Fernald. Cp (DE, NC, VA): brackish marshes; rare. July. NL (Newfoundland) to NC, along the coast. [= RAB, F, G, K; < *E. palustris* – C; < *E. uniglumis* (Link) Schultes – FNA; = *E. uniglumis* var. *halophila* Fernald & Brackett]

Eleocharis intermedia J.A. Schultes, Matted Spikerush. Mt (VA, WV): muddy calcareous seepage areas; rare. NS west to MN, south to VA, TN, and IL. The fruiting culms are of widely different lengths, the lowermost sprawling and much shorter than the longer. [= C, F, FNA, G, K, WV]

Eleocharis interstincta (Vahl) Roemer & J.A. Schultes. Ponds, borrow pits. May-September. S. AL and Panhadle FL south to s. FL and west (interruptedly) to OK and TX; Bahamas and West Indies; Mexico, Central America, e. South America. [= FNA, GW, K; < *E. equisetoides* – S]



Eleocharis melanocarpa Torrey, Black-fruited Spikerush. Cp (DE, GA, NC, SC, VA), Mt (VA): Coastal Plain ponds, cypress meadows, sinkhole ponds in the Shenandoah Valley; uncommon (rare in DE, NC, and VA). July-September. MA south to n. peninsular FL, west to s. MS; disjunct in e. TX, s. MI, and n. IN (Sorrie & Leonard 1999). [= RAB, C, F, FNA, G, GW, K, S]

Eleocharis microcarpa Torrey *var.* ***filiculmis*** Torrey. Cp (DE, NC, SC, VA): bogs, wet pine savannas; common. June-September. MA and MI south to FL west to TX. [= F, FNA; < *E. microcarpa* – RAB, C, G, GW, K; = *E. torreyana* Boeckeler – S]

Eleocharis microcarpa Torrey *var.* ***microcarpa***. Cp (SC): wet pine savannas, Coastal Plain bogs; rare. June-September. SC south to FL, west to LA; West Indies. [= F, FNA; < *E. microcarpa* – RAB, C, G, GW, K; = *E. microcarpa* – S]

Eleocharis montevidensis Kunth, Sand Spikerush. Cp (GA, NC, SC): maritime wet grasslands, ponds, swales, ditches; rare (GA Special Concern, NC Rare). July-September. E. NC south to FL, west to TX and CA; Mexico, South America. Reported for SC by Nelson & Kelly (1997) and discussed for GA by Carter, Baker, & Morris (2009). [= RAB, FNA, GW, K]

Eleocharis nigrescens (Nees) Steudel. Cp (SC): pond margins, flatwoods; rare. SC to FL; West Indies, Mexico; South America; Africa. [= FNA, GW, K; *? E. setifolia* (A. Richard) Raynal; < *E. microcarpa* – RAB; *? E. carolina* Small – S]

Eleocharis obtusa (Willdenow) J.A. Schultes. Cp (DE, GA, NC, SC, VA), Pd (GA, NC, SC, VA), Mt (GA, NC, SC, VA, WV): ditches, marshes, disturbed wet areas; common. June-October. NS west to BC, south to FL, TX, and CA. [= FNA, G, GW, K, S, WV; < *E. ovata* – RAB, C; > *E. obtusa* var. *obtusa* – F; > *E. obtusa* var. *ellipsoidalis* Fernald – F; > *E. obtusa* var. *jejuna* Fernald – F]

Eleocharis olivacea Torrey *var.* ***olivacea***. Cp (DE, GA, NC, SC, VA): Coastal Plain ponds, pools; common (uncommon in GA, NC, SC, VA). June-September. NS west to MN, south to FL and TX. [= K; < *E. flavescens* – RAB; < *E. flavescens* (Poiret) Urban var. *olivacea* (Torrey) Gleason – C, FNA, G; < *E. olivacea* – F, GW, S; ? *E. flaccida* (Reichenbach) Urban – S]

Eleocharis olivacea Torrey *var.* ***reductiseta*** (Schuyler & Ferren) Schuyler & Ferren. Tidal rivers. Endemic to s. NJ (as far as is known). [= K; < *E. flavescens* (Poiret) Urban var. *olivacea* (Torrey) Gleason – C, FNA, G; < *E. olivacea* – F]

Eleocharis palustris (Linnaeus) Roemer & J.A. Schultes, Small's Spikerush. Cp (DE, VA), Pd (DE, VA), Mt (NC, WV), {SC}: marshes; common (uncommon in VA and WV, rare in NC). June-September. NL (Labrador) west to AK, south to FL, TX, CA, and Mexico; Eurasia. As discussed by Smith et al. in FNA (2002b), variable in geographically correlated ways and probably warranting recognition of varieties or segregate species. *E. smallii* is sometimes separated as the eastern North American member of the north temperate *E. palustris* complex. [= FNA, G, K; < *E. palustris* – RAB, C; > *E. smallii* Britton – F, WV; > *E. palustris* var. *palustris* – F; > *E. palustris* var. *major* Sonder – F]

Eleocharis parvula (Roemer & J.A. Schultes) Link ex Bluff, Nees, & Schauer, Little-spike Spikerush. Cp (DE, GA, NC, SC, VA), Pd (GA, NC, SC), Mt (VA): tidal brackish and freshwater marshes, shallow waters of managed impoundments; common (rare in GA, NC, SC, and VA). July-September. NS, NL (Newfoundland), and MI south to FL and LA; BC south to CA; Mexico, Central America, South America, Eurasia, Africa. [= RAB, FNA, G, GW, K; = *E. parvula* var. *parvula* – C, F]

Eleocharis quadrangulata (Michaux) Roemer & J.A. Schultes. Cp (DE, GA, NC, SC, VA), Mt (GA, NC, SC, VA, WV), Pd (GA, NC, SC, VA): pools, marshes; common (uncommon in GA, NC, SC, VA, and WV). June-September. MA west to ON and MI, south to n. FL and TX. [= RAB, C, FNA, GW, K, S, WV; > *E. quadrangulata* var. *quadrangulata* – F, G; > *E. quadrangulata* var. *crassior* Fernald – F, G]

Eleocharis radicans (A. Dietrich) Kunth, Rooting Spikerush. Cp (VA), Mt (WV): {habitat}; rare (VA Rare). Widely scattered in North America; n. Mexico, West Indies, Central America, South America. [= C, F, FNA, G, GW, K]

Eleocharis robbinsii Oakes, Robbins Spikerush. Cp (DE, GA, NC, SC, VA), Mt (VA): quiet waters of limesink (doline) ponds, natural lakes; uncommon (rare in GA, NC, SC, VA). July-August. NS and NB west to ON, south to s. MS (Sorrie & Leonard 1999); also near the Great Lakes, from NY west to IN, WI, and MN. [= RAB, C, F, FNA, G, GW, K, S]

Eleocharis rostellata (Torrey) Torrey, Beaked Spikerush. Cp (DE, NC, VA), Mt? (WV?), {GA?, SC}: brackish and freshwater tidal marshes; uncommon (rare in NC and VA). July-September. ME, ON, and BC south to FL, TX, CA and Mexico; West Indies. Reported for WV (Harmon, Fort-Werntz, & Grafton 2006). [= RAB, C, F, FNA, G, GW, K]

Eleocharis tenuis (Willdenow) J.A. Schultes *var.* ***pseudoptera*** (Weatherby ex Svenson) Svenson. Pd (DE), {NC, VA}: bogs; common (rare in NC and VA?). June-September. NS, QC and IN south to NC, GA, and LA. [= C, F, FNA, G, K; < *E. tenuis* – RAB; = *E. elliptica* Kunth var. *pseudoptera* (Weatherby ex Svenson) L. Harms; < *E. capitata* (Linnaeus) R. Brown – S]

Eleocharis tenuis (Willdenow) J.A. Schultes *var.* ***tenuis***, Slender Spikerush, Kill-cow. Mt (WV), Cp (DE), Pd (DE), {GA, NC, SC, VA}: bogs, marshes; common (uncommon in DE). June-September. NS and QC south to SC and LA. [= C, F, FNA, G, K; < *E. tenuis* – RAB; < *E. capitata* (Linnaeus) R. Brown – S]

Eleocharis tenuis (Willdenow) J.A. Schultes *var.* ***verrucosa*** (Svenson) Svenson. Cp, Pd (GA, SC, VA): bogs; uncommon, rare in Piedmont (GA Special Concern, VA Watch List). June-September. PA, WI, and SD south to GA, LA, TX. [= C, F, FNA, G, K; = *E. verrucosa* (Svenson) E. Harms – GW; < *E. capitata* (Linnaeus) R. Brown – S]

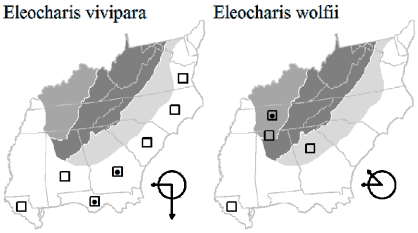
Eleocharis tortilis (Link) J.A. Schultes, Twisted Spikerush. Cp (DE, GA, NC, SC, VA): wet pine savannas, Coastal Plain seepage bogs, seeps, pocosin ecotones; common. July-September. NJ south to FL, west to TX, inland to TN and AR. [= RAB, C, F, FNA, G, GW, K]

Eleocharis tricostata Torrey, Three-angle Spikerush. Cp (DE, GA, NC, SC, VA), Pd (NC): wet pine savannas, bogs; uncommon (rare in DE, NC, and VA). July-September. MA, NY, and MI south to FL and AL. [= RAB, C, F, FNA, G, GW, K, S]

Eleocharis tuberculosa (Michaux) Roemer & J.A. Schultes. Cp (DE, GA, NC, SC, VA), Pd (GA, NC, SC), Mt (NC, VA): bogs, savannas, ditches; common (rare in Piedmont and Mountains). June-September. NS south to FL, west to TX. [= RAB, C, F, FNA, G, GW, K; > *E. simplex* (Elliott) A. Dietrich – S; > *E. tuberculosa* – S]

Eleocharis vivipara Link, Viviparous Spikerush. Coastal Plain ponds. July-September. NC south to FL, west to LA. [= RAB, C, F, FNA, GW, K, S; > *E. vivipara* – S; > *E. curtisii* Small]

Eleocharis wolfii (A. Gray) A. Gray ex Britton. Shallow ephemeral pools on granitic flatrocks. OH, WI, MN, and ND south to GA, AL, TN, LA, and TX. [= F, FNA, C, G, K] {not yet keyed}



Eleocharis bifida S.G. Smith, Cedar Glade Spikerush. Mt (GA): seasonally wet seepage in limestone cedar glades; rare. KY south through TN to nw. GA and n. AL. [= FNA; < *E. compressa* of many earlier authors] {not yet keyed; synonymy incomplete}

Eleocharis lanceolata Fernald, Ozark Spikerush. MO and KS south to LA and TX; disjunct in c. TN. [= FNA, K] {not yet keyed}

Eleocharis macrostachya Britton. Mt (WV): {habitats}; rare in WV. QC to AK south to WV, AL, MS, TX, CA, and Mexico; South America. [= FNA, K; < *E. palustris* – C] {not yet keyed; add to synonymy}

Eleocharis minima Kunth. {GA}. MD, FL, TX; West Indies, Central America, South America, Asia, Australia (FNA). Reported from specimens from sc. GA (Sorrie, pers. comm.). [= FNA, K; ? *E. uncialis* Chapman – S] {not yet keyed; add to synonymy }

Eleocharis montana (Kunth) Roemer & J.A. Schultes. Cp (GA): ponds, swales; rare. Se. and Sw. GA west to TX, south to Mexico, Central America, and South America; West Indies. [= FNA, K; > *E. nodulosa* (Roth) Schultes – S; > *E. montana* var. *nodulosa* (Roth) Svenson] {not yet keyed}

Eleocharis ovata (Roth) Roemer & J.A. Schultes. {VA} NL (Labrador), ON, and MN south to NJ, MD, DE, PA, VA, KY, MO, and OK; scattered in w. United States. Reported for VA in FNA; documentation needing verification. [= F, FNA, G, K; < *E. ovata* – C] {keyed}

Eriophorum Linnaeus (Cottongrass, Cottonsedge, Bogwool)

A genus of about 20 species, herbs, primarily north temperate, boreal, and arctic. References: Ball & Wujek in FNA (2002b); Goetghebeur in Kubitzki (1998b).

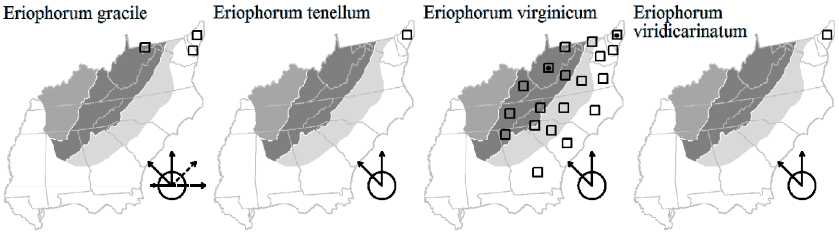
1 Foliaceous bracts (subtending the head of spikelets) 2 or 3, spreading, the inflorescence therefore appearing terminal.
  2 Blade of the uppermost leaf on the stem much shorter than its sheath ..... ***E. gracile***
  2 Blade of the uppermost leaf on the stem as long as the sheath or longer ..... ***E. tenellum***
1 Foliaceous bract (subtending the head of spikelets) solitary, erect, appearing as a continuation of the culm, the inflorescence therefore appearing lateral.
  3 Scales (subtending the flower) prominently 3-7-nerved ..... ***E. virginicum***
  3 Scales (subtending the flower) 1-nerved ..... ***E. viridicarinatum***

Eriophorum gracile W.D.J. Koch ex Roth, Slender Cottongrass. Bogs and open swamps. Circumboreal, in North America from NL (Labrador) west to AK, south to s. PA (Rhoads & Klein 1993), s.NJ, w. MD (C. Frye, pers comm. 2000), DE (McAvoy & Bennett 2001), OH, IN, IL, MN, CO, UT, NV, and CA. [= C, F, FNA, G; > *E. gracile* var. *gracile* – K]

Eriophorum tenellum Nuttall, Conifer Cottongrass. Bogs. June-September. NL (Newfoundland) west to MN, south to s. NJ, se. PA (Rhoads & Klein 1993), IL, and MI. [= C, FNA, G, K; > *E. tenellum* var. *tenellum* – F]

Eriophorum virginicum Linnaeus, Tawny Cottongrass. Peaty sites, limited in habitat throughout the region, occurring in the Mountains in bogs and fens, in the Piedmont (formerly) in bogs, in the fall-line sandhills in burned-out pocosins, in the Coastal Plain in pocosins, acidic seeps, and peat-burn pools. June-September. NL (Labrador) and NL (Newfoundland) west to ON and MN, south to se. NC, sw. NC, e. KY; disjunct in se. GA at Okefenokee Swamp. Very variable in size, from 5-15 dm tall, with heads ranging from 1-6 cm in diameter, the larger plants primarily in the Coastal Plain and the smaller in the Mountains. [= RAB, C, F, FNA, G, GW, K, S, W, WV]

Eriophorum viridicarinatum (Engelmann) Fernald, Darkscale Cottongrass. Bogs. May-August. NL (Newouindland and Labrador) west to AK, south to s. NJ, PA, OH, IN, IL, MN, ND, WY, ID, and WA; reported by Small (1933) for further south, apparently in error. [= C, FNA, K; = *E. viridi-carinatum* – F, G, orthographic variant]



Fimbristylis Vahl 1806 (Fimbry)

A genus of about 250-300 species, herbs, primarily warm temperate and tropical. References: Kral (1971)=Z; Kral in FNA (2002b); GW; Goetghebeur in Kubitzki (1998b). Key largely adapted from Z.

1 Style branches 3; achene trigonous or terete; plant an annual.
  2 Achene trigonous; spikelets linear-oblong to lanceolate, 3-7 mm long; ligule present, as a line of short, pale hairs ..... ***F. autumnalis***
  2 Achene terete; spikelets subglobose to ovoid, 2-4 mm long; ligule absent ..... ***F. littoralis***
1 Style branches 2; achene lenticular or terete; plant an annual or perennial.

3 Plants diminutive annuals, the culms 1-6 (-15) cm tall.
4 Achene cylindrical, 2-4× as long as wide, curved like a tiny banana; inflorescence bracts 1-2 cm long..... ***F. perpusilla***
4 Achene obovate, 1-1.5× as long as wide, not curved; inflorescence bracts 4-10 cm long..... ***F. vahlii***
3 Plants small to large annuals or perennials, the culms (6-) 15-150 cm tall.
5 Plant a medium-sized to robust perennial, the culms generally 5-15 dm tall, either cespitose, with a hardened base, and deeply set in the substrate, or rhizomatous, the rhizomes either slender or thick
6 Plant cespitose, lacking rhizomes; bases of leaves hard, leathery, dark brown, deeply set in the substrate, the base of the plant generally 5-15 cm below the ground surface; achene (1.3-) 1.5-2 mm long..... ***F. castanea***
6 Plant rhizomatous, the rhizomes either thick and knotty or slender and scaly (rarely with both); bases of leaves often somewhat thickened, hardened, and brownish, the base of the plant not especially deeply set; achene 0.8-1.2 (-1.3) mm long.
7 Plant a robust perennial to 15 (-20) dm tall, with elongate, slender, scaly, pale-to-reddish rhizomes (excavate carefully); leaves usually flat or keeled, 2-5 mm wide; stem usually flattened and scabrous-edged above; ligule a line of short, pale hairs..... ***F. caroliniana***
7 Plant a medium-sized perennial to 10 dm tall, rhizomatous, the rhizomes short, thick, and knotty (rarely also with slender rhizomes); leaves usually involute, ca. 1 mm wide; stem usually terete or oval in cross-section, smooth; ligule absent or poorly developed..... ***F. puberula*** *var.* ***puberula***
5 Plant a small to medium-sized annual or perennial, the culms to 8 dm tall, neither rhizomatous (except *F. brevivaginata*) nor with a hardened base deeply set in the substrate.
8 Spikelets pale, usually solitary (-3) on the scape (and thus appearing somewhat like an *Eleocharis*)..... ***F. schoenoides***
8 Spikelets dark, usually in a complex inflorescence.
9 Face (one side) of the achene with 15 or more longitudinal rows of rounded pits, the achene margin noticeably paler. ***F. tomentosa***
9 Face (one side) of the achene with 13 or fewer longitudinal rows of rectangular pits, the achene margin not noticeably paler.
10 Plant a perennial; leaves spreading, 2-5 mm wide; achenes lacking warts.
11 Plant bulbous at base, and also with scale-covered short rhizomes; spikelet scales glabrous or puberulent; [plant a rare native of rock outcrops in GA and AL]..... ***F. brevivaginata***
11 Plant neither bulbous nor rhizomatous; spikelet scales glabrous; [plant weedy, probably introduced in North America]..... ***F. dichotoma***
10 Plant an annual; leaves spreading or ascending, 1-4 mm wide; achenes with or without warts.
12 Achenes lacking warts or with warts scattered over the entire surface; primary rays of umbel spreading or ascending, the inflorescence generally longer than broad; leaves relatively soft..... ***F. annua***
12 Achenes with a few low warts on the edges; primary rays of umbel stiffly spreading (even deflexed), the inflorescence therefore often as broad as long or broader; leaves relatively hard, broad (averaging 2 mm wide), and spreading subdistichously..... ***F. decipiens***

*? ***Fimbristylis annua*** (Allioni) Roemer & J.A. Schultes. Wet, disturbed areas, thin soils of rock outcrops; variously interpreted as entirely alien or partly native. July-September. SE. PA, WV, s. IN, s. IL, MO, e. KS, south to n. peninsular FL, s. TX, s. AZ, and south through Mexico to Central and South America; West Indies; Eurasia, Africa, etc. [= C, FNA, G, GW, K, W, Z; < *F. dichotoma* – RAB; *? F. baldwiniana* (J.A. Schultes) Torrey – F, S]

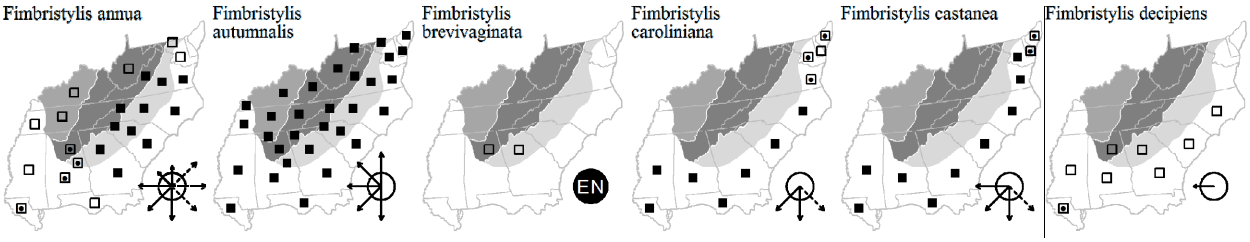
Fimbristylis autumnalis (Linnaeus) Roemer & J.A. Schultes. Moist to wet disturbed areas. June-October. ME west to MN and SD and south to s. FL and TX; New World tropics. [= RAB, C, FNA, G, GW, K, W, Z; > *F. autumnalis* var. *autumnalis* – F; > *F. autumnalis* var. *mucronulata* (Michaux) Fernald – F, WV; > *F. autumnalis* – S; > *F. geminata* (Nees) Kunth – S]

Fimbristylis brevivaginata Kral, Flatrock Fimbry. Pools and seepage over granite. Endemic to Piedmont of GA (on granite) and Cumberland Plateau of AL (on sandstone) (Kral 1992). See Kral (1992) for details. [= FNA, K]

Fimbristylis caroliniana (Lamarck) Fernald. Brackish or alkaline sands of marsh edges and dune swales, less typically in savannas or pine flatwoods. July-September. NJ south to s. FL and west and south to TX and the Yucatan Peninsula; West Indies. This species often grows in proximity to *F. castanea*, which, however, occupies the brackish marsh itself. [= C, F, FNA, G, GW, K, Z; < *F. spadicea* (Linnaeus) Vahl – RAB; > *F. harperi* Britton ex Small – S]

Fimbristylis castanea (Michaux) Vahl. Brackish marshes and dune swales. July-September. NY (Long Island) south to s. TX and adjacent Mexico; Yucatan peninsula; West Indies. Replaced in most of the New World tropics by the related *F. spadicea*. [= C, F, FNA, G, GW, K, S, Z; < *F. spadicea* (Linnaeus) Vahl – RAB]

Fimbristylis decipiens Kral. Wet, disturbed areas. July-September. E. NC south to n. FL and west to e. TX. [= FNA, GW, K, Z]



* ***Fimbristylis dichotoma*** (Linnaeus) Vahl. Wet, disturbed areas; presumably introduced, probably native of Asia. July-September. The species is now pantropical and subtropical. [= FNA, GW, K, Z; < *F. dichotoma* – RAB (also see *F. annua* and *F. tomentosa*); *? F. diphylla* (Retzius) Vahl – S]

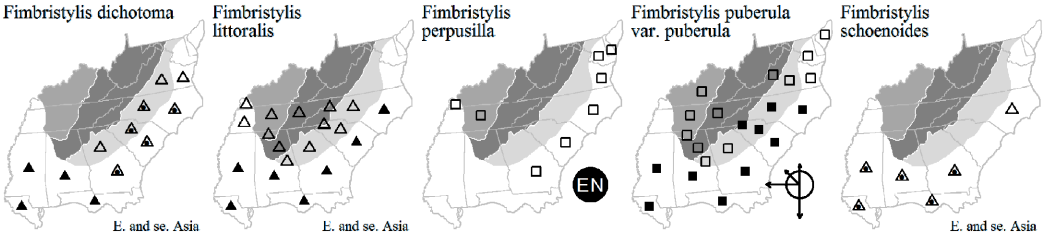
* ***Fimbristylis littoralis*** Gaudichaud. Disturbed wet ground; native of Asia. July-September. Kral (1971) suggests that it may have been introduced into se. United States early, in association with rice. In North America, now ranging from Central America and the West Indies north to NC, KY, and AR. The name *F. miliacea* has been rejected as a nomen ambiguum (Brummitt 2005). [= K; = *F. miliacea* (Linnaeus) Vahl – RAB, C, FNA, GW, S, W, Z, misapplied?]

Fimbristylis perpusilla R.M. Harper ex Small & Britton, Harper's Fimbry. Drawdown zones of natural depression ponds or exposed banks of blackwater rivers. July-September. The "range" consists of geographically scattered and "irregularly apparent"

populations, usually on the drawdown zones of natural ponds or rivers, in the Coastal Plain from DE and e. MD south through e. VA, se. NC, and ne. SC, to sw. GA, disjunct in the Cumberland Plateau of se. TN (Wofford & Jones 1988) and KY (Boone & Chester 2009). See Leonard (1981a, 1981b, 1987) for the first reports of the species in SC and NC. The species characteristically occurs on dry to moist banks exposed in summer by falling water levels, often with other diminutive annuals, such as *Hemicarpha micrantha*, *Oldenlandia uniflora*, *Juncus repens*, *Lindernia dubia*, *Eleocharis baldwinii*, and *Eragrostis hypnoides*. At known locations it does not appear every year; presumably it is present in a seedbank which germinates only under favorable hydrologic (and other?) conditions. [= C, FNA, GW, K, S, Z]

Fimbristylis puberula (Michaux) Vahl *var.* ***puberula***. Savannas, pine flatwoods, bogs, wet meadows or prairie-like areas, granite outcrops. July-September. Var. *puberula* ranges from Long Island, NY south to s. FL and west to TX, KS, and NE; var. *interior* (Britton) Kral ranges from NE south to TX and west to NM and AZ. [= C, FNA, K, Z; < *F. spadicea* (Linnaeus) Vahl – RAB, W; *? F. drummondii* (Torrey & Hooker) Böckler – F; > *F. puberula* – GW, S; > *F. anomala* Böckler – S]

* ***Fimbristylis schoenoides*** (Retzius) Vahl. Disturbed wetlands; native of Asia. Reported for sw. GA (Jones & Coile 1988) and also occurs in se. GA (B. Sorrie, pers. comm.). Also recently reported for Ocracoke Island, Hyde County (Sorrie & LeBlond 2008). [= FNA, GW, K]



* ***Fimbristylis tomentosa*** Vahl. Wet, disturbed areas; presumably introduced, probably native of e. and se. Asia. July-September. Ranging north to NC, e. TN, and AR. [= FNA, GW, K, Z; < *F. dichotoma* – RAB]

Fimbristylis vahlii (Lamarck) Link. On exposed silty or clayey sediments. July. Primarily from MO south to MS and e. TX, but with scattered outliers as far away as NJ, SC (?), IL, and KS; also in western United States, Mexico, Central America. Note that the basis of the SC record is uncertain, and may be based on a misidentification of *F. perpusilla*. [= RAB, C, F, FNA, G, GW, K, S, Z]

Fuirena Rottbøll (Umbrella-sedge)

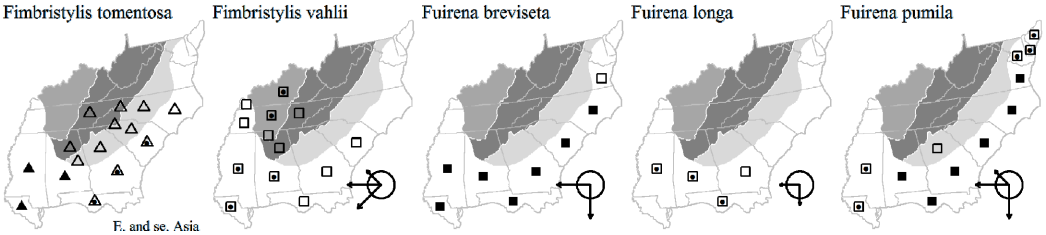
A genus of about 30 species, herbs, primarily in Africa and America, in tropical and warm temperate regions. References: Kral (1978a)=Z; Kral in FNA (2002b); Goetghebeur in Kubitzki (1998b).

1 Sheaths of leaves glabrous, the largest leaf blades 0-2 (-5) cm long; plant strongly rhizomatous, the culms usually about 10 cm apart.
  2 Blades of culm leaves <5 cm long; spikelets mostly lance-ovoid, sessile in terminal clusters and also often with additional sessile or peduncled clusters lower on the culm; involucral bract longer than the spikelets..... ***F. longa***
  2 Blades of culm leaves very short (< 0.5 cm long); spikelets mostly ovoid, sessile in terminal clusters; subtending involucral bract shorter than the spikelets..... ***F. scirpoidea***
1 Sheaths of leaves sparsely to densely hirsute, the largest leaf blades 10-15 cm long; plant more-or-less cespitose, annual or perennial, if perennial the rhizomes short and cormlike, the culms usually arising together.
  3 Perianth bristles no longer than the achene stipe (not nearly reaching halfway up the achene body), without barbs (sometimes very finely toothed, the teeth ascending); blades of the perianth scales with a blunt or short-apiculate apex ..... ***F. breviseta***
  3 Perianth bristles longer than the achene stipe, reaching the middle of or exceeding the achene body, strongly and retrorsely barbed; blades of the perianth scales with an acuminate to awned apex.
    4 Perianth bristles reaching 1/2 to 3/4 the length of the achene body; anthers about 1.0 mm long; blades of the perianth scales mostly acuminate; perennial ..... ***F. squarrosa***
    4 Perianth bristles as long as or exceeding the achene body; anthers about 0.5 mm long; blades of the perianth scales mostly awned or bearing a subapical bristle; annual
      5 Blades of the perianth scales acuminate, narrowed into an awn..... ***F. pumila***
      5 Blades of the perianth scales rounded, retuse, or rarely acute at the tip, bearing a subapical bristle which is retrorsely barbed..... ***F. simplex*** *var.* ***aristulata***

Fuirena breviseta (Coville) Coville in R.M. Harper, Short-bristled Umbrella-sedge. July-October. Carolina bays, savannas, ditches, other wet habitats. A Southeastern Coastal Plain endemic: se. VA south to s. FL and west to e. TX, primarily in the outer Coastal Plain. [= C, F, FNA, G, GW, K, S, Z; < *F. squarrosa* – RAB]

Fuirena longa Chapman, Chapman's Umbrella-sedge. Pond margins. Panhandle FL and sw. GA west to e. TX. Possibly a hybrid derivative of *F. breviseta* and *F. scirpoidea*. [= FNA, GW, K, S, Z]

Fuirena pumila (Torrey) Sprengel, Dwarf Umbrella-sedge. Depression ponds, savannas, ditches, other wet habitats. July-October. Primarily a species of the Southeastern Coastal Plain, ranging from se. MA south to s. FL and west to TX, and also disjunct in the lowlands around the Great Lakes (as in n. IN and s. MI). [= RAB, C, F, FNA, G, GW, K, Z; = *F. squarrosa* – S, misapplied]



Fuirena scirpoidea Michaux, Southern Umbrella-sedge. Natural lakes, pineland depression ponds, wet savannas. July-October. A Southeastern Coastal Plain endemic: se. GA (Jones & Coile 1988; Carter, Baker, & Morris 2009) and FL, west to se. TX, also in Cuba and apparently disjunct (or introduced?) in ne. NC and s. IL. Kral's (1978a) report of this species from ne. NC, where disjunct from the main body of the range in the deep South, needs further investigation. [= C, FNA, G, GW, K, S, Z]

Fuirena simplex Vahl *var.* ***aristulata*** (Torrey) Kral. Moist open areas. July-October. MO and NE south to w. KY, e. LA, and c. TX. [= FNA, K, Z; < *F. simplex* – GW]

Fuirena squarrosa Michaux, Hairy Umbrella-sedge. Savannas, seepages, streamhead pocosins, ditches, bogs, other wet habitats. July-October. NY (Long Island) south to n. FL, west to c. TX, inland to w. NC, w. TN, KY, s. AR, and se. OK, mainly on the Coastal Plain, but less strictly limited to it than our other species. [= C, F, FNA, G, GW, K, W, Z; < *F. squarrosa* – RAB; = *F. hispida* Elliott – S]

Isolepis R. Brown (Club-rush)

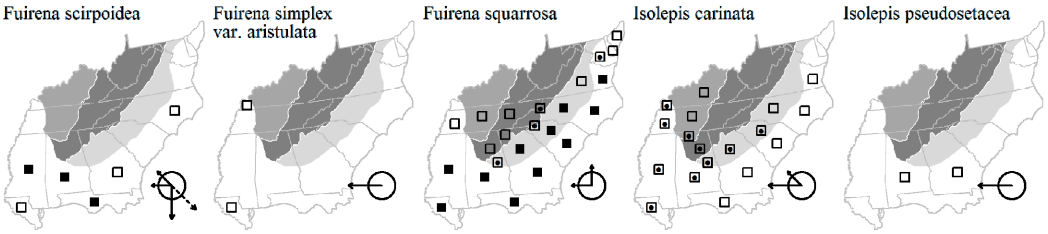
A genus of about 60 species, herbs, subcosmopolitan in distribution. Since *Isolepis* is more closely related to *Cyperus* than to *Scirpus*, in which it has often been included, its separation from *Scirpus* is clearly warranted. The generic delimitation of *Isolepis* in relation to *Ficinia* and *Scirpoides* is uncertain. References: Smith in FNA (2002b); Goetghebeur in Kubitzki (1998b).

1 Achenes 1.0-1.5 mm long; scales in middle of spikelet 1.8-2.0 mm long, with a short awn ..... ***I. carinata***
1 Achenes 0.7-0.9 mm long; scales in middle of spikelet 1.0-1.2 mm long, mucronate ..... ***I. pseudosetacea***

Isolepis carinata Hooker & Arnott ex Torrey. Moist soils adjacent to granitic flatrocks, seepage areas, ephemeral pools, moist sandy sites, low fields, ditches. May-June. C. NC, TN, and se. KS south to Panhandle FL and c. TX; also in CA. [= FNA, K; = *Scirpus koilolepis* (Steudel) Gleason – RAB, C, F, G, GW, WH; = *S. carinatus* (Hooker & Arnott ex Torrey) A. Gray – S (not *S. carinatus* Sm.); = *I. koilolepis* Steudel]

Isolepis pseudosetacea (Daveau) Gandoger. Altamaha grit outcrops, moist soils. E. GA (Carter, Baker, & Morris 2009) west to sw. MO, AR, and c. TX. This species often grows intermixed with *I. carinata* and may be more widespread in our area. [= FNA; ? *Isolepis molesta* (M.C. Johnston) S.G. Smith – K; ? *Scirpus molestus* M.C. Johnston]

Isolepis setacea (Linnaeus) R. Brown. On waste and ballast at Camden, NJ and Philadelphia, PA in the 1800s. [= FNA, K] {not keyed or mapped}



Kyllinga Rottbøll (Greenhead Sedge)

A genus of about 60 species, pantropical to warm temperate, especially in Africa. References: Delahoussaye & Thieret (1967)=Z; Tucker (1987)=Y; Tucker (1984)=X; Tucker in FNA (2002b); Goetghebeur in Kubitzki (1998b).

1 Scale keel winged, laciniate; anthers ca. 2 mm long ..... ***K. squamulata***
1 Scale keel smooth or denticulate; anthers 0.2-1.1 mm long.
  2 Plant a rhizomatous perennial, mat-forming, the culms arising singly along the rhizome; anthers 0.8-1.1 mm long.
    3 Achene 1.0-1.2 (-1.3) mm long; scale keel denticulate or smooth; stamen 2 (rarely 1); longest inflorescence bract erect ..... ***K. brevifolia***
    3 Achene 1.5-1.8 mm long; scale keel smooth; stamens 2-3; longest inflorescence bract horizontal to slightly reflexed ..... ***K. gracillima***
  2 Plant a cespitose annual or perennial, the culms arising clumped; anthers 0.2-0.5 mm long.
    4 Mature achene purple black, with stipe and apiculus contrastingly light in color; achene obovate, 0.7-0.8 (-0.9) mm wide; scale keel denticulate or smooth ..... ***K. odorata***
    4 Mature achene uniformly tan or light brown, not bicolored; achene oblong, 0.4-0.6 (-0.7) mm wide; scale keel denticulate (very rarely smooth) ..... ***K. pumila***

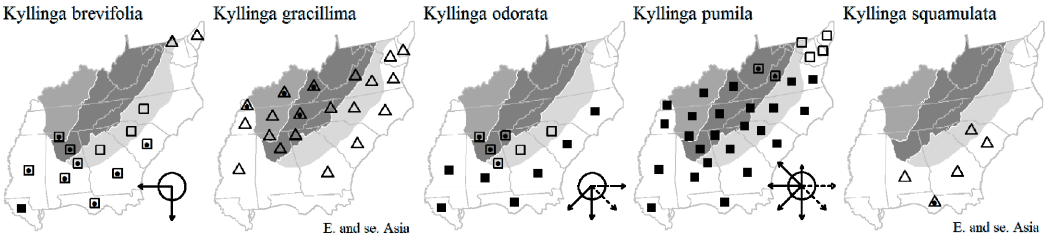
Kyllinga brevifolia Rottbøll, Perennial Greenhead Sedge. Moist soils of fields, ditches, lawns. June-September. Pantropical, north in North America to n. NC, se. OK, and CA. Likely to occur in s. VA. [= FNA, K, S, WH, X, Y; = *Cyperus brevifolius* – RAB, GW, Z; < *Cyperus brevifolius* (Rottbøll) Endlicher & Hasskarl – F, G]

* ***Kyllinga gracillima*** Miquel, Asiatic Greenhead Sedge. River sand bars, tidal marshes, tidal shores, moist soils of pastures and ditches; apparently introduced and native of e. Asia. See Bryson et al. (1996). *K. gracillima* Miquel (1866) appears to be the oldest valid combination in the genus *Kyllinga*, predating *K. brevifolioides* (Thieret & Delahoussaye) Tucker. Its distribution in North America is still somewhat obscure (because of confusion with *C. brevifolia*), but it is currently known from scattered locations in NC, SC, VA, CT, PA, MD, TN, AL, GA, NJ, DE, AR, MS, and KY. Reported for SC by Hill & Horn (1997), as *K. brevifolioides*. [= FNA, K; > *Cyperus brevifolioides* Thieret & Delahoussaye – RAB, C, GW, W, Z; < *C. brevifolius* (Rottbøll) Endlicher & Hasskarl – F; > *K. brevifolioides* (Thieret & Delahoussaye) Tucker – Y]

Kyllinga odorata Vahl, Whitehead Sedge. Moist soils of fields, ditches, lawns, shores of ponds and rivers, sand and gravel bars. July-September. Pantropical, north in North America to ne. NC and se. AR. Likely to occur in se. VA. [= K, S, WH, X, Y; = *Cyperus sesquiflorus* (Torrey) Mattfeld & Kükenthal ex Kükenthal – RAB, C, GW, Z]

Kyllinga pumila Michaux, Annual Greenhead Sedge. Moist soils of fields, ditches, lawns, shores of ponds and rivers. July-October. Pantropical, north in North America to e. PA, MO, and e. KS. [= K, S, WH, WV, X, Y; = *Cyperus tenuifolius* (Steudel) Dandy – RAB, C, F, G, GW, W, Z]

* ***Kyllinga squamulata*** Thonning ex Vahl, Crested Greenhead Sedge. Lawns, turf farms, athletic fields, golf courses, other disturbed areas; native of Asia. [= FNA, WH] {add to synonymy}



Lipocarpha R. Brown

A genus of about 35 species, herbs, pantropical and extending into warm temperate regions. Several recent authors have advocated submerging *Hemicarpha* in *Lipocarpha*, including Tucker (1987). References: Tucker (1987)=Z; Tucker in FNA (2002b); Goetghebeur in Kubitzki (1998b).

1 Spikes 2.5-10 (-12) mm long; anther ca. 0.5 mm long; stigmas 3 ..... ***L. maculata***
1 Spikes 2-5 (-8) mm long; anther 0.1-0.25 mm long; stigmas 2.
  2 Culms 7-35 cm long; longest involucral bract spreading to reflexed; achenes 3.5-5× as long as wide ..... ***L. microcephala***
  2 Culms 1-20 cm long; longest involucral bract more or less erect; achenes 1.5-2.5× as long as wide.
    3 Scales about as long as the achene, with long awns ..... ***L. aristulata***
    3 Scales reduced, shorter than the achene, awnless ..... ***L. micrantha***

*? ***Lipocarpha aristulata*** (Coville) G. Tucker. Moist ground; rare. Se. SC south to s. FL, west to the mw. and w. United States; the eastern occurrences may be adventive. [= FNA, K, WH, Z; = *Hemicarpha aristulata* (Coville) Smyth – F, GW; = *H. micrantha* var. *aristulata* Coville – C, G]

Lipocarpha maculata (Michaux) Torrey, American Lipocarpha. Ditches, moist exposed soil. July-September. Se. VA south to s. FL, west to AL. [= RAB, C, F, FNA, G, GW, K, S, WH, Z]

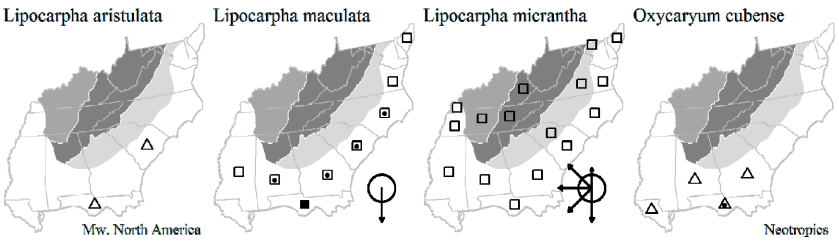
Lipocarpha micrantha (Vahl) G. Tucker. Riverbank draw-down zones, other moist sandy areas. July-August. ME west to ON and MN, south to s. FL and TX; south into tropical America. [= FNA, Z; = *Hemicarpha micrantha* (Vahl) Pax – RAB, F, GW, S; = *H. micrantha* var. *micrantha* – C; = *H. micrantha* var. *minor* (Schrader) Friedland – G; < *H. micrantha* – K, WH]

* ***Lipocarpha microcephala*** (R. Brown) Kunth. Cp (AL, FL?, GA): ditches; rare, native of Asia and Australia. [= FNA; < *H. micrantha* – K, WH]

Oxycaryum Nees

A monotypic genus of tropical and subtropical America and Africa. References: Bruhl in FNA (2002b).

* ***Oxycaryum cubense*** (Poeppig & Kunth) Palla, Cuban Bulrush. Swamps, marshes, ponds, ditches; aggressively weedy, probably adventive from the New World tropics. See Bryson et al. (1996) and Carter, Baker, & Morris (2009). [= FNA, K; = *Scirpus cubensis* Poeppig & Kunth – GW, S, WH] {not yet keyed}



Rhynchospora Vahl 1805 (Beaksedge, Beakrush)
(by Richard J. LeBlond)

A genus of about 250 species, subcosmopolitan, but concentrated in tropical and warm temperate America. See Thomas (1984) for the reasons for the inclusion of *Dichromena* in *Rhynchospora*. References: McMillan (2007)=Y; Gale (1944)=Z; Kral in FNA (2002b); Kral (1996, 1999); Goetghebeur in Kubitzki (1998b). Distributions given for tropical America are largely derived from Thomas (1992).

Identification notes: Measurements and descriptions of the achene are of the achene body only, *not* including the tubercle, unless otherwise indicated.

Key to groups

1 Tubercles 3-23 mm long; style simple or bifid only at the tip; [subgenus *Haplostylae*] ..... **Key A**
1 Tubercles < 3 mm long; style divided into 2 slender stigmatic branches; [subgenus *Diplostylae*].
2 Inflorescence bracts several, foliaceous, basally bright white, reflexed to horizontally spreading; [subgenus *Diplostylae*; section *Dichromena*] ..... **Key B**
2 Inflorescence bracts 0-several, capillary to foliaceous, green throughout (straminous in age), variously oriented.
3 Bristles present, plumose (at least proximally); [subgenus *Diplostylae*; section *Plumosae*] ..... **Key C**
3 Bristles absent, or present and smooth or minutely barbed.
4 Bristles present, retrorsely barbed (at least distally), or antrorsely barbed and straplike (flattened); [subgenus *Diplostylae*; section *Albae*] ..... **Key D**
4 Bristles absent, or present and smooth, or antrorsely barbed and filiform.
5 Achene surface smooth, minutely pitted, or finely striate (not ridged, rugose, or reticulate); subgenus *Diplostylae*; sections *Chapmaniae*, *Fasciculares*, and *Fuscae*] ..... **Key E**
5 Achene surface transversely ridged, rugose, or honeycombed-reticulate (sometimes faintly so); [subgenus *Diplostylae*; sections *Globulares*, *Harveyae*, *Mixtae*, *Psilocarya*, *Pusillae*, and *Rariflorae*] ..... **Key F**

Key A - beaksedges with tubercles 3-23 mm long [subgenus *Haplostylae*; sections *Longirostres* and *Polycephalae*]

1 Spikelets in 1-4 globose clusters; tubercle 3-5 mm long; leaf blades 2-8 mm wide; [section *Polycephalae*] ..... ***R. tracyi***
1 Spikelets in > 4 paniculate or corymbose clusters; tubercle 10-23 mm long; leaf blades 6-20 mm wide; [section *Longirostres*].
2 Longest bristles shorter than the achene.
3 Achene 5.0-6.0 mm long, 2.8-3.3 mm wide ..... ***R. corniculata*** var. ***corniculata***
3 Achene 4.4-5.3 mm long, 2.4-2.8 mm wide ..... ***R. corniculata*** var. ***interior***
2 Longest bristles longer than or equaling the achene.
4 Plants cespitose; primary clusters with 10-50 (rarely 7 or fewer) densely clustered spikelets; achene (4.5-) 5-6 mm long ..... ***R. macrostachya***
4 Plants rhizomatous; primary clusters with 1-6 loosely clustered spikelets; achene (3.5-) 4.0-4.8 mm long.
5 Bristles 2-8 mm long, the central bristle longest on one face, shortest or absent on the other ..... ***R. careyana***
5 Bristles 7-12 mm long, essentially of equal length ..... ***R. inundata***

Key B - beaksedges with basally-white bracts (White-bracted Sedges) [subgenus *Diplostylae*; section *Dichromena*]

1 Inflorescence bracts 3-6 (-7); basal bract (1.4-) 2-5 mm wide, the white portion (2.5-) 9-25 mm long, tapering gradually into the green portion; rhizomes slender, straight, (0.6-) 0.7-1.7 (-2.1) mm in diameter; achene 1.0-1.2 mm wide; tubercle broadly truncate on achene ..... ***R. colorata***
1 Inflorescence bracts (5-) 6-10; basal bract 5-12 mm wide, the white portion 22-55 mm long, tapering abruptly into the green portion; rhizomes often bent and swollen at the nodes, 1.4-3.8 mm in diameter; achene 1.2-1.5 mm wide; tubercle decurrent on achene ..... ***R. latifolia***

Key C - beaksedges with plumose bristles [subgenus *Diplostylae*; section *Plumosae*]

1 Spikelets (4-) 5-8 mm long, borne singly or a few together in loose clusters, some or all spikelets on slender stalks; achene 1.7-2.6 mm long, 1.2-2.0 mm wide.
2 Achene obovoid, 1.7-2.0 mm long, 1.2-1.5 mm wide, the tubercle seated on its summit without a constriction or basal flange; longer bristles < ½ as long as the achene ..... ***R. galeana***
2 Achene broadly elliptic, 1.9-2.6 mm long, 1.5-2.0 mm wide, its summit constricted below a collar-like flange at the base of the tubercle; longer bristles three-fourths to exceeding the length of the achene ..... ***R. oligantha***
1 Spikelets 2-4 mm long, borne several to many in clusters, none of the spikelets on slender stalks; achene 1.3-2.2 mm long, 0.9-1.7 mm wide
3 Leaves 2-4 mm wide, slightly involute (V-shaped in ×-section); achene 2.0-2.2 mm long; [FL only] ..... ***R. pineticola***
3 Leaves 0.8-1.5 mm wide, strongly involute (and often appearing superficially terete); achene 1.3-1.8 mm long; [more widespread] ..... ***R. plumosa***

Key D - beaksedges with bristles retrorsely barbed (at least distally) or antrorsely barbed and straplike (flattened) [subgenus *Diplostylae*; section *Albae*]

1 Bristles 8-25, retrorsely barbed distally, antrorsely barbed proximally; spikelets white, turning tan with age.
2 Spikelets with 2-3 florets; bristles 8-12; achene 1.6-2.1 mm long, 0.9-1.3 mm wide ..... ***R. alba***
2 Spikelets with 1 floret; bristles 16-25; achene 2.0-2.4 mm long, 1.3-1.5 mm wide ..... ***R. macra***
1 Bristles 6 or fewer, either retrorsely or (rarely) antrorsely barbed their entire length; spikelets variously brown, rufous, or tan (or very rarely white).
3 Spikelets 1-fruited, the solitary achene terminating the axis; clusters 1-7, globose to turbinate.
4 Clusters globose to turbinate; achene (measured from base of bristles) 1.3-1.8 mm long, 0.65-0.95 mm wide; tubercle 0.7-1.6 mm long.
5 Clusters turbinate to hemispheric (rarely subglobose), the lowest spikelets usually spreading-ascending to spreading; larger leaves < 2 mm wide; achene 1.6-1.8 mm long; tubercle 1.0-1.6 mm long ..... ***R. chalarocephala***
5 Clusters globose to subhemispheric, the lowest spikelets usually reflexed; larger leaves > 2 mm wide; achene 1.3-1.6 mm long; tubercle 0.7-1.2 mm long ..... ***R. microcephala***
4 Clusters globose to hemispherical; achene (measured from base of bristles) 1.8-2.6 mm long, 1.1-1.8 mm wide; tubercle 1.4-2.4 mm long.
6 Achene 1.1-1.2 mm wide, 1.8 mm long ..... ***R. cephalantha*** *var.* ***attenuata***
6 Achene 1.2-1.8 mm wide, 2.1-2.6 mm long ..... ***R. cephalantha*** *var.* ***cephalantha***
3 Spikelets 1-5 fruited (if 1-fruited, then the axis terminated by a sterile floret); clusters 2-many, ovoid to turbinate (rarely globose).
7 Clusters numerous, usually 20 or more; tubercle 1.3-1.8 mm long; achene 1.1-1.4 mm wide, 1.5-2.0 mm long, the summit narrowly truncate, the faces umbonate, the margin thickened and wire-like; leaves 2.5-7 mm wide ..... ***R. glomerata*** var. ***glomerata***
7 Clusters 2-8; tubercle 0.4-1.2 mm long; achene 0.6-1.2 mm wide, 1.1-2.0 mm long, the summit more rounded than truncate, the faces lenticular, a wire-like margin narrow or not evident; leaves 0.2-3.5 mm wide.
8 Achene 0.6-0.8 mm wide, 1.1-1.3 mm long; tubercle 0.4-0.6 mm long; bristles more-or-less equaling the achene ..... ***R. knieskernii***
8 Achene 0.8-1.2 mm wide, 1.3-2.0 mm long; tubercle 0.8-1.6 mm long; bristles more-or-less equaling the tubercle.
9 Inflorescence typically with 1 terminal and 1 lateral cluster, the clusters ovoid, with 1-10 spikelets each; achene 1.8-2.0 mm long, 0.8-1.0 mm wide, 2-3 × as long as wide; leaves 0.2-0.4 mm wide ..... ***R. capillacea***
9 Inflorescence with 1-6 lateral clusters, the clusters turbinate with usually > 10 spikelets; achene 1.3-1.8 mm long, 0.9-1.2 mm wide, 1.5-2 × as long as wide; leaves 1.5-3.5 mm wide.
10 Longer bristles 0.4 mm shorter than to 0.3 mm longer than the tubercle; tubercle 0.9-1.4 (-1.6) mm long, on average 0.69× as long as achene body; glomerules 3-5 (-6), 6-13 mm wide; [widespread in our area] ..... ***R. capitellata***
10 Longer bristles 0.3-1.0 mm longer than the tubercle; tubercle 0.8-1.1 mm long, on average 0.57× as long as achene body; glomerules 4-8, 4-8 mm wide; [of the Coastal Plain] ..... ***R. leptocarpa***

Key E - beaksedges with bristles smooth, or antrorsely barbed and filiform, or absent, the achene surface smooth, minutely pitted, or finely striate [subgenus *Diplostylae*; sections *Chapmaniae*, *Fasciculares*, and *Fuscae*]

1 Bristles 12; [section *Fasciculares*] ..... ***R. baldwinii***
1 Bristles 6 or fewer.
2 Leaves with a short taper at the tip, blunt to acute, but not long-acuminate; achene surface minutely pitted near the margin; [section *Chapmaniae*].
3 Basal leaves 4-6 mm wide, ciliate, rosulate; scales acuminate, the midrib ciliate; bristles 6, < ½ the length of the achene ..... ***R. ciliaris***
3 Largest basal leaves 2.5-3 mm wide, eciliate, not rosulate; scales aristate, the midrib eciliate; bristles 3-4, 1 or more equaling or exceeding the tubercle ..... ***R. solitaria***
2 Leaves long-acuminate at the tip; achene surface smooth or finely striate.
4 Bristles absent or 1-3 rudimentary; scales white to pale tan (or pale reddish-brown in *R. brachychaeta*); [section *Chapmaniae*].
5 Inflorescence composed of (1-) 2-3 turbinate to ellipsoid clusters; spikelets pale reddish-brown, (2.7-) 3-3.5 mm long; achenes usually 2 per spikelet ..... ***R. brachychaeta***
5 Inflorescence composed of 1 (-2) hemisphaeric to broadly turbinate cluster(s); spikelets white to pale brown, either 2-2.5 (-3) mm or (3.5-) 4-5.5 mm long; achenes 1 per spikelet.
6 Base of plant not bulb-like, not enclosed in bladeless sheaths; spikelets 2-2.5 (-3) mm long; achene 1.0-1.2 mm long, 0.8-1.0 mm wide ..... ***R. chapmanii***
6 Base of plant bulb-like, enclosed in bladeless sheaths; spikelets (3.5-) 4-5.5 mm long; achene 1.4-1.8 mm long, 1.2-1.5 mm wide ..... ***R. pallida***
4 Bristles present (if rudimentary, then 4-6); scales tan, rufous, or brown.
7 Achene 0.6-1.1 mm wide, pyriform, obovoid, or narrowly elliptic, pale to dark brown but not blackish; tubercle margin setose (smooth in *R. species 1*).
8 Inflorescence of 1 cluster; tubercle 0.3-0.4 mm long, the margin smooth ..... ***R. species 1***
8 Inflorescence of (1-) 2-4 (-10) clusters; tubercle 0.4-1.4 mm long, the margin setose; [section *Fuscae*].
9 Achene narrowly elliptic or narrowly obovoid, 1.2-1.5 mm long by 0.6-0.7 mm wide, twice as long as wide; tubercle 0.8-1.2 mm long ..... ***R. curtissii***
9 Achene broadly elliptic to obovoid or pyriform, < 2× as long as wide; tubercle 0.4-1.5 mm long.
10 Leaves 2-4 (-5) mm wide; stipe subtending achene 0.5-1.0 mm long ..... ***R. crinipes***
10 Leaves 0.2-1.5 (-2) mm wide; stipe subtending achene < 0.4 mm long.
11 Leaves to 1.5 (-2) mm wide; achene 1.0-1.7 mm long, 0.9-1.1 mm wide; tubercle 0.5-1.5 mm long.
12 Culms solitary to loosely cespitose by slender rhizomes; terminal internode straight; clusters turbinate to ovoid; achene 1.0-1.3 mm long, uniformly medium to dark brown; tubercle 0.7-1.5 mm long; bristles usually of two lengths, some equaling the tubercle, and some equaling or shorter than the achene ..... ***R. fusca***
12 Culms solitary to cespitose, without slender rhizomes; terminal internode often arched; clusters corymbose to hemispheric; achene 1.3-1.7 mm long, pale to reddish-brown, often translucent centrally, with a distinctly thickened wire-like margin; tubercle 0.5-1.0 mm long; all bristles more-or-less equaling the tubercle ..... ***R. harperi***

11 Leaves filiform, < 1 mm wide; achene 0.8-1.3 mm long, 0.6-0.9 mm wide; tubercle 0.4-0.8 mm long.
13 Culms without rhizomes; spikelets 2.5-4 mm long; achene translucent centrally; tubercle 0.4-0.6 mm long.... ***R. filifolia***
13 Culms with delicate rhizomes; spikelets 5-7 mm long; achene uniformly opaque; tubercle 0.6-0.8 mm long ..... ***R. pleiantha***

6 Achene > 1 mm wide (except 0.8 mm wide in *R. fernaldii* with a blackish surface), suborbicular or broadly ellipsoid; tubercle margin smooth or roughened but not setose; [section *Fasciculares*].
14 Achene 0.8 mm wide, 0.9-1.0 mm long, blackish ..... ***R. fernaldii***
14 Achene 1.1-1.7 mm wide, 1.3-2.0 mm long, brown to dark brown.
15 Tubercle 1.0-2.6 mm long, long-attenuate to subulate..... ***R. gracilenta***
15 Tubercle 0.2-0.8 mm long, triangular to triangular-attenuate or with a strap-like beak.
16 Bristles rudimentary to ½ as long as the achene body.
17 Larger leaves to 1 mm wide; mature culms to 4.5 dm long; floral fascicles 1 (-2); tubercle 0.2-0.5 mm long..... ***R. debilis***
17 Larger leaves 2-4 mm wide; mature culms to 13 dm long; floral fascicles (1-) 2-4; tubercle 0.4-0.7 mm long ..... ***R. fascicularis***
16 Bristles > ½ as long to exceeding the achene body.
18 Basal leaves filiform to (rarely)1.3 mm wide, the longer approaching length of culm; tubercle narrowed above the base into a strap-like beak..... ***R. wrightiana***
18 Basal leaves 1.3-4 mm wide, all much shorter than the culm; tubercle triangular to triangular-attenuate.
19 Longer bristles equaling to exceeding the achene body; achene body elliptic, 1.1-1.3 mm wide; tubercle triangular-attenuate; larger basal leaves 1.3-2.5 mm wide..... ***R. distans***
19 Longer bristles < ½ as long to rarely exceeding achene body; achene suborbicular, 1.2-1.5 mm wide; tubercle triangular; larger basal leaves 2-4 mm wide..... ***R. fascicularis***

Key F – beaksedges with bristles smooth, or antrorsely barbed and filiform, or absent, the achene surface transversely ridged, rugose, or honeycombed-reticulate [subgenus *Diplostylae*; sections *Globulares*, *Harveyae*, *Mixtae*, *Psilocarya*, *Pusillae*, *Rariflorae*]

1 Bristles absent (or apparently so at 10×); achene 0.5-0.7 mm wide; tubercle 0.1-0.2 mm long, skull-cap like; [section *Pusillae*].
2 Achene including tubercle 1.0-1.2 mm long, the achene surface evidently reticulate and obscurely transversely ridged, the body ellipsoid; bristles present, white, barely visible at 20×, the longest shorter than the achene body ..... ***R. thornei***
2 Achene including tubercle 0.6-0.9 mm long, the body obovoid; bristles absent.
3 Achene surface smooth, faintly reticulate, not transversely ridged..... ***R. divergens***
3 Achene surface rough, distinctly transversely ridge..... ***R. pusilla***

1 Bristles present or absent; if absent, then the achene > 1 mm long or > 0.7 mm wide, and tubercle triangular to subulate.
4 Culms and leaves filiform.
5 Achene including tubercle 1.0-1.2 mm long; tubercle minute, skullcap-like; [section *Pusillae*]..... ***R. thornei***
5 Achene including tubercle 1.5-2.9 mm long; tubercle triangular to triangular-acuminate; [section *Rariflorae*].
6 Bristles subequaling to exceeding the tubercle; tubercle 0.75-1.4 mm long ..... ***R. stenophylla***
6 Bristles shorter than the achene body; tubercle 0.3-1.0 mm long.
7 Achene 1.3-1.6 mm long, 0.9-1.4 mm wide; tubercle 0.3-0.6 (-0.75) mm long; bristles 1/3-1/2(-4/5) as long as achene body ..... ***R. rariflora***
7 Achene 1.6-1.8 mm long, 1.35-1.5 mm wide; tubercle 0.6-1.0 mm long; bristles 2/3 to nearly as long as achene body..... ***R. species 2***
4 Culms stouter; leaves wider, not filiform.
8 Achene faces flat or concave; when one face is concave, the opposite face is sometimes slightly convex (slightly biconvex *R. decurrens* and *R. microcarpa* are keyed here for convenience).
9 Achene at least twice as long as wide, elliptic-oblong; tubercle subulate, 0.8-1.2 mm long; [section *Mixtae*]..... ***R. inexpansa***
9 Achene < twice as long as wide, obovate; tubercle triangular, 0.2-0.9 mm long.
10 Longer bristles exceeding the achene body.
11 Achene ±2.2 mm long, ±1.8 mm wide; tubercle ±0.9 mm long; [section *Globulares*]..... ***R. punctata***
11 Achene 0.8-1.2 mm long, 0.7-1.2 mm wide; tubercle 0.2-0.5 mm long; [section *Mixtae*].
12 Larger leaves (3-) 4-6 mm wide; bristles exceeding tubercle; achene faces flattened..... ***R. elliottii***
12 Larger leaves 1-3 (-4) mm wide, bristles half as long as achene to equaling tubercle; achene faces slightly convex..... ***R. microcarpa***
10 Longer bristles shorter than to equaling achene body, or absent.
13 Larger leaves 4-5 mm wide; achene 1.4-1.6 mm wide; tubercle 0.6-0.8 mm long, abruptly rising from a flaring basal collar; [section *Globulares*] ..... ***R. compressa***
13 Larger leaves 1-3 (-4) mm wide; achene 0.7-1.3 mm wide; tubercle 0.15-0.5 mm long, without a flaring basal collar; [section *Mixtae*].
14 Bristles rudimentary or absent ..... ***R. perplexa***
14 Bristles one-half as long to equaling achene.
15 Achene 1.3-1.8 mm long, 0.9-1.2 mm wide, the faces flat with 10-12 transverse ridges ..... ***R. torreyana***
15 Achene 0.8-1.4 mm long, 0.7-1.2 mm wide, the faces slightly biconvex with 6-12 transverse ridges.
16 Clusters elongate; achene 1.0-1.4 mm long, 0.8-1.0 mm wide, narrowly obovate to elliptic, averaging 8-12 transverse ridges; most tubercle bases convexly seated on the achene summit and somewhat decurrent along the achene margins, the tubercle surface often whitish-waxy ..... ***R. decurrens***
16 Clusters usually compact; achene 0.8-1.2 mm long, 0.7-1.2 mm wide, suborbicular to elliptic, averaging 6-7 transverse ridges; most tubercle bases flat across the achene summit, not decurrent, the tubercle surface usually dark, not waxy..... ***R. microcarpa***
8 Achenes biconvex or tumid.
17 Achene 1.4-4.2 mm long, 1.2-3.6 mm wide, the summit with a thickened bony to crustaceous rim surrounding the base of the tubercle; [section *Harveyae*].

18 Achene lenticular and transversely ridge, ±1.4 mm long, ±1.2 mm wide ..... ***R. culixa***
18 Achene tumid, lightly pitted or cancellate in a honeycomb pattern, 1.5-4.2 mm long, 1.4-3.6 mm wide.
19 Leaves 4-8 mm wide; achene 3.0-4.2 mm long, 3.0-3.6 mm wide ..... ***R. megalocarpa***
19 Leaves 2-4 mm wide; achene < 2.7 mm long and < 2.5 mm wide.
20 Achene 2.0-2.7 mm long, 2.0-2.5 mm wide ..... ***R. grayi***
20 Achene 1.5-1.8 mm long, 1.4-1.7 mm wide ..... ***R. harveyi***
17 Achene 0.7-1.8 mm long, 0.7-1.5 mm wide, the summit without a textured rim surrounding the base of the tubercle (if the base of the tubercle is rim-like, then it is distinguished from the summit of the achene by a constriction or articulation).
21 Bristles absent; achene 0.7-1.0 mm long; [section *Psilocarya*].
22 Scales broadly ovate, obtuse to sub-acute; achene strongly transversely ridged; tubercle depressed, broader than long; style not persistent ..... ***R. nitens***
22 Scales lance-ovate, acute; achene weakly transversely ridged; tubercle triangular-lanceolate, as long as broad or longer; style usually persistent ..... ***R. scirpoides***
21 Bristles present (occasionally detached in *R. decurrens* and *R. miliacea* with achenes 1.0-1.4 mm long).
23 Bristles not exceeding the achene body.
24 Cluster branches flexuous; bristles one-half as long to equaling the achene (or longer in *R. microcarpa*); achene slightly biconvex, 0.8-1.4 mm long, 0.7-1.0 (-1.2) mm wide; [section *Mixtae*].
25 Clusters elongate; achene narrowly obovate to elliptic, averaging 8-12 transversed ridges; most tubercle bases convexly seated on the achene summit and somewhat decurrent along the achene margins, the tubercle surface often whitish-waxy . ..... ***R. decurrens***
25 Clusters usually compact; achene suborbicular to elliptic, averaging 6-7 transverse ridges; most tubercle bases flat across the achene summit, not decurrent, the tubercle surface usually dark, not waxy ..... ***R. microcarpa***
24 Cluster branches stiff; bristles ¾ or less as long as the achene; achene tumid above, somewhat compressed below, 1.0-1.8 mm long, 1.0-1.6 mm wide; tubercle conical-attenuate, the edges somewhat concave; [section *Globulares*].
26 Larger culm leaves to 5 mm wide; achenes (1.2-) avg. 1.45 (-1.85) mm long, (1.1-) avg. 1.4 (-1.75) mm wide; achene surface alveoli longitudinally narrow; tubercle 0.3-0.7 mm long, base 0.6-1.0 mm wide ..... ***R. recognita***
26 Larger culm leaves to 3 mm wide; achenes (1.0-) avg. 1.3 (-1.5) mm long and wide; if achene surface alveoli longitudinally narrow, then tubercle 0.2-0.4 mm long and base 0.5-0.7 mm wide (*R. globularis*).
27 Longer bristles ⅓-½ (-¾)× the length of the achene; achene surface alveoli longitudinally narrow (typically 0.02-0.05 mm wide between the longitudinal walls), the latitudinal walls raised into horizontal ridges; tubercle 0.2-0.4 mm long, the base 0.5-0.7 mm wide ..... ***R. globularis***
27 Longer bristles ⅔-1× the length of the achene; achene surface alveoli nearly as wide as long (typically 0.05-0.1 mm wide between the longitudinal walls), the latitudinal walls obscurely or not at all raised into horizontal ridges; tubercle 0.35-0.7 mm long, the base 0.7-0.9 mm wide ..... ***R. pinetorum***
23 Bristles equaling or longer than the tubercle.
28 Primary branches of the inflorescence spreading at right angles from the culm, each spikelet or small cluster on slender spreading or reflexed stalks; [section *Mixtae*] ..... ***R. miliacea***
28 Primary branches of the inflorescence ascending.
29 Spikelets 6-9 mm long; [section *Mixtae*] ..... ***R. odorata***
29 Spikelets < 5 mm long.
30 Tubercle 0.4-0.8 mm long, the edges setose or uneven with waxy or crusty irregular protuberances; [section *Mixtae*].
31 Achene obovate to suborbicular, 1.2-1.6 mm wide, latitudinal alveoli walls strongly raised into transverse ridges..... ..... ***R. caduca***
31 Achene slenderly obovoid, 0.8-1.0 mm wide, latitudinal alveoli walls weakly or not at all raised into transverse ridges..... ***R. mixta***
30 Tubercle 0.2-0.5 mm long, the edges smooth.
32 Spikelets 3.5-4 mm long; bristles exceeding the tubercle; achene 1.3-1.5 mm long, 1.2-1.3 mm wide; [section *Globulares*] ..... ***R. saxicola***
32 Spikelets 2.5-3 mm long; longer bristles about equaling the tubercle; achene 0.8-1.2 mm long, 0.7-1.2 mm wide; [section *Mixtae*].
33 Inflorescence occupying the upper ¼-½ of the culm, the lowest 2-4 nodes barren..... ***R. microcarpa***
33 Inflorescence occupying ⅔-¾ of the length of the culm, the lowest lateral panicle at the first or second node above the base ..... ***R. sulcata***

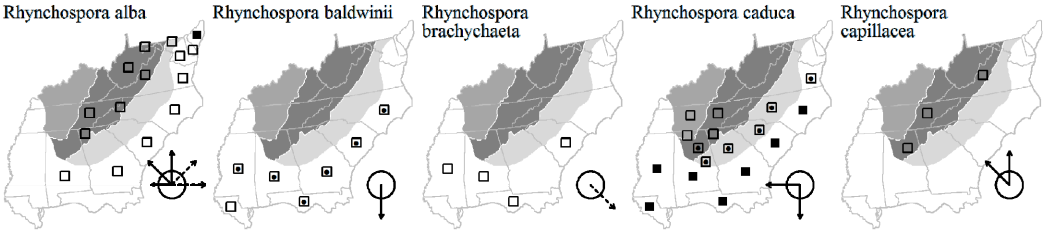
Rhynchospora alba (Linnaeus) Vahl, Northern White Beaksedge. Mountain bogs and fens, peaty situations in the Coastal Plain, such as low pocosins in peat domes or large Carolina bays, and floating peat mats in limesink (doline) ponds and bay lakes, possibly also in seepage bogs with abundant *Sphagnum*, generally occurring in the most open, harshest, and peatiest areas. July-October. Circumboreal, in North America from NL (Labrador) west to AK, south to SC, TN, TN, IL, SK, ID, and CA; disjunct in se. GA (Charlton Co., at the Okefenokee Swamp) (Williges & Loftin 1995), s. AL (Escambia Co.; specimen at CLEMS), and the mountains of Puerto Rico. [= C, F, FNA, G, GW, K, RAB, W, WV, Y, Z; = *Rynchospora alba* – S]

Rhynchospora baldwinii A. Gray, Baldwin's Beaksedge. Wet savannas, seepages. July-August. Se. NC south to s. FL and west to LA. [= C, FNA, K, GW, RAB, WH, Y, Z; = *Rynchospora baldwinii* – S]

Rhynchospora brachychaeta C. Wright. Cypress ponds, other depressions. E. SC south to Panhandle FL and s. AL and s. MS; Cuba. Reported for SC (McMillan 2007). Kral in FNA considers this species possibly adventive, but McMillan (2007) provides good reasons for considering it native in our area. [= FNA, K, Y, Z; < *Rynchospora wrightiana* – S] {not yet keyed}

Rhynchospora caduca Elliott, Angle-stem Beaksedge. Savannas, hardwood swamps, other wet areas. July-September. E. and c. VA south to s. FL and west to TX, OK, and AR, north in the interior to sc. TN. This species is found at a few sites in the mountains of GA. See notes under *R. miliacea*. [= C, F, FNA, G, GW, K, RAB, W, WH, Y, Z; > *Rynchospora caduca* – S; > *Rynchospora patula* A. Gray – S]

Rhynchospora capillacea Torrey. Calcareous wetlands. NL (Newfoundland) west to SK, south to sw. VA, ne. TN, and n. AR. [= C, F, FNA, G, K, Y, Z]



Rhynchospora capitellata (Michaux) Vahl, Brownish Beaksedge. Bogs and fens, seepages, and wet rock outcrops in the Mountains and upper Piedmont, also in wet habitats in the Coastal Plain of ne. NC and e. VA. July-September. Widespread in e. North America, south to nc. GA. The only common beaksedge in the Mountains of our area. A somewhat similar species, *R. knieskernii*, occurs north of our area, but should be looked for here; they are discussed at the end of this genus. Sorrie (2000) has clarified the relationships and distinctions of this taxon with *R. leptocarpa*. [= C, F, G, W, WV, Y; < *R. capitellata* – FNA, GW, K, RAB, Z; = *Rynchospora capitellata* – S]

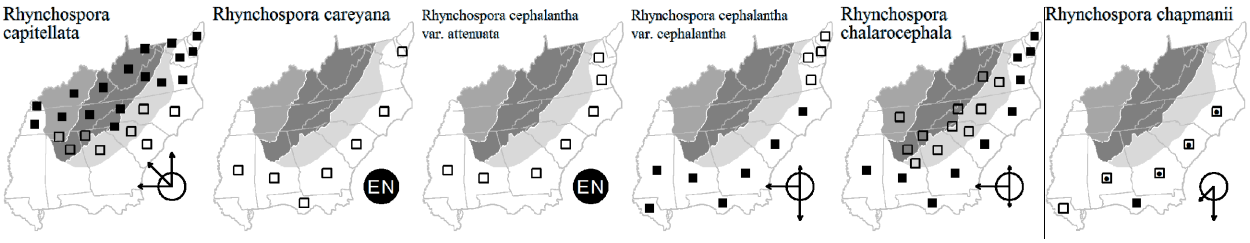
Rhynchospora careyana Fernald, Carey's Horned Beaksedge. Limesink (doline) depression ponds and in intermittently flooded depression meadows. July-September. Apparently ranging from se. NC south to FL, but the range poorly known because of confusion with *R. inundata*, from which it is perhaps not specifically distinct. [= FNA, K, Y; < *R. inundata* – RAB, WH; < *R. corniculata* – GW (listed in synonymy under *R. corniculata* in GW, but would actually key to *R. inundata)*; = *Rynchospora careyana* – S]

Rhynchospora cephalantha A. Gray *var.* ***attenuata*** Gale, Small Bunched Beaksedge. Savannas, sandhill seeps, openings in streamhead pocosins. July-October. The range of this variety is poorly known; is reported by Z from NC, SC, AL, and MS. Recent collections from MD and VA extend the range. See discussion in Sorrie et al. (1997). [= Y, Z; < *R. cephalantha* – C, FNA, GW, K, RAB; < *Rynchospora axillaris* – S]

Rhynchospora cephalantha A. Gray *var.* ***cephalantha***, Common Bunched Beaksedge. Savannas. July-October. S. NJ south to s. FL and west to LA. Often weedy, this species occurs commonly along wet roadsides, powerline corridors, and the like. [= Y; < *R. cephalantha* – C, FNA, GW, K, RAB, WH; > *R. cephalantha* var. *cephalantha* – F, G, Z; > *R. cephalantha* var. *pleiocephala* Fernald & Gale – F, G, Z; < *Rynchospora axillaris* (Lamarck) Britton – S]

Rhynchospora chalarocephala Fernald & Gale, Loose-head Beaksedge. Savannas, limesink ponds, and swamps, often weedy and occurring in abundance on wet roadsides and in powerline corridors. July-September. S. NJ south to c. FL and west to LA; disjunct in nw. GA (Jones & Coile 1988) and sc. TN (Coffee County). [= C, F, FNA, G, GW, K, RAB, W, WH, Y, Z; ? – S]

Rhynchospora chapmanii M.A. Curtis, Chapman's Beaksedge. Savannas, seepage bogs, sandy margins of limesink (doline) ponds, and other wet, acid habitats. July-September. Se. NC south to s. FL and west to e. LA; Belize, Nicaragua. [= FNA, GW, K, RAB, WH, Y, Z; = *Rynchospora chapmanii* – S]



Rhynchospora ciliaris (Michaux) C. Mohr, Fringed Beaksedge. Savannas, sandhill seeps. July-September. Se. NC south to s. FL and west to LA. [= FNA, GW, K, RAB, WH, Y, Z; = *Rynchospora ciliaris* – S]

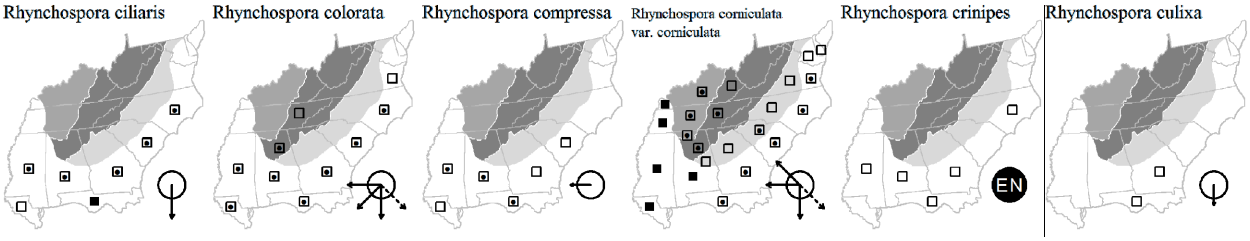
Rhynchospora colorata (Linnaeus) H. Pfeiffer, Narrowleaf Whitetop Sedge. Wet savannas, ditches, dune swales. May-September. Primarily a Southeastern Coastal Plain endemic: se. VA south to FL and west to TX; Mexico (Tabasco, Chiapas, Yucatán), West Indies, Belize, Guatemala, Costa Rica, Venezuela. [= C, FNA, K, WH, Y; = *Dichromena colorata* (Linnaeus) H. Pfeiffer – F, G, GW, RAB, S]

Rhynchospora compressa Carey ex Chapman. Savannas. S. SC south to Panhandle FL, west to e. LA. This species was reported for SC (Kartesz 1999), based on the South Carolina Plant Atlas (http://cricket.biol.sc.edu/herb/); McMillan (pers. comm.) states that the record is in error, based on a misidentified specimen. The species occurs in sc. GA (Jones & Coile 1988) and has since been found in SC by McMillan (2003). [= FNA, GW, K, WH, Y, Z; = *Rynchospora compressa* – S]

Rhynchospora corniculata (Lamarck) A. Gray *var.* ***corniculata***, Short-bristle Horned Beaksedge. Pondcypress savannas in Carolina bays, swamp forests, other wetlands. July-September. Var. *corniculata* ranges from DE south to FL and west to LA, extending north into KY and MO; also in the West Indies. Var. *interior*, possibly not worth recognition, is distinguished by a shorter and narrower achene, the summit barely broader than the base of the tubercle, and occurs in the Mississippi drainage. [= C, F, G; < *R. corniculata* (Lamarck) A. Gray – FNA, GW, K, RAB, WH, Y; < *Rynchospora corniculata* – S]

Rhynchospora crinipes Gale, Alabama Beaksedge. Sand-clay bars and peaty stream banks of blackwater streams. July-September. Sc. NC (Sorrie et al. 1997) through sc. GA to FL Panhandle, west to s. AL; very scattered in occurrence. This very rare species is related to *R. filifolia*, but is a coarser plant, readily distinguishable by characters of the achene, culm, and leaves. Anderson (1988) discusses its systematics, habitat, and rarity. [= FNA, GW, K, WH, Y, Z]

Rhynchospora culixa Gale, Georgia Beaksedge. Pine savannas, flatwoods. GA and FL. [= K, Y, Z; = *R. harveyi* W. Boott var. *culixa* (Gale) Kral – FNA; < *R. harveyi* – WH]



Rhynchospora curtissii Britton. Pine flatwoods and bogs. An East Gulf Coastal Plain endemic, in Panhandle FL, AL, and s. MS (Sorrie & Leonard 1999); also reported from SC by Kral (1996) and for NC and SC by Kartesz (1999), but specimens so annotated are misidentified. [= FNA, GW, K, WH, Y, Z; = *Rynchospora smallii* – S]

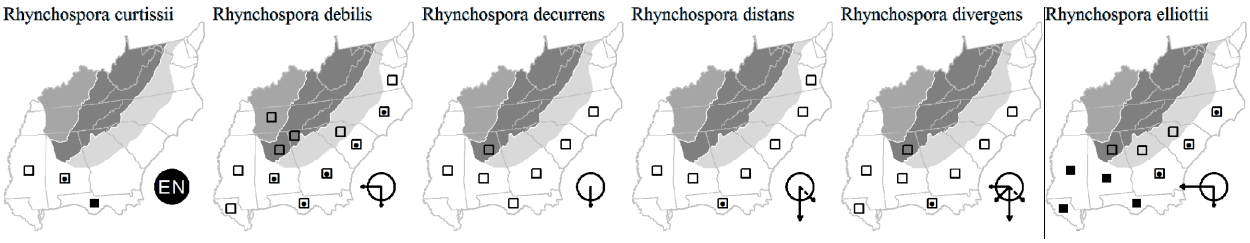
Rhynchospora debilis Gale, Savanna Beaksedge. Savannas, sandhill seeps. July-September. Se. VA south to n. peninsular FL and west to se. TX (Brown & Marcus 1998). Like a small version of *R. fascicularis*, often with several ascending, cespitose culms, each terminated by a single glomerule. [= C, F, FNA, GW, K, RAB, WH, Y, Z]

Rhynchospora decurrens Chapman, Swamp-forest Beaksedge. Swamp forests and river marshes, especially along blackwater rivers. July-August. Se. NC south to c. peninsular FL and west to s. MS (Sorrie & Leonard 1999). [= FNA, GW, K, RAB, WH, Y, Z; = *Rynchospora decurrens* – S]

Rhynchospora distans (Michaux) Vahl. Savannas and limesink ponds. June-September. Se. VA south to s. FL and west to s. MS (Sorrie & Leonard 1999); West Indies. Appearing to merge with *R. wrightiana* on the outer Coastal Plain of NC. [= Y; = *Rhynchospora fascicularis* (Michaux) Vahl var. *distans* (Michaux) Chapman – F, K, Z; < *R. fascicularis* – FNA, G, GW, RAB, WH; = *Rynchospora distans* – S]

Rhynchospora divergens Chapman ex M.A. Curtis, White-seeded Beaksedge. Wet savannas, especially in exposed sands. May-September. Se. NC south to s. FL and west to se. TX; Bahamas, Mexico (Chiapas), Belize. *R. divergens*, *R. pusilla*, and *R. thornei* are all small, grass-like plants, very similar in appearance to one another. [= FNA, GW, K, RAB, WH, Y; = *Rynchospora divergens* – S]

Rhynchospora elliottii A. Dietrich, Elliott's Beaksedge. Savannas, ditches, other wet habitats, often weedy. July-September. Se. NC south to c. peninsular FL and west to e. TX. The achenes are typically flat or concave on one face, and flat or slightly convex on the other. See note under *R. microcarpa*. [= FNA, GW, K, WH, Y; = *R. schoenoides* (Elliott) Wood – RAB, Z; = *Rynchospora schoenoides* – S]



Rhynchospora fascicularis (Michaux) Vahl, Fascicled Beaksedge. Savannas, limesink ponds, ditches. June-September. Se. VA south to s. FL and west to se. TX; West Indies. [= Y; = *Rhynchospora fascicularis* (Michaux) Vahl var. *fascicularis* – F, K, Z; < *R. fascicularis* – FNA, G, GW, RAB, WH; = *Rynchospora fascicularis* – S]

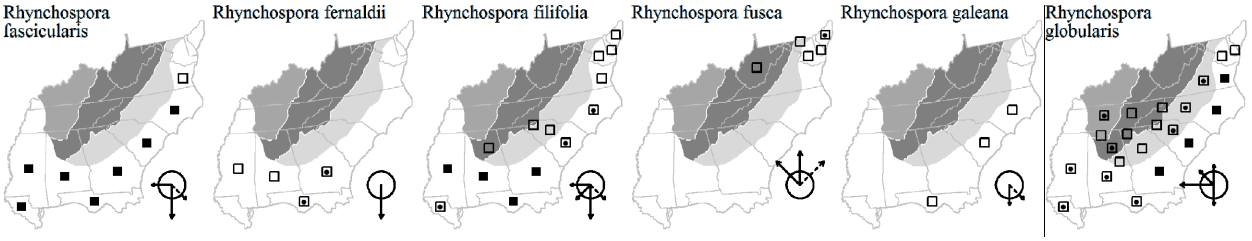
Rhynchospora fernaldii Gale, Fernald's Beaksedge. Pine flatwoods. S. GA south to s. FL, west to s. MS. [= FNA, GW, K, WH, Y, Z]

Rhynchospora filifolia A. Gray, Threadleaf Beaksedge. Sandy shores of limesink (doline) depressions, especially at the lower margin, savannas. July-September. S. NJ south to c. FL and west to e. TX; Cuba, Mexico (Tabasco), Belize, Nicaragua. [= C, F, FNA, G, K, RAB, WH, Y, Z; < *R. filifolia* – GW; = *Rynchospora filifolia* – S]

Rhynchospora fusca (Linnaeus) Aiton f. Atlantic white-cedar swamps, sea-level fens, fens. Circumboreal, in North America from NL (Labrador) west to SK, south to NJ, e. PA (Rhoads & Klein 1993), MD, DE, WV (FNA; Harmon, Ford-Werntz, & Grafton 2006), IN, IL, and MN. [= C, F, FNA, G, K, Y, Z]

Rhynchospora galeana Naczi, W. Knapp, & Gerry Moore, Short-bristle Beaksedge. Wet savannas. July-September. Se. NC south to s. FL and west to s. MS; West Indies. This species will colonize disturbances (roadsides, powerline corridors), but not aggressively. The leaf tips of *R. galeana* are acute and minutely serrulate, while those of the closely related *R. oligantha* are blunt and smooth; these characters are, however, often difficult to determine. See Naczi, Knapp, and Moore (2010) for discussion of the need to replace the name *R. breviseta* because of an earlier-named Asian species. [= *R. breviseta* (Gale) Channell – FNA, GW, K, RAB, WH, Y (later homonym) ; < *R. oligantha* – F, G; < *Rynchospora oligantha* – S; = *R. oligantha* A. Gray var. *breviseta* Gale – Z]

Rhynchospora globularis (Chapman) Small, Globe Beaksedge. Sandy or peaty depressions, wet ditches, powerline corridors, savannas. June-September. Apparently ranges from DE south to s. FL and west to c. TX and OK; north in the interior to nc. TN; also allegedly in n. CA. Both *R. globularis* and *R. pinetorum* tend to produce shorter plants with smaller glomerules than *R. recognita*. Occasional achenes of *R. globularis* exhibit the wide alveoli of *R. pinetorum* near the base or summit, with little or no horizontal ridging, but centrally have narrow alveoli with pronounced horizontal ridges. The opposite condition occasionally occurs in *R. pinetorum* achenes, with narrow alveoli and horizontal ridging basally or at the summit, but wide alveoli and little or no ridging centrally. [= Y; < *R. globularis* – RAB, W; = C, F, FNA, G, K, WH, Z; < *R. globularis* var. *globularis* – GW; = *Rynchospora globularis* – S]



Rhynchospora glomerata (Linnaeus) Vahl *var.* ***glomerata***, Clustered Beaksedge. Cp (DE, FL, GA, NC, SC, VA), Pd (GA, NC, SC, VA), Mt (GA, NC, SC, VA): savannas, bogs, other wet habitats; common (rare in Mountains, rare in DE). July-September. Var. *glomerata* ranges from s. NJ south to ne. FL, FL Panhandle, and west to e. TX, and inland in KY, TN, AR, and KS. Var. *angusta* Gale occurs in AR, LA, and e. TX. It is distinguished primarily by a narrower and longer gynophore. [= Y, Z; < *R. glomerata* – C, F, FNA, G, GW, K, RAB, W, WH; < *Rynchospora glomerata* – S]

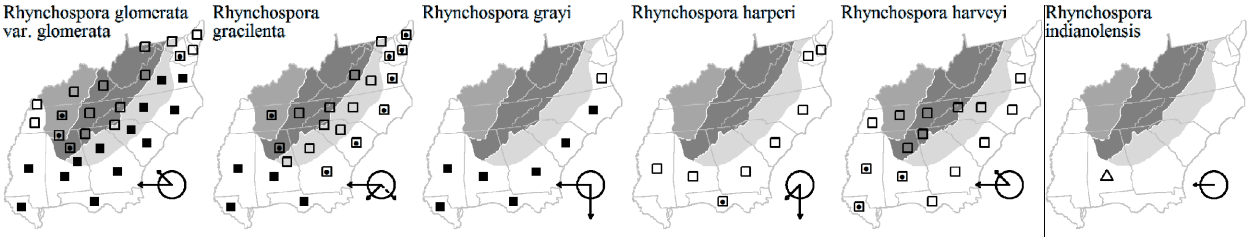
Rhynchospora gracilenta A. Gray, Slender Beaksedge. Cp (DE, FL, GA, NC, SC, VA), Pd (GA, NC, SC, VA), Mt (NC, SC, VA): savannas, bogs; uncommon (rare in Piedmont and Mountains). July-September. NJ south to ne. FL, FL Panhandle, and west to e. TX, north in the inland to nc. TN and AR; Cuba, Mexico (Chiapas), Belize, Nicaragua. [= C, F, FNA, G, GW, K, RAB, W, WH, Y, Z; = *Rynchospora gracilenta* – S]

Rhynchospora grayi Kunth, Gray's Beaksedge. Cp (FL, GA, NC, SC, VA): sandhills and other dry, sandy sites; uncommon. June-September. VA south to s. FL, west to TX. [= C, F, FNA, G, K, RAB, WH, Y, Z; = *Rynchospora grayi* – S]

Rhynchospora harperi Small, Harper's Beaksedge. Cp (DE, FL, GA, NC, SC): peaty limesink depression ponds (dolines), from standing water to the upper margins of the pond-shore; rare. July-September. Se. NC south to sc. peninsular FL and west to s. AL and s. MS (Sorrie & Leonard 1999); disjunct in DE and MD; disjunct in Belize. See Nelson (1993) for first SC record, and LeBlond (1997) for additional information on the species, especially its distribution. [= FNA, K, WH, Y, Z; < *R. filifolia* – GW; = *Rynchospora harperi* – S]

Rhynchospora harveyi W. Boott, Harvey's Beaksedge. Cp (FL, GA, NC, SC, VA), Mt (GA, NC), Pd (NC): savannas in the Coastal Plain, seepage bogs in the Sandhills, bogs in the Mountains and Piedmont; rare. July-August. Se. VA south to ne. FL, FL Panhandle, and west to TX and OK, and north in the interior to nc. TN and MO. [= C, F, G, GW, K, RAB, W, Y, Z; = *R. harveyi* var. *harveyi* – FNA; = *Rynchospora harveyi* – S; < *R. harveyi* – WH]

Rhynchospora indianolensis Small. Cp (AL): roadside ditches; rare. Coastal Plain of TX; recently also found in s. AL. Kral in FNA mentions that *R. indianolensis* may be conspecific with the Cuban *R. scutellata*. [= FNA; = *Rynchospora indianolensis*; < *R. scutellata* Grisebach] {add to synonymy; not yet keyed}



Rhynchospora inexpansa (Michaux) Vahl, Nodding Beaksedge. Wet savannas, streamhead pocosins where frequently burned, usually in peaty situations, often weedy, colonizing disturbances. July-September. Se. VA south to ne. FL, FL Panhandle, and west to e. TX and AR; West Indies. [= C, F, FNA, G, GW, K, RAB, WH, Y, Z; = *Rynchospora inexpansa* – S]

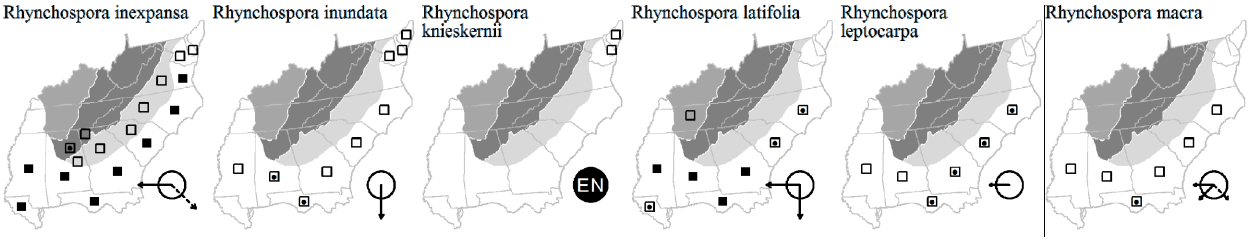
Rhynchospora inundata (Oakes) Fernald, Narrow-fruit Horned Beaksedge. In water of limesink dolines and clay-based Carolina bays. usually found in shallow water or at the lower margins of pond-shores, typically producing large colonies. July-September. Apparently ranging from e. MA south to s. FL and west to e. TX (the range, however, obscured by confusion with *R. careyana*) (Singhurst, Mink, & Holmes 2010). The relation of this species to *R. careyana* and to more northern entities of *R. inundata* remain unresolved. [= C, F, FNA, G, GW, K, Y; < *R. inundata* – RAB, WH; = *Rynchospora inundata* – S]

Rhynchospora knieskernii Carey. Pinelands. Moist sandy/peaty swales. Endemic in NJ and DE. It has been reported, in error, from SC. [= C, F, FNA, G, K, Y, Z]

Rhynchospora latifolia (Baldwin ex Elliott) W.W. Thomas, Broadleaf Whitetop Sedge. Wet savannas. May-September. A Southeastern Coastal Plain endemic: se. NC south to s. FL and west to se. TX; disjunct in sc. TN (Coffee County). [= FNA, K, Y; = *Dichromena latifolia* Baldwin ex Elliott – GW, RAB, S]

Rhynchospora leptocarpa (Chapman ex Britton) Small. Seepage bogs, pocosins, especially in openings. E. NC south to ne. FL, Panhandle FL, west to se. LA, in the Coastal Plain. It appears that *R. leptocarpa* is a valid species, a southeastern Coastal Plain relative of the more northern and montane *R. capitellata* (Sorrie 2000). Its occurrence in NC is reported by Sorrie et al. (1997). [= WH, Y; < *R. capitellata* – FNA, GW, K, RAB, Z; = *Rynchospora leptocarpa* – S]

Rhynchospora macra (C.B. Clarke) Small, Southern White Beaksedge. *Sphagnum* bogs in frequently-burned streamhead pocosins, and in sandhill seepage bogs. July-September. Sc. NC south to ne. FL, FL Panhandle, and west to se. TX; Nicaragua, Puerto Rico. *R. macra* is a robust southern relative of *R. alba*. Like *R. alba* and *R. pallida*, it has scales which are at first bright white, "fading" in age to a medium tan or light brown. These three species are thus superficially most distinctive (from other *Rhynchospora*) in June, July, and August. The occurrence of this species in NC and SC is discussed by Sorrie et al. (1997). [= FNA, GW, K, WH, Y, Z; = *Rynchospora macra* – S]



Rhynchospora macrostachya Torrey ex A. Gray, Tall Horned Beaksedge. Marshes, swamps, upland depression ponds, other wetlands. July-September. E. MA south to ne. FL and west to e. TX, north in the interior to sc. TN, s. MI, MO, and KS; disjunct (historically) in s. ME. This is most readily distinguished from *R. corniculata*. *R. inundata*, and *R. careyana* by the large glomerules composed of numerous spikelets. The recognition of varieties does not seem to be warranted. [= C, FNA, G, GW, K, RAB, WH, Y; > *R. macrostachya* var. *colpophila* Fernald & Gale – F; > *R. macrostachya* var. *macrostachya* – F; = *Rynchospora macrostachya* – S]

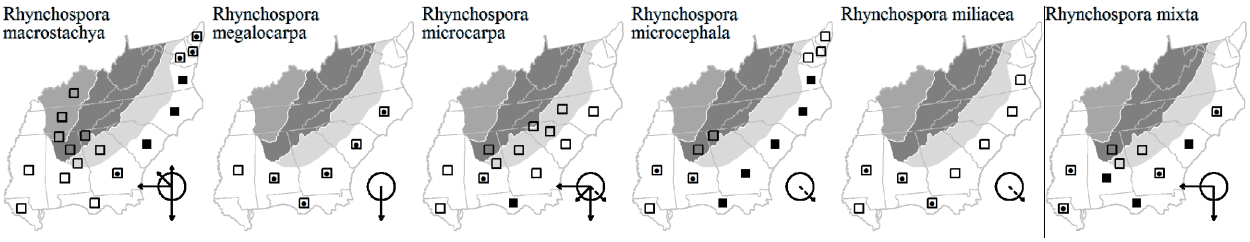
Rhynchospora megalocarpa A. Gray, Sandhill Beaksedge. Xeric sandhills. June-August. Se. NC south to s. FL, west to MS. [= FNA, K, RAB, WH, Y, Z; = *Rynchospora dodecandra* Baldwin ex A. Gray – S]

Rhynchospora microcarpa Baldwin ex A. Gray, Southern Beaksedge. Swamp forests, clay-based Carolina bays. July-August. E. NC south to s. FL and west to TX; West Indies (Cuba, Puerto Rico), Bahamas, Belize. This species is easily confused with *R. elliottii* and *R. perplexa*. *R. elliottii* is distinguished by leaves 4-6 mm wide, bristles longer than the tubercle, flattish achene faces, and a tubercle that is longer than broad. *R. microcarpa* and *R. perplexa* have leaves 1-3 mm wide and tubercles as broad as long or broader. In *R. microcarpa*, the achene is biconvex and the bristles are half as long as the achene to equaling the tubercle. In *R. perplexa*, the achene faces are flattish and the bristles are absent or rudimentary (< ½ as long as the achene). [= F, FNA, GW, RAB, WH, Y, Z; < *R. microcarpa* – K (also see *R. sulcata*); > *Rynchospora edisoniana* Britton in Small – S; > *Rynchospora microcarpa* – S]

Rhynchospora microcephala (Britton) Britton ex Small, Small-headed Beaksedge. Savannas, sandhill-pocosin ecotones. July-October. S. NJ south to s. FL and west to MS; Cuba. [= C, F, FNA, G, GW, K, RAB, WH, Y, Z; = *Rynchospora microcephala* – S; = *R. cephalantha* A. Gray var. *microcephala* (Britton) Kükenthal]

Rhynchospora miliacea (Lamarck) A. Gray, Millet Beaksedge. Swamp forests, including maritime swamp forests. July-August. Se. VA south to s. FL and west to LA; West Indies. The inflorescence branches of *R. mixta* and (less commonly) *R. caduca* can spread at right angles from the culm, superficially resembling *R. miliacea*. The three can be separated by tubercle length: the tubercle of *R. miliacea* is 0.2-0.4 mm long, while those of *R. mixta* and *R. caduca* are 0.4-0.9 mm long. [= C, F, FNA, G, GW, K, RAB, WH, Y, Z; = *Rynchospora miliacea* – S]

Rhynchospora mixta Britton in Small, Mingled Beaksedge. Swamp forests, marshes. June-August. Ne. NC south to c. peninsular FL and west to TX. See notes under *R. miliacea*. [= FNA, GW, K, RAB, S, WH, Y, Z; > *Rynchospora mixta* – S; > *Rynchospora prolifera* Small – S]



Rhynchospora nitens (Vahl) A. Gray, Short-beak Beaksedge. Wet savannas, limesink (doline) ponds, ditches, disturbed wet areas, often weedy. July-August. Primarily a Coastal Plain endemic: MA south to s. FL and west to se. TX; lowlands around the Great Lakes; West Indies, Belize, Nicaragua. [= C, FNA, K, WH, Y; = *Psilocarya nitens* (Vahl) Wood – F, G, GW, RAB, S]

Rhynchospora odorata C. Wright ex Grisebach, Fragrant Beaksedge. Maritime swamp forests and maritime wet grasslands. June-August. E. NC south to s. FL; West Indies and Bahamas. First reported for SC by Nelson & Kelly (1997). [= F, FNA, GW, K, RAB, WH, Y, Z; = *Rynchospora stipitata* Chapman – S]

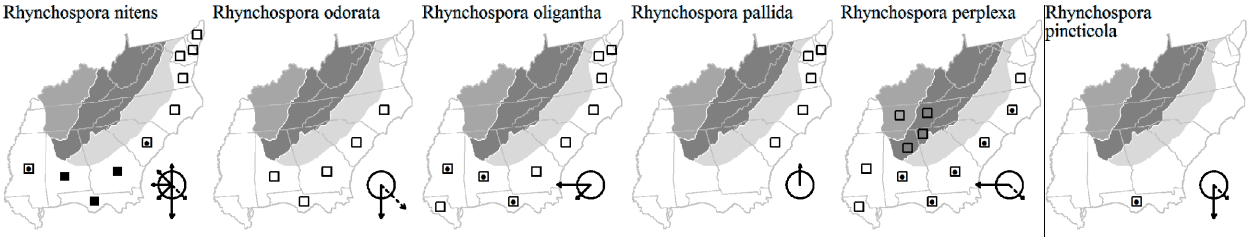
Rhynchospora oligantha A. Gray, Feather-bristle Beaksedge. Wet savannas, sandhill-pocosin ecotones, sandhill seepage bogs, sea-level fens, usually in rather peaty, acid places. July-August. S. NJ south to ne. FL, Panhandle FL, and west to se. TX; Belize, Nicaragua. The leaf tips of *R. oligantha* are blunt and smooth, while those of the closely related *R. galeana* are acute and minutely serrulate; these characters are often difficult to determine, however. Considered to be absent between NC and NJ prior to its discovery in e. VA (Fleming & Ludwig 1996). [= C, FNA, GW, K, RAB, WH, Y; < *R. oligantha* – F, G (presumably including *R. galeana*); < *Rynchospora oligantha* – S; = *R. oligantha* var. *oligantha* – Z]

Rhynchospora pallida M.A. Curtis, Pale Beaksedge. Savanna-pocosin and sandhill-pocosin ecotones, peaty seepage bogs, usually growing in or near *Sphagnum*. July-September. Long Island, NY south through NJ to nc. SC, primarily in NJ and NC. Like *R. alba* and *R. macra*, it has scales which are at first bright white, "fading" in age to a medium tan or light brown. These three species are thus superficially most distinctive (from other *Rhynchospora*) in June, July, and August. The bristle characters separate the three species easily. See Nelson (1993) for first SC record. [= C, F, FNA, G, GW, K, RAB, Y, Z; = *Rynchospora pallida* – S]

Rhynchospora perplexa Britton in Small, Pineland Beaksedge. Savannas, sandhill seepage bogs. July-September. E. NC south to ne. FL, FL Panhandle, and west to TX, and north in the interior to ec. TN; West Indies. Var. *virginiana* Fernald, alleged to be endemic to se. VA, is alleged to differ in several characters, including larger spikelets (2.5-3.0 mm long vs. 2.0-2.5), the

achene tubercles broadly rounded at the tip (rather than deltoid and acute). Also see note under *R. microcarpa*. [= C, FNA, G, GW, K, RAB, WH, Y, Z; > *R. perplexa* var. *perplexa* – F; > *R. perplexa* var. *virginiana* Fernald – F; = *Rynchospora perplexa* – S]

Rhynchospora pineticola C.B. Clarke, Pinebarren Beaksedge. Sandhills, scrub, other dry sandy pinelands. May-November. Ne. FL and e. Panhandle FL south to s. FL; Cuba. [= FNA, K, Y; = *Rynchospora intermedia* (Chapman) Britton – S; = *Rhynchospora intermedia* (Chapman) Britton – WH, Z]



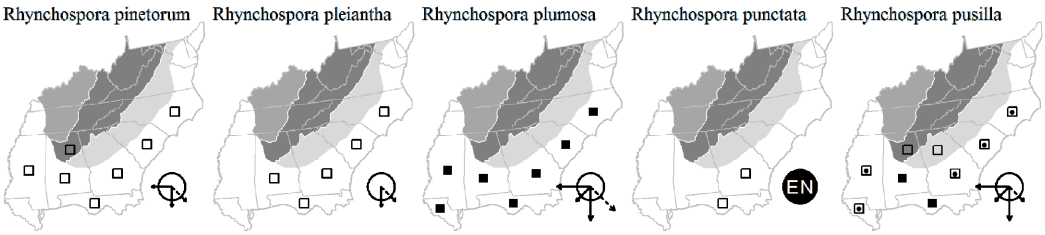
Rhynchospora pinetorum Small, Small's Beakrush. Wet calcareous savannas, maritime wet grasslands. June-September. FL west to MS (Sorrie & Leonard 1999) and LA, apparently disjunct to se. NC and ne. SC, and also in the West Indies. See note under *R. globularis*. [= Y; = *R. globularis* (Chapman) Small var. *pinetorum* (Small) Gale – FNA, GW, K, Z; = *Rynchospora pinetorum* – S; < *R. globularis* – WH]

Rhynchospora pleiantha (Kükenthal) Gale, Coastal Beaksedge. Sandy margins of limesink depression ponds (dolines), typically in shallow water or at the lower margins of pond-shores. July-September. Se. NC south to c. peninsular FL, and Panhandle FL, west to se. AL; also in Cuba. [= FNA, GW, K, RAB, WH, Y, Z; = *Rynchospora fusca* – S, misapplied]

Rhynchospora plumosa Elliott, Plumed Beaksedge. Savannas, sandhill-pocosin ecotones, especially where the sandy surface dries out in summer (on spodosols such as the Leon soil series). July-August. NC south to s. FL and west to se. TX; West Indies (Cuba), Belize, Honduras, Nicaragua. *R. semiplumosa* of s. GA and n. FL needs additional evaluation but is included here. [= FNA, GW, K, RAB, WH, Y; > *Rynchospora plumosa* – S; > *Rynchospora semiplumosa* A. Gray – S] {add Z synonymy}

Rhynchospora punctata Elliott, Pineland Beaksedge. Wet savannas, pitcherplant bogs. S. GA south to ne. FL. [= FNA, GW, K, WH, Y, Z; = *Rynchospora punctata* – S]

Rhynchospora pusilla Chapman ex M.A. Curtis, Dwarf Beaksedge. Wet savannas, especially in exposed wet sands of disturbed ground, such as roadsides. June-September. E. NC south to s. FL and west to e. TX; West Indies, Mexico (Tabasco, Chiapas), Belize, Guatemala, Nicaragua. *R. pusilla, R. divergens,* and *R. thornei* are all small, grass-like plants, very similar in appearance to one another. [= FNA, GW, K, WH, Y; = *R. intermixta* C. Wright – RAB; = *Rynchospora intermixta* – S]



Rhynchospora rariflora (Michaux) Elliott, Few-flower Beaksedge. Wet savannas, seepage bogs in the Sandhills, bogs in the Piedmont. July-September. S. NJ south to s. FL and west to e. TX; inland in ec. TN; West Indies, Belize, Honduras, Nicaragua. Resembling *R. galeana* and *R. oligantha*, but the spikelets conspicuously smaller. [= C, F, FNA, G, GW, K, RAB, WH, Y, Z; = *Rynchospora rariflora* – S]

Rhynchospora recognita (Gale) Kral, Cymose Beakrush. Wet to dry low grounds, diabase glades, ditches, powerline corridors, savannas, moist seepage on rock outcrops, other wet areas. June-September. NJ south to FL, west to TX, north in the interior to nc. TN and around the Great Lakes; CA; West Indies; and Central America. As explained by Kral (1999), this taxon appears to warrant specific status. [= FNA, K, Y; = *R. globularis* (Chapman) Small var. *recognita* Gale – C, F, G, WV, Z; < *R. globularis* – RAB, W, WH; < *R. globularis* var. *globularis* – GW; = *Rynchospora cymosa* Elliott – S, misapplied]

Rhynchospora saxicola Small. Seepages on granitic outcrops and Altamaha Grit glades. W. SC south into the Piedmont and rarely Coastal Plain of c. GA and ne. and ec. AL (Kral 1999). [= Y; = *R. globularis* (Chapman) Small var. *saxicola* (Small) Kükenthal – FNA, K; = *Rynchospora saxicola* – S]

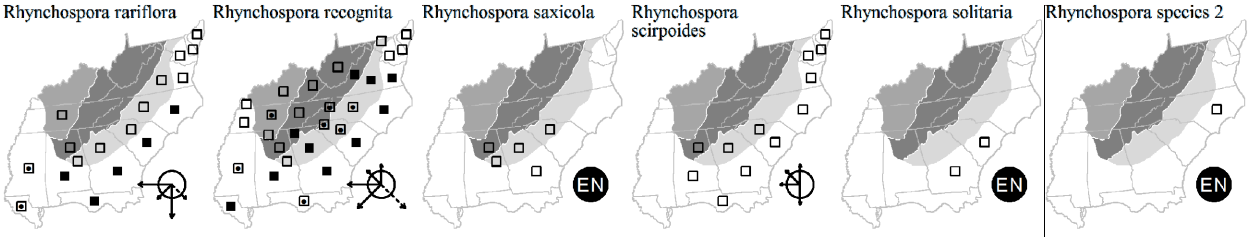
Rhynchospora scirpoides (Torrey) Grisebach, Long-beak Beaksedge. Limesink ponds, usually at the lower margins of pond-shores, wet savannas, beaver ponds, and other wetlands with "drawdown" hydrology. July-September. Se. MA south to n. peninsular FL, Panhandle FL and s. MS (Sorrie & Leonard 1999), se. OK and TX (Singhurst, Bridges, & Holmes 2007); disjunct in the lowlands around the Great Lakes. [= C, FNA, K, WH, Y; = *Psilocarya scirpoides* Torrey – GW, RAB, S; > *Psilocarya scirpoides* var. *grimesii* Fernald & Griscom – F, G]

Rhynchospora solitaria R.M. Harper, Autumn Beaksedge. Wet, sandy/peaty depressions. Known from a few sites in the Gulf Coastal Plain of GA (Colquitt, Irwin, Tift, and Turner counties) (Sorrie 1998b) and SC (Berkeley County) (McMillan, pers.comm. and specimen at NCU). It resembles a delicate *R. ciliaris*; its distinctiveness is well described in Bridges & Orzell (1992). It should be sought in seepage bogs in the fall-line sandhills and in wet savannas of the outer Coastal Plain. [= FNA, GW, K, Y, Z; = *Rynchospora solitaria* – S]

Rhynchospora species 1. Cp (MS). [= Y] {not yet keyed or mapped}

Rhynchospora species 2, Croatan beaksedge. Wet pine savanna and pocosin ecotone, known from a single spodosol savanna site in Croatan National Forest, and growing with *Ctenium aromaticum*, *Pinguicula caerulea*, *Sarracenia flava*, *Dionaea*

muscipula, *Zenobia pulverulenta*, *Polygala ramosa*, and *Eriocaulon decangulare* var. *decangulare*. Plants may mature by mid-spring, and are very similar in habit to *R. rariflora*. [= Y]



Rhynchospora species 3. Mt (GA): Coosa Valley prairies; rare. Under study by Jim Allison. {not yet keyed or mapped}

Rhynchospora stenophylla Chapman, Coastal Bog Beaksedge. Peaty seepage bogs, streamhead pocosins, savanna-pocosin ecotones, usually growing in *Sphagnum*, especially where frequently burned. July-September. Se. NC south to nw. FL and west to s. MS; disjunct in se. VA (Southampton Co.) (Belden et al. 2004). Reported for GA by Sorrie (1998b). [= FNA, GW, K, RAB, WH, Y, Z; = *Rynchospora stenophylla* – S]

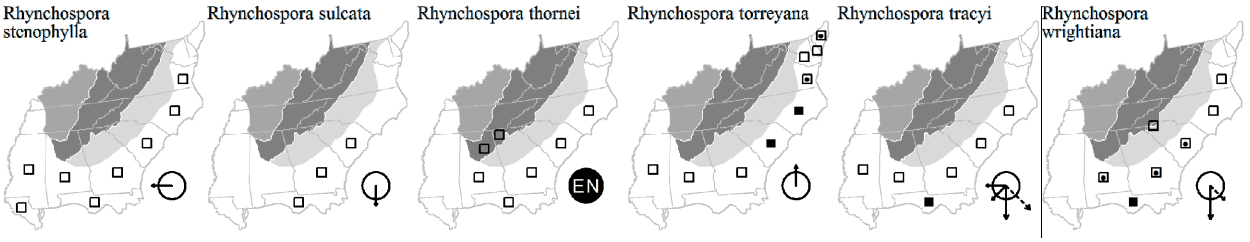
Rhynchospora sulcata Gale, Grooved Beaksedge. Limesink ponds (dolines). June-July. Se. SC south to GA (Jones & Coile 1988) and c. peninsular FL and Panhandle FL. Perhaps not distinct from *R. microcarpa*. [= GW, RAB, WH, Y, Z; < *R. microcarpa* Baldwin ex A. Gray – K]

Rhynchospora thornei Kral, Thorne's Beaksedge. In open sands in savannas underlain by marl, and nearby roadsides, moist limestone barrens and prairies (GA). Known from about 35 locations, in Coastal Plain of NC, SC, GA, ne. FL, Panhandle FL, and AL; also in Ridge and Valley region of AL and GA, and Black Belt region of AL. *R. thornei*, *R. divergens*, and *R. pusilla* are all small, grass-like plants, very similar in appearance to one another, and they frequently co-occur. Recently discovered in SC (Georgetown Co.) by McMillan (2003). [= FNA, K, WH, Y]

Rhynchospora torreyana A. Gray, Torrey's Beaksedge. Savannas, seepage bogs, often weedy. July-September. Se. MA south to GA. [= C, F, G, GW, K, RAB, Y, Z; = *Rynchospora torreyana* – S]

Rhynchospora tracyi Britton, Tracy's Beaksedge. Cypress savannas and graminoid-dominated depressions, in small, clay-based Carolina bays or shallow limesink ponds (dolines), typically in shallow water or at the lower margins of pond-shores. June-September. A Southeastern Coastal Plain endemic: s. NC south to s. FL, west to s. MS (Sorrie & Leonard 1999); disjunct in sw. LA; West Indies, Belize. [= FNA, K, GW, RAB, WH, Y; = *Rynchospora tracyi* – S]

Rhynchospora wrightiana Böckler, Wright's Beaksedge. Wet savannas. July-September. Se. VA south to c. FL and west to s. AL; West Indies. Appearing to merge with *R. fascicularis* var. *distans* on the outer Coastal Plain of NC. Leaves are most frequently filiform and < 1 mm wide; rarely flat and to 1.3 mm wide. [= FNA, GW, K, RAB, WH, Y, Z; < *Rynchospora wrightiana* – S (also see *R. brachychaeta*)]



Schoenoplectus (Reichenbach) Palla 1888 (Bulrush)

A genus of about 50 species, herbs, cosmopolitan in distribution. Micromorphologic and anatomic studies have confirmed earlier opinions based on morphology that *Schoenoplectus* is not closely related to *Scirpus* (Strong 1994, Smith 1995, Schuyler, pers. comm.). Most investigators now also favor the separation of *Bolboschoenus* from *Schoenoplectus* (Pignotti & Mariotti 2004). References: Strong (1994)=Z; Smith (1995)=Y; Smith in FNA (2002b); Goetghebeur in Kubitzki (1998b); Pignotti & Mariotti (2004). [also see *Bolboschoenus*]

1 Main involucral bracts 2-8, spreading and foliaceous (the inflorescence thus appearing terminal); rhizomes bearing ovoid tubers; bristles persistent on the achene; achenes 2.5-5 mm long (including body and apiculus) ..... **[*Bolboschoenus*]**

1 Main involucral bract 1 (rarely with an additional 1-2 lateral bracts), erect and terete or triangular, appearing as a continuation of the culm (the inflorescence thus appearing lateral, though in some species the longer inflorescence branches may overtop the bract); rhizomes not bearing tubers; bristles falling from the achene; achenes 1.0-4.5 mm long (including body and apiculus).

2 Spikelets on stalks of varying lengths, at least some clearly not sessile.

3 Culms distinctly triangular in cross-section, more sharply so above than below, nearly terete near the base; [section *Malacogeton*] ..... ***S. etuberculatus***

3 Culms terete throughout, or obscurely triangular above; [section *Schoenoplectus*].

4 Spikelets appearing dull gray-brown, the scales copiously covered with red-brown dots (as seen at 10×) 6-15 mm long; lower and middle scales (3.0-) 3.5-4.0 mm long; culms firm, not easily compressed ..... ***S. acutus* var. *acutus***

4 Spikelets appearing reddish-brown, the scales not obviously dotted (as seen at 10×), 6-11 mm long; lower and middle scales (2.0-) 2.5-3.0 (-3.5) mm long; culms soft, easily compressed.

5 Perianth bristles plumose; spikelets acute; culms obscurely triangular near the inflorescence ..... ***S. californicus***

5 Perianth bristles retrorsely barbed; spikelets obtuse; culms terete throughout their length ..... ***S. tabernaemontani***

2 Spikelets all sessile, in a cluster at one point (rarely with 1 or 2 short branches to 5 mm long).
6 Spikelet solitary; leaves numerous; plant usually aquatic, the culms and leaves flaccid, supported by the water; [section *Malacogeton*] ... ***S. subterminalis***
6 Spikelets (1-) 2-several; leaves 1-4; usually of wet places, but the culms stiff and erect, not floating.
7 Rhizomatous perennial; culms triangular in cross-section, usually 5-20 dm tall.
8 Leaves elongate, > ½ as long as the culms; achenes trigonous; styles 3-branched; [section *Malacogeton*] ... ***S. torreyi***
8 Leaves short, < ½ as long as the culms; achenes plano-convex; styles 2 (-3) branched; [*Schoenoplectus pungens* complex of section *Schoenoplectus*].
9 Sides of the culm strongly concave, wing-angled; culms 3-10 mm in diameter; main involucral bract 1-2.5 (-6) cm long; spikelet scale with apical notch 0.1-0.4 mm deep ... ***S. americanus***
9 Sides of the culm flat, slightly concave, or slightly convex; culms 1-6 mm in diameter; main involucral bract (1-) 3-20 cm long; spikelet scale with apical notch (0.3-) 0.5-1 mm deep.
10 Spikelets 3-35; achenes 1.9-2.6 mm long, biconvex; styles 2-fid ... ***S.deltarum***
10 Spikelets 1-5 (-10); achenes (2.0-) 2.5-3.5 mm long, biconvex or trigonous; styles 2-3-fid ... ***S. pungens** var**. pungens***
7 Cespitose annual or perennial; culms terete, 1-6 dm tall.
11 Perianth bristles absent; achenes 1.2-1.6 mm long, transversely rugose; [section *Supini*].
12 Achenes biconvex to obscurely trigonous, the faces convex ... ***S. erectus** ssp. **raynalii***
12 Achenes biconvex, with a planar or concave area on the adaxial surface ... ***S. hallii***
11 Perianth bristles 5-6; achenes 1.5-2.0 mm long, smooth, finely pitted, or finely papillose; [section *Actaeogeton*].
13 Culms 2-3 mm thick, acutely triangular in ×-section ... ***S. mucronatus***
13 Culms 1-2 mm thick, cylindric in ×-section.
14 Achenes 1.75-2.0 mm long, unequally biconvex (rounded on both faces, but less so on one than the other), rounded-obovate, broadly cuneate at the base, rounded at the apex ... ***S. purshianus***
14 Achenes 1.5-1.8 mm long, planoconvex (nearly flat on 1 face), obovate, cuneate at the base, subtruncate at the apex ... ***S. smithii***

Schoenoplectus acutus (Muhlenberg ex Bigelow) Á. Löve & D. Löve *var.* ***acutus***, Hardstem Bulrush, Great Bulrush. Marshes. June-early August; August-October. The species is widespread in temperate North America; var. *acutus* is restricted to e. North America. [= FNA, K, Y; = *Scirpus acutus* Muhlenberg ex Willdenow – RAB, C, F, G, GW, W, WV; *? Schoenoplectus lacustris* Linnaeus ssp. *glaucus* (Smith) Hartman]

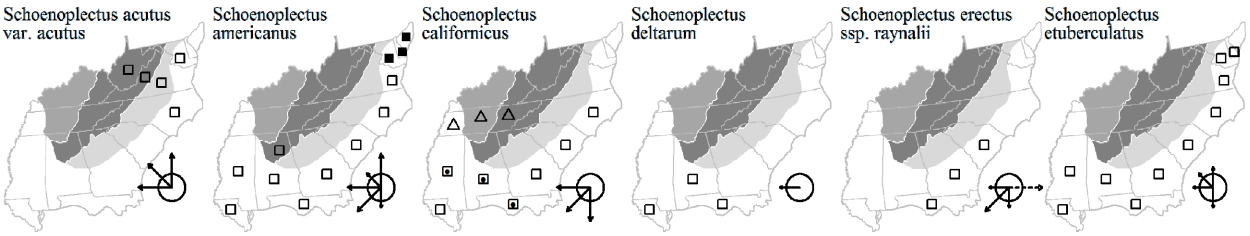
Schoenoplectus americanus (Persoon) Volk ex Schinzius & R. Keller, Olney Threesquare. Tidal freshwater to brackish marshes. Late May-June; June-September. NS west to WA, south to South America. Schuyler (1974) discusses the need to replace the name *S. olneyi* (as traditionally applied) with *S. americanus*, traditionally applied to what must now be called *S. pungens*. Because of this nomenclatural change, the interpretation of much some information and records is now uncertain. [= FNA, K, Z; = *Scirpus americanus* Persoon – C, WH; = *Scirpus olneyi* – RAB, F, G, GW, S]

Schoenoplectus californicus (C.A. Meyer) Soják, Giant Bulrush, Southern Bulrush, Tule. Marshes. SC south to s. FL, west to TX, and extending s. into the New World tropics; on the west coast, from CA southward. [= FNA, K; = *Scirpus californicus* (C.A. Meyer) Steudel – GW, S, WH]

Schoenoplectus deltarum (Schuyler) Soják, Delta Bulrush. Brackish marshes and other wetlands. AL and FL west to KS and TX. [= FNA, K; = *Scirpus deltarum* Schuyler]

Schoenoplectus erectus (Poiret) Palla ex J. Raynal *ssp.* ***raynalii*** (Schuyler) K. Lye. Sandy or peaty, seasonally wet soils (such as on pond shores). September-October. Apparently ranging from SC south to c. peninsular FL and sw. GA; also in the tropics of both hemispheres. [= FNA, K; < *Scirpus hallii* A. Gray – RAB, misapplied; *? Scirpus erismaniae* Schuyler – GW; = *Scirpus erectus* Poiret var. *raynalii* (Schuyler) B.F. Hansen & Wunderlin – WH; < *Scirpus erectus* Poiret]

Schoenoplectus etuberculatus (Steudel) Soják, Swamp Bulrush, Canby's Bulrush. Beaver ponds, on peat in small depression ponds, in flowing blackwater streams. July-August; August-September. DE south to c. peninsular FL and west to e. TX (the distribution rather discontinuous); substantially disjunct in s. MO and RI. The hybrid *S. etuberculatus* × *subterminalis* has been collected in Hoke Co, NC and Lexington County, SC; it has sterile, malformed achenes. [= FNA, K, Z; = *Scirpus etuberculatus* (Steudel) Kuntze – RAB, C, F, G, GW, S, WH]



Schoenoplectus hallii (A. Gray) S.G. Smith, Sharpscale Bulrush. Pond shores in peaty sands. It has also been reported for our area by RAB, and is apparently included in our area by C, as *Scirpus supinus* Linnaeus var. *hallii* (A. Gray) A. Gray, and by others; at least some of these reports are misidentifications of the similar *S. erectus*. It is reported for sw. GA by Jones & Coile (1988) and Smith in FNA (2002b). It is very similar to *S. erectus*, differing in having the spikelet scales yellow brown (vs. reddish brown) and achenes concave on the ventral surface (vs. bulging on the ventral surface). [= FNA, K; = *Scirpus supinus* Linnaeus var. *hallii* (A. Gray) A. Gray – C; = *Scirpus hallii* A. Gray]

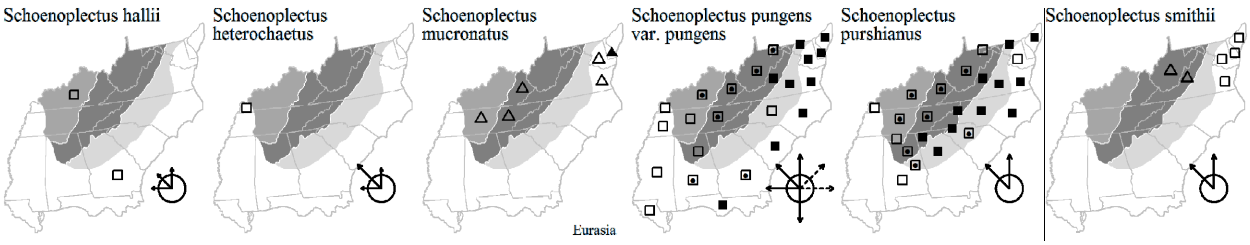
Schoenoplectus heterochaetus (Chase) Soják, Slender Bulrush. Fresh marshes and lakes. June-August. VT and QC west to AB, south to NY, PA, w.KY, TX, and CA. [= FNA, K; = *Scirpus heterochaetus* Chase – C, F, G]

* ***Schoenoplectus mucronatus*** (Linnaeus) Palla, Rough-seed Bulrush. Ponds, ditches, ricefields, disturbed wet ground; native of Eurasia. Weed (native of Eurasia) in rice fields and other disturbed situations, known from old collections in PA, NJ, NY and more recently from VA (Virginia Botanical Associates 2009), KY, and TN. [= FNA, K; = *Scirpus mucronatus* Linnaeus]

Schoenoplectus pungens (Vahl) Palla *var.* ***pungens***, Common Threesquare, Chairmaker's Rush, Swordgrass. Marshes, rocky river beds. Mid May-June; June-September. The species is circumboreal, ranging in North America from NL (Newfoundland) west to AK, south to South America; var. *pungens* is widespread. This taxon has traditionally had the name *Scirpus americanus* applied to it; this name, however, is properly applied to the traditional *Scirpus olneyi*. *Schoenoplectus pungens* (or *Scirpus pungens*) becomes the correct name for this plant (Schuyler 1974). [= FNA, K, Y; < *Scirpus americanus* – RAB, F, G, GW, S, W, WV, misapplied; = *Scirpus pungens* Vahl var. *pungens* – C; < *Scirpus pungens* – WH; < *Schoenoplectus pungens* – Z]

Schoenoplectus purshianus (Fernald) M.T. Strong, Bluntscale Bulrush. Marshes. Late June-August; July-October. ME west to MN, south to nc. GA (Jones & Coile 1988), AL, MS, TN, and KY. [= FNA, K, Z; = *Scirpus purshianus* Fernald – RAB, C, F, GW, W, WV; > *Scirpus smithii* var. *williamsii* (Fernald) Beetle – G; *? Scirpus debilis* Pursh – S, misapplied; *? Scirpus juncoides* Roxburg var. *digynus* (Böckler) T. Koyama; *? Scirpus juncoides* var. *williamsii* (Fernald) T. Koyama]

Schoenoplectus smithii (A. Gray) Soják, Smith's Bulrush, Bluntscale Bulrush. Gravelly intertidal beaches, millponds, Atlantic white-cedar swamps. July; Late July-August. QC west to MN, south to NJ, DE, ne. VA, PA, n. OH, and IL. Reported from mountains of sw. VA. The varieties recognized by Smith in FNA (2002b) are of uncertain value; all three are in or approach our area. Var. *smithii* (south to DE, NJ, and PA) has perianth bristles absent or rudimentary. Var. *levisetus* (with a historic occurrence in VA) has 1-4 perianth bristles, much shorter than to equaling the achene, the bristles smooth or sparsely retrorsely barbed. Var. *setosus* (with records from NC, DE, and MD) has 4-6 perianth bristles, as long as or longer than the achene, and densely retrorsely barbed. [= K, Z; = *Scirpus smithii* A. Gray – C, F; *? Scirpus smithii* var. *smithii* – G; > *Schoenoplectus smithii* var. *smithii* – FNA; > *Schoenoplectus smithii* var. *setosus* (Fernald) S.G. Smith – FNA; > *Schoenoplectus smithii* var. *levisetus* (Fernald) S.G. Smith – FNA]



Schoenoplectus subterminalis (Torrey) Soják, Swaying Rush, Water Bulrush. Beaver ponds, bogs, blackwater creeks, in highly acid water. May-June; June-August. NL (Newfoundland) west to s. AK, south to se. NC, nc. SC, MO, UT (?), and n. CA (the distribution discontinuous, especially southward). The hybrid *S. etuberculatus* × *subterminalis* has been collected in Hoke Co, NC and Lexington County, SC; it has sterile, malformed achenes. [= FNA, K, Z; = *Scirpus subterminalis* Torrey – RAB, C, F, G, GW, S, W]

Schoenoplectus tabernaemontani (C.C. Gmelin) Palla, Softstem Bulrush, Great Bulrush. Marshes, sedge meadows, streambeds, riverbeds, calcareous fens. June-September. NL (Newfoundland) west to AK, south to South America; also in Europe. [= FNA, K, Y; ? *Scirpus validus* Vahl – RAB, C, F, G, GW, S; > *Scirpus validus* var. *validus* – F; > *Scirpus validus* var. *creber* Fernald – F, WV; = *Scirpus tabernaemontani* K.C. Gmelin – W, WH; ? *Schoenoplectus validus* (Vahl) A. & D. Löve – Z; ? *Schoenoplectus lacustris* Linnaeus ssp. *validus* (Vahl) T. Koyama var. *validus*; = *Scirpus lacustris* Linnaeus var. *tabernaemontani* (C.C. Gmelin) Döll]

Schoenoplectus torreyi (Olney) Palla, Torrey's Bulrush, Torrey's Threesquare. Sinkhole ponds. NB west to MB, south to NJ, PA, WV, w. VA, MO, and NE. Known in VA only from natural ponds in Augusta and Rockingham counties. [= FNA, K, Z; = *Scirpus torreyi* Olney – C, F, G, W]

Schoenus Linnaeus 1753 (Blacksedge, Bogrush)

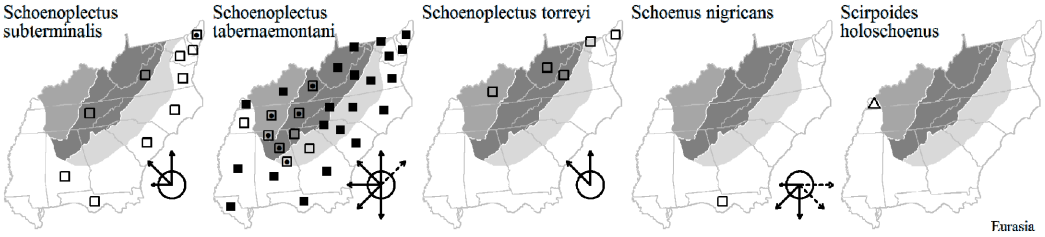
A genus of about 100 species, herbs, mainly of Australia and Malesia. References: Goetghebeur in Kubitzki (1998b).

Schoenus nigricans Linnaeus, Blacksedge, Black Bog-rush. Marshes, calcareous bogs, wet flatwoods, always with either calcareous or saline influence. April-July. Panhandle FL, TX, CA and AZ south into Mexico; West Indies; Old World tropics and subtropics. [= FNA, GW, K, S, WH]

Scirpoides Scheuchzer ex Séguier (Round-headed Bulrush)

A genus of ca. 5 species, herbs, of tropical and warm temperate Europe, Africa, and nw. Asia. References: Goetghebeur in Kubitzki (1998b).

Scirpoides holoschoenus (Linnaeus) Soják, Round-headed Bulrush. Ore piles; probably only a waif, native of Eurasia. [= J; = *Scirpus holoschoenus* Linnaeus]



Scirpus Linnaeus 1753 (Bulrush)

A genus of about 20 species, herbs, of circumboreal distribution, also with species in Australia, Malaysia, and South America. The complex of species including *S. atrovirens*, *S. georgianus*, *S. hattorianus*, *S. flaccidifolius* are difficult to identify, and some have doubted their validity. Although further work on this group is needed, they do generally appear to behave as biological species despite their morphological similarity. Schuyler (1967) writes that "the remaining species in the key differ in minute characteristics and often the most satisfactory means of identification is by carefully comparing specimens of them. Despite the close morphological similarity of these species, their characteristics are reasonably constant even in areas where they coexist and occasionally hybridize." References: Whittemore & Schuyler in FNA (2002b); Schuyler (1967)=Z; Strong (1994)=Y;. Key adapted from C, FNA, GW, and Z. [also see *Bolboschoenus, Isolepis*, *Oxycaryum, Schoenoplectus*, and *Trichophorum*]

1 Bristles smooth, without teeth along the margins, strongly contorted and greatly exceeding the achenes when extended.
  2 Scales usually with prominent green midribs; mature bristles mostly contained within the scales; achenes1.0-1.3 mm long, brown to purplish-brown when mature.
    3 Perianth bristles (extended) shorter than, equal to, or slightly exceeding the achene; mature culms lax, the inflorescences lopping over to (or nearly to) the ground, with 2-3 lateral inflorescences in addition to the terminal one; rays of the inflorescence scabrous, ascending to divergent, with axillary bulblets.....***S. lineatus***
    3 Perianth bristles (extended) exceeding the achene by 2-3×; mature culms rigid, nearly upright, with 0-2 lateral inflorescences in addition to the terminal one; rays of the inflorescence glabrous, ascending, lacking axillary bulblets.....***S. pendulus***
  2 Scales usually with inconspicuous midribs; mature bristles exceeding the scales and giving the inflorescence a woolly appearance; achenes 0.6-1.0 mm long, whitish, pale, brown, dark brown or black.
    4 Plants colonial by elongate rhizomes; scales 2-3.1 mm long; achenes reddish-brown; [NJ northward].....***S. longii***
    4 Plants cespitose in tussocks; scales 1.1-2.2 mm long; achenes tan to whitish; [collectively widespread].
      5 Achenes maturing August-September; spikelets in dense cymes of 2-15, the central spikelet sessile, the others either sessile or pedicellate; [widespread].....***S. cyperinus***
      5 Achenes maturing June-July; spikelets in open cymes, the central spikelet sessile, the others pedicellate; [NJ, PA, WV, OH, and KY northwards].
        6 Achenes maturing late June to early July; scales usually blackish, at least towards the tip; involucral bracts solid black at base; [WV northwards].....***S. atrocinctus***
        6 Achenes maturing July; scales pale brown (rarely some black along the midrib); involucral bracts brownish at base (sometimes bordered with black); [n. NJ, OH, c. KY, and MO northwards].....***S. pedicellatus***
1 Bristles with retrorse or antrorse teeth along the margins, strongly contorted to nearly straight, shorter than to greatly exceeding the achenes when extended (or bristles absent or nearly so in *S. georgianus*).
  7 Spikelets all solitary with distinct pedicels; mature scales with broad green midribs; achenes with protruding angles and concave sides.....***S. divaricatus***
  7 Spikelets all or mostly in glomerules with the pedicels scarcely developed; mature scales with midribs not usually green; achenes less sharply trigonous, the sides convex, flat, or slightly concave.
    8 Culms with 10-20 leaves; spikelets broadly ovate; scales reddish-brown and, excluding the tips, about as wide as long.....***S. polyphyllus***
    8 Culms with 2-10 leaves; spikelets broadly ovate to narrowly ovate; scales brown or black and, excluding the tips, mostly longer than wide.
      9 Bristle teeth thick-walled and sharp-pointed, densely arranged almost to the base of the bristle.
        10 Plants cespitose with short, brownish rhizomes; leaf sheaths green throughout; scales broadest above the middle; achenes 0.6-0.8 mm wide.....***S. ancistrochaetus***
        10 Plants spreading with long, reddish rhizomes having conspicuous nodes and internodes; lower leaf sheaths red-tinged near their bases; scales usually broadest below the middle; achenes (0.6-) 0.8-1.0 mm wide.
          11 Styles 3-fid; achenes trigonous, with poorly-developed receptacles from which the bristles readily detach; [widespread].....***S. expansus***
          11 Styles 2 (-3)-fid; achenes biconvex with well-developed receptacles with persistent bristles; [from NJ, WV, and KY northwards].....***S. microcarpus***
      9 Bristle teeth thin-walled and with rounded tips, mostly restricted to the upper 2/3 of the bristle (or bristles absent or nearly so in *S. georgianus*).
        12 Bristles 0-3, shorter than the achenes; teeth, if present, concentrated near the tips of the bristles.....***S. georgianus***
        12 Bristles usually 5-6, shorter than to slightly longer than the achenes; teeth extending basally from the tips of all or at least some of the bristles.
          13 Scales 1.6-2.8 mm long, terminating in a flattened or terete awn 0.4-0.6 (1.2) mm long.....***S. pallidus***
          13 Scales 1.0-2.1 mm long, terminating in a mucro 0.1-0.3 (-0.4) mm long.
            14 Mature culms lax and reclining with the inflorescences lopping over to (or nearly to) the ground; glomerules usually with < 15 spikelets; lower scales of spikelets slightly mucronate, blackish.....***S. flaccidifolius***
            14 Mature culms upright or nearly so; glomerules frequently with > 15 spikelets; lower scales of spikelets mucronate, blackish or brownish.
              15 Lower leaf blades and sheaths usually nodose-septate; spikelets ovate or narrowly ovate; scales mostly brownish; longer bristles frequently exceeding the achenes; achenes 1.0-1.3 mm long.....***S. atrovirens***

15 Lower leaf blades and sheaths nearly smooth; spikelets broadly ovate or ovate; scales mostly blackish; longer bristles usually shorter than or about equaling the achenes; achenes 0.8-1.1 mm long.....***S. hattorianus***

Scirpus ancistrochaetus Schuyler, Northeastern Bulrush. Mountain ponds. July-September. VT, MA, and NY south to PA, e. WV, and w. VA. See Bartgis (1992) and Schuyler (1962) for additional information on this species. [= FNA, K, Z; < *S. atrovirens* var. *atrovirens* – C]

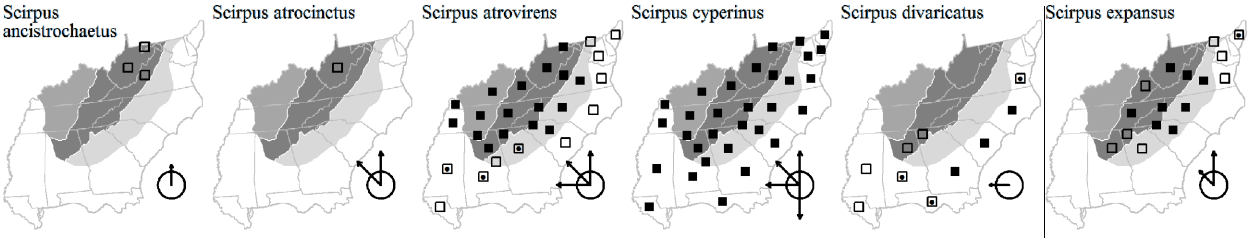
Scirpus atrocinctus Fernald. Bogs, wet meadows. Late June-early July. NL (Newfoundland) and NL (Labrador) west to NT and BC, south to n. NJ, WV (Grant, Hampshire, Harrison, Pendleton, Pocahontas, Randolph, and Tucker counties), IL, IA, SD, WY, and WA. [= FNA, F, K, WV; < *S. cyperinus* (Linnaeus) Kunth – C, G]

Scirpus atrovirens Willdenow, Black Bulrush. Marshes. July-September. NL (Newfoundland) west to MN, south to GA and TX; disjunct in AZ. [= FNA, K, Z; < *S. atrovirens* – RAB, GW, S, W; < *S. atrovirens* var. *atrovirens* – C, F, G, WV]

Scirpus cyperinus (Linnaeus) Kunth, Woolgrass Bulrush. Marshes, ditches, beaver ponds, disturbed wet ground. (July-) August-September. NL (Newfoundland) west to BC, south to c. peninsular FL, e. TX, and OR. The varieties may be worthy of recognition. [= RAB, FNA, GW, K, W, WH; < *S. cyperinus* – C; > *S. cyperinus* var. *cyperinus* – F, WV; > *S. cyperinus* var. *pelius* Fernald – F, WV; > *S. rubricosus* Fernald – F, WV; > *S. cyperinus* – G, S; > *S. eriophorum* Michaux – G, S]

Scirpus divaricatus Elliott. Swamp forests. July-September. Se. VA south to Panhandle FL, west to e. TX, s. TN, and s. MO. [= RAB, C, F, FNA, G, GW, K, S, WH, Z]

Scirpus expansus Fernald, Woodland Bulrush. Bogs, marshes, streambeds. July-September. ME west to MI, south to ne. GA and OH. [= RAB, C, F, FNA, G, GW, K, W, Z; < *S. sylvaticus* Linnaeus – S, misapplied; = *S. expanus* – WV, misspelling]



Scirpus flaccidifolius (Fernald) Schuyler, Reclining Bulrush. Bottomlands. July-September. Endemic to se. VA and ne. NC. Ludwig (1993) found the following characters to be most useful in distinguishing *S. flaccidifolius* from *S. georgianus* growing in the same region: bristles 1.2-1.4 mm long (vs. absent or mostly < 0.2, rarely to 1.0 mm long in *S. georgianus*), spikelets 1.5-2.1 mm wide (vs. 1.1-2.2 mm wide), spikelets 3-9 (-12) per glomerule (vs. 4-23), and inflorescence rays 5.5-17.9 cm long (vs. 3.5-13.5 cm long). Bristle length was the only character which consistently separated the 2 species; other characters showed overlapping values of possibly statistical value. [= FNA, K, Z; < *S. atrovirens* var. *atrovirens* – C; = *S. atrovirens* Willdenow var. *flaccidifolius* Fernald – F]

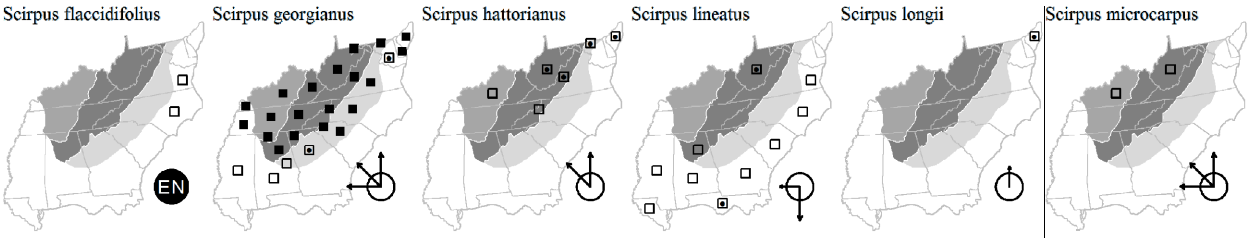
Scirpus georgianus R.M. Harper, Georgia Bulrush. Marshes, wet areas, ditches; common. July-September. PE west to NE, south to GA and e. TX. [= FNA, K, S, Z; < *S. atrovirens* – RAB, GW, W; < *S. atrovirens* var. *atrovirens* – C; = *S. atrovirens* Willdenow var. *georgianus* (R.M. Harper) Fernald – F, G, WV]

Scirpus hattorianus Makino, Northern Bulrush. Seepages, ditches, marshes, mostly at moderate to high elevations. July-September. NL (Newfoundland) to w. ON and WI, south to MD, NC, OH, and IN. [= FNA, K, Z; < *S. atrovirens* – RAB, GW, W; < *S. atrovirens* var. *atrovirens* – C, F, G, WV]

Scirpus lineatus Michaux. Swamp forests over coquina limestone ("marl"). May-July. Se. VA south to c. peninsular FL, west to LA. Reported for a single county (Tucker County) in WV (Harmon, Ford-Werntz, & Grafton 2006). [= C, FNA, GW, K, WH, Z; = *S. fontinalis* R.M. Harper – RAB, F, S; > *S. fontinalis* var. *virginiana* Fernald – G]

Scirpus longii Fernald. Marshes. NS south to s. NJ. Also reported as occurring in e. NC by Radford, Ahles, & Bell (1968) and Fernald (1950); this report is in error. [= FNA, C, F, G, K]

Scirpus microcarpus J. & K. Presl. Marshes. NL (Newfoundland) and NL (Labrador) west to AK, south to n. NJ, e. WV (Monongalia, Pocahontas, Randolph, and Tucker counties), KY, IL, IA, NE, NM, AZ, and CA. [= FNA, C, K; > *S. rubrotinctus* Fernald – F, G, WV]



Scirpus pallidus (Britton) Fernald, Cloaked Bulrush. Marshes. ON west to BC, south to WI, MO, TX, NM, AZ, OR; apparently disjunct (probably introduced) in se. PA (Rhoads & Klein 1993) and NJ (Kartesz 1999). [= F, FNA, K; = *S. atrovirens* Willdenow var. *pallidus* Britton – C, G]

Scirpus pedicellatus Fernald. Marshes. NL (Newfoundland), ON and MN south to n. NJ, OH, c. KY, and MO. [= F, FNA, K; < *S. cyperinus* (Linnaeus) Kunth – C, G]

Scirpus pendulus Muhlenberg. Mt (GA, VA, WV), Pd (DE, NC, SC, VA), Cp (DE, FL, NC, SC, VA): wet ground over limestone, diabase, or other circumneutral rocks; rare. June-July. ME west to MN, SD, and CO, south to NC, ne. FL, NM, and n. Mexico. [= C, FNA, GW, K, W, WH, Z; = *S. lineatus* – RAB, F, G, S, WV, misapplied]

Scirpus polyphyllus Vahl. Mt (GA, NC, SC, VA, WV), Pd (DE, GA, NC, SC, VA), Cp (DE, VA): marshes, mountain bogs; common (rare in DE Coastal Plain). July-September. MA and VT west to IL and s. MO, south to nc. GA (Jones & Coile 1988) and AL. [= RAB, C, F, FNA, G, GW, K, S, W, WV, Z]

Scleria P.J. Bergius 1765 (Nutrush)
(by Richard J. LeBlond)

A genus of about 250 species, herbs, pantropical, and locally extending into warm temperate regions. This treatment attempts to recognize the stablest and most distinctive *Scleria* entities. Intermediate and otherwise difficult-to-classify specimens are occasionally encountered within some species groups, suggesting hybridization or incomplete speciation. This is particularly true within the *S. ciliata/pauciflora* group (here boldly treated as four species and two varieties). This complex genus likely will continue to challenge and exasperate those who study it. References: Kessler (1987)=Z; Fairey (1967)=Y; Reznicek, Fairey, & Whittemore in FNA (2002b); Core (1936); Goetghebeur in Kubitzki (1998b).

Identification notes: *Scleria* superficially resembles *Rhynchospora* in the field, but mature specimens are readily recognized by the terete white, gray, or black bony achenes. Hardened achenes are necessary for reliable identification to species. In the key, achene length includes hypogynium when present. The scale character applies only to the ultimate bracteate structure clasping the achene.

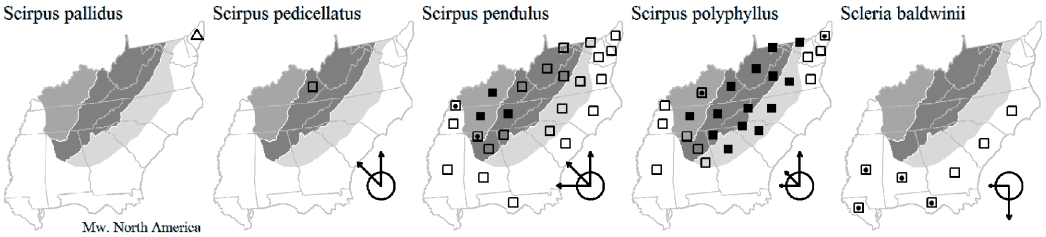
1 Base of achene without hypogynium (a circular, angular, lobed, or tuberculate disk differing in texture and structure from the achene body), the achene base constricted, pitted, and/or ribbed, but appearing as a continuation of the achene body.
  2 Inflorescence of 2-9 sessile clusters along an axis up to 13 cm long, the individual spikelets 2-5 mm long; bracts (at least above proximal cluster) setaceous.
    3 Plants perennial with rhizomes; leaf blades usually pubescent, 1.5-5 mm wide; bract and scale margins long-ciliate; spikelets 4-5 mm long; achenes smooth ..... ***S. distans***
    3 Plants annual with fibrous roots; leaf blades glabrous, 0.5-2 mm wide; bract and scale margins eciliate; spikelets 2-3 (-4) mm long; achenes reticulate-papillose to reticulate-verrucose ..... ***S. verticillata***
  2 Inflorescence of a single cluster, the individual spikelets 4-10 mm long; bracts foliaceous.
    4 Triangular base of achene lacking pits in the three concave sides; achene 3-4 mm long ..... ***S. baldwinii***
    4 Triangular base of achene with a pair of pits on each of the three sides; achene 2-3 mm long ..... ***S. georgiana***
1 Base of achene with hypogynium.
  5 Achene body smooth (often longitudinally ribbed); hypogynium with 0, 8, or 9 tubercles.
    6 Hypogynium with 8 or 9 minutely papillate tubercles ..... ***S. oligantha***
    6 Minutely papillate portion of hypogynium continuous, not divided into separate tubercles.
      7 Achene 1-2 mm long; culm 1-2 mm wide at base; leaves 1-3 mm wide ..... ***S. minor***
      7 Achene 2-4 mm long; culm 2.5-6 mm wide at base; leaves 5-9 mm wide.
        8 Plants cespitose to short-rhizomatous; sheaths brown or straminous to reddish, glabrous to glabrate on the ventral surface except for a pubescent and usually thickened summit; inflorescences terminal and lateral; achenes 2.0-3.3 mm long, (1.12-) avg. 1.25 (-1.38× as long as wide; hypogynium surface with laterally and apically rounded papillae; [of wet to mesic pinelands] ..... ***S. triglomerata***
        8 Plants long-rhizomatous or cespitose; sheaths purple to reddish, the ventral surface uniformly pubescent; inflorescences terminal only or terminal and lateral; achenes 2.5-4.0 mm long, (1.35-) avg. 1.45 (-1.54)× as long as wide; hypogynium surface with rounded or flattened papillae; habitats various.
          9 Plants usually cespitose; inflorescence terminal and lateral (a few culms in a clump can be terminal only); hypogynium surface with laterally flattened and apically triangular-acute to acuminate papillae, often resembling shards of glass or porcelain; [of coastal hammocks, oak woods near saltwater, and blackwater swamps] ..... ***S. flaccida***
          9 Plants usually long-rhizomatous; inflorescence terminal only; hypogynium surface with laterally and apically rounded papillae; [mostly of dry to dry-mesic pinelands and barrens] ..... ***S. nitida***
  5 Achene reticulate or papillose, rarely smooth (most often from apparent abortion or abnormal development); hypogynium with 3 tongue-shaped lobes, or 3 or 6 tubercles.
    10 Hypogynium of 3 tongue-shaped lobes appressed to the underside of the achene (appearing nearly bract-like); achene reticulate, the pits generally squarish or rectangular and arranged regularly in rows, rarely smooth (apparently by abortion or abnormal development).
      11 Achene pubescent (occasionally becoming glabrate); lower lateral inflorescences on long, filiform, usually drooping peduncles; bract of the uppermost lateral inflorescence usually reaching from 1/3-3/4 the length of the terminal internode; terminal internode 6-30 cm long ..... ***S. muehlenbergii***
      11 Achene glabrous; lower lateral inflorescences sessile or on short-erect peduncles; bract of the uppermost lateral panicle usually reaching 3/4 the length of to exceeding the terminal internode; terminal internode 3-8 cm long ..... ***S. reticularis***
    10 Hypogynium with 3 or 6 tubercles; achene papillose, sometimes reticulate (if so, the pits generally variable in shape and not forming regular rows), or rarely smooth.
      12 Achenes 1.5-2 mm long, the hypogynium with 6 paired but distinctly separate tubercles.
        13 Culms, leaves, and bracts copiously villous-cilliate with spreading hairs 0.5-1 mm long ..... ***S. pauciflora*** *var.* ***caroliniana***
        13 Culms, leaves, and bracts glabrous or sparsely hirtellous, but not copiously villous-ciliate ..... ***S. pauciflora*** *var.* ***pauciflora***
      12 Achenes 2.0-3.6 mm long, the hypogynium with 3 tubercles, these often 2-lobed, the lobes united (becoming separate in *S.* species 1 with achenes smoothish and > 2.5 mm long).
        14 Achenes 2-2.5(-3) mm long, 1.5-2.0(-2.3) mm wide; larger leaves 1-3.5 mm wide; culms, sheaths, blades, and bracts glabrous to moderately pubescent or ciliate.
          15 Culms and/or sheaths hairy; blades and bracts ciliate; plants of loamy sands (e.g., ultisols) ..... ***S. ciliata*** *var.* ***ciliata***
          15 Culms, sheaths, blades, and bracts glabrous; plants of sandy soils (e.g., spodosols) ..... ***S. ciliata*** *var.* ***glabra***
        14 Achenes 2.6-3.3(-3.6) mm long, 2.0-2.6 mm wide; larger leaves 3-7 mm wide; culms, sheaths, blades, and bracts moderately to densely pubescent and/or ciliate; plants usually of loamy soils (e.g., ultisols and alfisols).
          16 Herbage pubescent between as well as along primary sheath and adaxial leaf surface nerves and culm angles; most pistillate scales pubescent with appressed hairs 0.1 (-0.2) mm long, the keel similarly pubescent or ciliate with hairs (0.1-)0.2 mm long;

achene body distinctly papillose, 2.0-2.4 (-2.5) mm wide, averaging 2.2 mm, the length:width ratio 1.2-1.5 (-1.7); hypogynium with 3 usually lobed tubercles ..... ***S. elliottii***

16 Herbage pubescence restricted to primary sheath and leaf surface nerves and culm angles; pistillate scales glabrous, the keel ciliate with glutinous hairs, the longer 0.5-1.0 mm; achene body smoothish, uneven with low, broad non-papillose rises, (2.3-) 2.4-2.6 mm wide, averaging 2.5 mm, the length:width ratio 1.1-1.25; hypogynium with 3 deeply lobed tubercles, or 6 paired but separate tubercles..... ***S. species 1***

Scleria baldwinii (Torrey) Steudel, Baldwin's Nutrush. Cp (FL, GA, NC, SC): wet savannas, under *Pinus serotina, P. palustris*, and/or *Taxodium ascendens*; uncommon (rare in GA, NC, and SC). June-July. Se. NC south to s. FL and west to se. TX; also in Cuba and the Bahamas (Sorrie & LeBlond 1997). *S. baldwinii* is a more robust plant, with larger achenes, than *S. georgiana*. [= RAB, FNA, K, GW, WH]

Scleria ciliata Michaux var. ***ciliata***, Hairy Nutrush. Cp, Pd (GA, NC, SC, VA), Mt (NC, SC), {FL}: wet to dry sandy thickets and flatwoods, typically on sandy soil; frequent, rare in the mountains, rare in VA (VA Rare). May-August. VA south to FL, west to MO and TX, and in the West Indies, Mexico, and Central America. [= FNA, S, Y; < *S. ciliata* – RAB, C, F, G, GW, W; < *S. ciliata* var. *ciliata* – K, WH] {not yet mapped}



Scleria ciliata Michaux var. ***glabra*** (Chapman) Fairey, Smooth Nutrush. Savannas and flatwoods. NC south to FL, west to TX. *S. ciliata* var. *curtissii* (Britton) Kessler (=*S. pauciflora* Muhl. ex Willd. var. *curtissii* (Britton) Fairey) is currently of uncertain taxonomic standing. It is distinguished by its reticulate, non-papillose achenes, but such a condition has been observed in achenes with the hypogynium lobing of both *S. ciliata* and *S. pauciflora* (as suggested by the synonymy), and may only represent a form or condition. [= FNA, Y, K; > *S. brittonii* Core ex Small – S; < *S. ciliata* – RAB, C, F, G, GW, W; < *S. ciliata* var. *glabra* – K, WH; > *S. ciliata* var *curtissii* (Britton) Kessler – Z; > *S. pauciflora* Muhl. ex Willd. var. *curtissii* (Britton) Fairey – K] {not yet mapped}

Scleria distans Poiret in J. Lamarck et al., Riverswamp Nutrush. Moist sandy or peaty soil of pine savannas and flatwoods, boggy areas, and wet openings along roads. May-October. GA south to s. FL west to TX; West Indies; Mexico, Central and South America; Africa. [= FNA, WH; *? S. hirtella* Swartz – GW, K, S, Y, Z, misapplied]

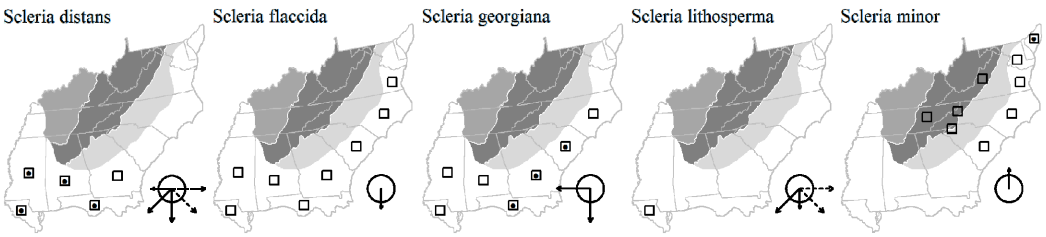
Scleria elliottii Chapman, Broad-leaved Hairy Nutrush. Savannas, flatwoods, pine-oak woodlands, meadows, bogs, and clay-based Carolina bays, typically on loamy sands. May-September. VA south to FL, west to TX, MO, OK. The descriptions of *S. elliottii* in S and of *S. ciliata* Michaux var. *elliottii* (Chapman) Fernald in F do not include the entity here treated as *S. species 1*. [= S; = *S. ciliata* Michaux var. *elliottii* (Chapman) Fernald – F, FNA, Y; < *S. ciliata* var. *ciliata* – K, WH; < *S. ciliata* – RAB, C, G, GW, W] {not yet mapped}

Scleria flaccida Steudel, Flaccid Nutrush. Blackwater swamps, coastal hammocks, oak woods and thickets near saltwater. Scattered along the outer Coastal Plain from se. VA to s. FL and west to LA. This is a poorly known species, with more locations likely to be found upon re-examination of *S. triglomerata* and *S. nitida* specimens. The often pendulus and capillary lateral peduncles suggest *S. oligantha*, another swamp species. *S. oligantha* is most readily separated by its 8-9-lobed hypogynium with minute rounded papillae. [= F. < *S. triglomerata* Michaux – RAB, C, FNA, GW, K, S, WH; < *S. nitida* – G]

Scleria georgiana Core, Georgia Nutrush. Pine savannas, cypress savannas, depression meadows, mostly on the outer Coastal Plain. June-August. E. NC south to s. FL, west to TX; and in the West Indies, Central and South America. See note under *S. baldwinii*. [= RAB, FNA, GW, K, WH; = *S. gracilis* Elliott – S (name preoccupied)]

Scleria lithosperma (Linnaeus) Swartz. Wet pine savannas. S. FL and s. LA south into Mexico, Central America and South America; West Indies; tropical Asia and Africa. [= FNA, GW, S, WH] {not yet keyed}

Scleria minor W. Stone, Slender Nutrush. Wet savannas and peaty seepages in the Coastal Plain and Sandhills, bogs in the Mountains. June-August. NJ south to FL, west to se. TX. [= RAB, C, F, FNA, G, K, W; < *S. triglomerata* – GW, S]



Scleria muehlenbergii Steudel, Pitted Nutrush. Open wet sand, pine savannas and flatwoods, depression meadows, cypress savannas, limesink ponds, bogs. June-September. NY (Long Island), NJ, and NC south to FL, west to TX, north in the interior to MO and IN; also in the West Indies, Bahamas (Sorrie & LeBlond 1997), Mexico, and Central America. *S. muehlenbergii* is adapted to a variety of freshwater wetland habitats, while *S. reticularis* is primarily restricted to the drawdown zones of limesink (doline) ponds and clay-based Carolina bays. Also see notes under *S. reticularis*. In normal specimens, the achene reticulation ridges are sharp-edged and steeply sloped (compare *S. reticularis*). The achene pubescence is often tawny, and achenes

appearing superficially glabrous often have a tawny residue under magnification. [= FNA, K; < *S. reticularis* Michaux – RAB, C, GW, W, WH; = *S. muhlenbergii* – F, orthographic variant; = *S. reticularis* var. *pubescens* Britton – G; = *S. setacea* Poiret – S]

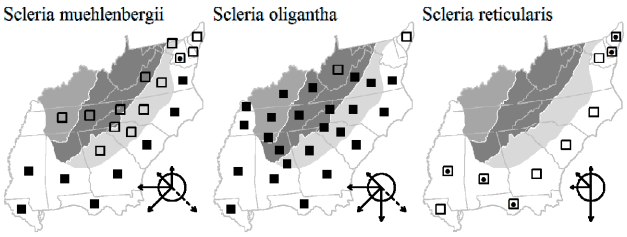
Scleria nitida Willdenow, Shining Nutrush. Cp (DE, FL, NC, SC, VA), Mt (NC, SC, VA), Pd (DE, NC, SC, VA) {FL, GA?}: dry sandy or rocky soil of pine/scrub oak woodlands, ridgetop forests at lower elevations in the Mountains such as pine/oak heaths, and heath balds; uncommon (rare in DE). May-October. MA, VA, and KY south to FL, west to LA and MO (also see note under *S. triglomerata*). [= F; < *S. nitida* – G; < *S. triglomerata* Michaux – RAB, C, FNA, GW, K, S, W, WH] {not yet mapped}

Scleria oligantha Michaux, Few-flowered Nutrush. Dry to moist forests and woodlands, swamp forests. June-September. NJ and MO south to c. peninsular FL and TX, also in Puerto Rico, Mexico, and Central America. The long, filiform, arching lateral peduncles are distinctive. [= RAB, C, F, FNA, G, GW, K, S, W, WH]

Scleria pauciflora Muhlenberg ex Willdenow *var.* ***caroliniana*** A. Wood, Carolina Nutrush. Cp (GA, NC, SC, VA?): savannas; uncommon. June-September. NH west to MI, south to n. FL, TN, and MO. [= F, FNA, G, K; < *S. pauciflora* – RAB, C, GW, S, W] (not yet mapped}

Scleria pauciflora Muhlenberg ex Willdenow *var.* ***pauciflora***, Papillose Nutrush. Cp (GA, NC, SC, VA), Pd (GA, NC, SC, VA), Mt (GA, NC, SC, VA, WV): wet to dry pine flatwoods, pine savannas, depression meadows; common (rare in WV). June-September. NJ west to KS, south to FL and TX, also in Cuba. Typification of *S. pauciflora* is controversial and unresolved at this time (Fairey & Whittemore 1999). [= F, FNA, G, K; < *S. pauciflora* – RAB, C, GW, S, W] {not yet mapped}

Scleria reticularis Michaux, Netted Nutrush. Limesink ponds, clay-based Carolina bays. June-September. MA south to FL, west to TX, north to IN, MI, and WI. Reports from Mexico are based on *S. muehlenbergii*. See notes under *S. muehlenbergii*. In normal specimens, the achene reticulation ridges are soft-edged and obliquely sloped. Occasional stipitate-capitate fungal growth on the achene has been mistaken for pubescence (a condition perhaps restricted to herbarium specimens), apparently contributing to the unwarranted agglomeration of this distinctive taxon and *S. muehlenbergii*. There is conbtroversy about typification of the name *Scleria reticularis* (Camelbeke, Reznicek, & Goetghebeur 2003). [= F, FNA, K, S; < *S. reticularis* – RAB, C, GW, W, WH (also see *S. muehlenbergii)*; = *S. reticularis* var. *reticularis* – G]



Scleria species 1, Smooth-seeded Hairy Nutrush. Wet savannas shallowly underlain by coquina limestone in the Coastal Plain, and apparently in diabase glades and barrens in the Piedmont. May-September. Currently known only from Granville, Onslow, and Pender counties, NC. In the Coastal Plain, it is associated with other narrow endemics such as *Thalictrum cooleyi, Allium species 1*, and *Carex lutea.*

Scleria triglomerata Michaux, Tall Nutrush. Wet to mesic flatwoods, savannas, and hardwood forests. May-September. VT and ON west to MN, south to s. FL and TX. *S. triglomerata* sensu lato also occurs in Puerto Rico and Mexico, and may include *S. nitida* and *S. flaccida*. [= F, G; < *S. triglomerata* – RAB, C, FNA, GW, K, S, W, WH, WV]

Scleria verticillata Muhlenberg ex Willdenow, Savanna Nutrush. Wet calcareous savannas of the outer coastal plain, freshwater marshes and maritime wet grasslands on barrier islands influenced by salt spray and shell deposits, wet calcareous or mafic fens or seepages in the mountains, calcareous grasslands. July-September. MA and ON west to MN, south to FL and TX, also in the West Indies, Mexico, Central and South America. This species is a distinct calciphile, with only scattered occurrences in most of our area. The roots are strongly fragrant. [= RAB, C, F, FNA, G, GW, K, S, WH]

Trichophorum Persoon (Deergrass)

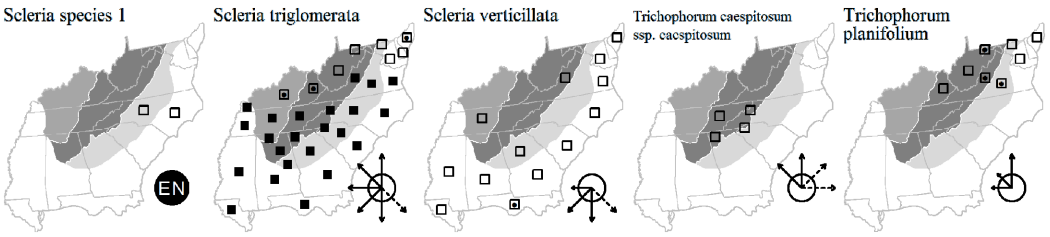
A genus of about 10 species, herbs, primarily circumboreal, but with disjunct occurrence in montane tropical Asia and montane tropical South America. *Trichophorum* has long been recognized as distinct from *Scirpus* by many authors (especially in Europe and Asia). Molecular and other studies have clearly confirmed that these species are more closely allied to *Eriophorum* than to *Scirpus*, and their removal from *Scirpus* creates a more natural classification (Strong 1994). *Trichophorum* resembles *Eriophorum* in most morphologic characters, and shares with it a generally boreal and north temperate distribution. *Trichophorum alpinum* (Linnaeus) Persoon demonstrates previous confusion over the affinities of the group; it has been variously treated (by those who do not recognize *Trichophorum*) as *Eriophorum alpinum* Linnaeus or *Scirpus hudsonianus* (Michaux) Fernald. References: Crins in FNA (2002b); Strong (1994)=Z; Goetghebeur in Kubitzki (1998b).

1 Culms terete or nearly so, smooth; [(in our area) of moderate to high elevation cliffs] ..... ***Tr. caespitosum*** *ssp.* ***caespitosum***
1 Culms sharply triangular in cross-section, the angles scabrous; [plants of low to moderate elevation forests, woodlands, and bluffs] ..... ***Tr. planifolium***

Trichophorum caespitosum (Linnaeus) Schur *ssp.* ***caespitosum***, Deergrass, Deerhair Bulrush. Cliffs receiving fog/cloud deposition and seepage, mostly at high elevations, over amphibolite, granite, gneiss, or schist, notably at Grandfather Mountain, Roan Mountain, Whiteside Mountain, and Chimney Rock. July-September. A circumboreal tundra and alpine species, south in North America to the mountains of New England and fens in NY, and to n. IL, MN, montane UT, and OR, common in wet tundra

and on alpine summits, disjunct (from NY) to about a dozen sites in the Southern Appalachians of w. NC, e. TN, sw. SC, and ne. GA (Jones & Coile 1988). The disjunct southern occurrences are certainly relicts of a more widespread distribution during the Pleistocene. Reported for South Carolina by Hill & Horn (1997) and Hill (1999). [< *Trichophorum caespitosum* – K; > *Scirpus cespitosus* var. *callosus* Bigelow – RAB, F, G; < *Scirpus cespitosus* Linnaeus – C, W; < *Trichophorum cespitosum* – FNA, orthographic variant; < *Scirpus caespitosus* – S; *? Baeothryon cespitosum* (Linnaeus) A. Dietrich]

Trichophorum planifolium (Sprengel) Palla. Woodlands, bluffs, forests. ME west to ON, south to sc. VA, e. WV, KY, OH, and se. MO. See Crins (1989a) for an interesting discussion of this species. [= FNA, K, Z; = *Scirpus verecundus* Fernald – C, F, G, W, WV; = *Scirpus clintonii* – S, misapplied]



106. POACEAE (R. Brown) Barnhart 1895 ***or GRAMINEAE*** A.L. de Jussieu 1789 (Grass Family) [in POALES]

A family of about 670 genera and 10,000 species, herbs (and some shrubs and trees), cosmopolitan. References: Flora of North America Editorial Committee (2003a, 2007a)=FNA; Hitchcock and Chase (1950)=HC; Blomquist (1948). Key to genera adapted in large part from FNA.

[note: only a small portion of the key to genera complete]

Key to tribes

1 Plant a shrub or tree (the culms perennial, woody, to 25 m tall), with complex branching systems from the upper nodes; leaves strongly dimorphic, those of the main culm sheathing, those of the branches or culm tips pseudopetiolate ..... **Key A: tribe *Bambuseae***

1 Plant an herb (the culms annual, not truly woody, to 5 m tall), lacking complex branching systems from the upper nodes; leaves not dimorphic, none of them pseudopetiolate.

4

5 ..... **Key P: tribe *Paniceae***

5 ..... **Key Q: tribe *Andropogoneae***

4

6 ..... **Key N: tribe *Aristideae***

6

7

8 ..... **Key C: tribe *Brachyelytreae***

8

9 ..... **Key B: tribe *Oryzeae***

9

10 ..... **Key L: tribe *Cynodonteae***

10 ..... **Key J: tribe *Poeae***

7 [to be continued]

Key A – tribe *Bambuseae*

Key based on Stapleton (2007).

1 Rhizomes pachymorph, having root-bearing internodes thicker than the culm; culms usually in single clumps ..... ***Bambusa***

1 Rhizomes leptomorph, root-bearing internodes thinner than the culm; culms solitary or in many connected clumps.

2 Mid-culm branches consistently 2, unequal, rarely with a smaller central third branch ..... ***Phyllostachys***

2 Mid-culm branches not consistently 2, initially 1-9.

3 Dwarf bamboos, < 1(-1.5) m tall.

4 Leaf blade margins more or less bleached in winter, terminal blade often angled from shoot axis, blades usually not variegated ..... ***[Sasa]***

4 Leaf blade margins not or only slightly bleached in winter, terminal blade parallel to shoot axis, blades often variegated..... ***Pleioblastus***

3 Medium-stature to tall bamboo, > 1 m tall.

5 Mid-culm branches initially 5-9 ..... ***Pleioblastus***

5 Mid-culm branches initially 1-3(-5).

6 Mid-culm branches (1-)2-7; branches and leaves small to medium relative to culm size; [native] ..... ***Arundinaria***

6 Mid-culm branches 1(-3); branch and leaves often very large relative to culm size; [alien].

7 Leaf blade margins bleached in winter, terminal blade often deflexed from shoot axis; culm buds initially closed ..... ***[Sasa]***

7 Leaf blade margins not bleached in winter, terminal blade parallel to shoot axis; culm buds initially open or closed..... ***Pseudosasa***

Key B – tribe *Oryzeae*

1 Lemma margins free; plants perennial.
  2 Plants **either** < 1 m tall **or** a floating aquatic with lax stems to 1.5 m long ..... ***Luziola***
  2 Plants 1-4 m tall, emergent, the stems stout, not lax ..... ***Zizaniopsis***
1 Lemmas and paleas clasping along their margins; plants annual or perennial.
  3 Spikelets either pistillate or staminate, the upper branches of the panicle with pistillate spikelets, the lower branches with staminate spikelets; caryopses terete ..... ***Zizania***
  3 Spikelets bisexual; caryopses laterally flattened.
    4 Glumes absent and also lacking glume-like sterile florets subtending the floret; lemmas and paleas pectinately ciliate-hispid on the margins; [native] ..... ***Leersia***
    4 Glumes absent or greatly reduced, glume-like sterile florets subtending the fertile floret; lemmas and paleas glabrous or pubescent, but not pectinately ciliate hispid on the margins; [introduced] ..... ***Oryza***

Key C – tribe *Brachyelytreae*

One genus ..... ***Brachyelytrum***

Key D – tribe *Diarrheneae*

One genus ..... ***Diarrhena***

Key E – tribe *Meliceae*

1 Lemmas awned, the awns 8-15 mm long; calluses hairy; [of VA, WV, KY, and northward] ..... ***Schizachne***
1 Lemmas unawned; calluses glabrous; [collectively widespread in our area].
  2 Lower glumes 1-veined; [plants of wetlands] ..... ***Glyceria***
  2 Lower glumes 3-7-veined; [plants of mesic to dry habitats] ..... ***Melica***

Key F – tribe *Stipeae*

1 Plants not cespitose, the main leaves cauline ..... ***[Piptatherum (racemosum)]***
1 Plants cespitose, the leaves basally disposed.
  2 Leaves > 4 mm wide; awns **either** 7-15 **or** 40-120 mm long.
    3 Leaves 4-10 mm wide, the base twisted so that the abaxial surface is uppermost; awns 7-15 mm long ..... ***Oryzopsis***
    3 Leaves 2-8 mm wide, not twisted at the base; awns 50-120 mm long ..... ***[Nassella (neesiana)]***
  2 Leaves < 4 mm wide; awns 5-120 mm long
    4 Palea grooved, longer than the lemma; lemma margins involute, fitting into the paleal groove; [native species, collectively widespread in our area] ..... ***Piptochaetium***
    4 Palea flat, shorter than or equal to the lemma; lemma margin convolute or not overlapping; [alien and native species, rare in our area].
      5 Lemmas papillose and also often pubescent, particularly on the veins, convolute and wrapping around the caryopsis such that the margins strongly overlap; awns 15-120 mm long ..... ***Nassella***
      5 Lemmas smooth, the margins separated and parallel their entire lengths at maturity; awns 5-25 mm long; [native species, of WV northward] ..... ***Piptatherum (canadense)***

Key G – tribe *Brachypodieae*

One genus ..... ***Brachypodium***

Key H – tribe *Bromeae*

One genus ..... ***Bromus***

Key I – tribe *Triticeae*

1 Spikelets 2-7 at all or most nodes.
  2 Spikelets 3 at each node ..... ***Hordeum***
  2 Spikelets
3Elymus
3Secale
1 Spikelets 1 at all or most nodes.

Agropyron, Elymus, Pascopyrum, Aegilops, Triticum, Thinopyrum

Key J – tribe *Poeae*

Poa, Festuca, Deschampsia, Avenella, Cynosurus, Phalaris, Lagurus, Hainardia, Parapholis, Schedonorus, Vulpia, Lolium, Puccinellia, Sclerochloa, Dactylis, Torreyochloa, Briza, Aira, Sphenopholis, Agrostis, Polypogon, Lagurus, Phleum, Gastridium, Desmazeria, Lachnagrostis, Amphibromus, Calamagrostis, Gaudinia, Avena, Holcus, Arrhenatherum, Trisetum, Koeleria, Rostraria, Anthoxanthum, Cinna, Limnodea, Ammophila, Milium, Alopecurus, Apera

Key K – tribe *Arundineae*

Molinia, Phragmites, Arundo

Key L – tribe *Cynodonteae*

Uniola, Distichlis (incl. Monanthochloe), Tridens, Triplasis, Leptochloa, Dinebra, Eragrostis, Eleusine, Dactyloctenium, Sporobolus, Calamovilfa, Muhlenbergia, Chloris, Eustachys, Gymnopogon, Ctenium, Cynodon, Spartina, Bouteloua, Tragus, Zoysia

Key M – tribe *Danthonieae*

Cortaderia, Danthonia

Key N – tribe *Aristideae*

One genus ..... ***Aristida***

Key O – tribe *Centotheceae*

One genus ..... ***Chasmanthium***

Key P – tribe *Paniceae*

{partial key only}

1 First glume 5-7.5 mm long, nearly as long as sterile lemma; fertile lemma 1/3 length of sterile lemma ..... ***Phanopyrum***
1 First glume shorter, or if this long, then at most 3/4 length of sterile lemma; fertile lemma > ½ the length of the sterile lemma.
  2 Sterile palea indurate and expanding the spikelet at maturity, as long as sterile lemma; outer surface of the distal palea with compound papillae ..... ***Steinchisma***
  2 Sterile palea membranous, not expanding the spikelet at maturity, usually shorter than sterile lemma or absent; outer surface of the distal palea lacking compound papillae ..... ***Panicum***

Digitaria, Anthenantia, Alloteropsis, Amphicarpum, Oplismenus, Echinochloa, Sacciolepis, Dichanthelium, Panicum, Megathyrsus, Phanopyrum, Brachiaria, Melinis, Urochloa, Eriochloa, Pennisetum, Cenchrus, Setaria, Stenotaphrum, Steinchisma, Axonopus, Paspalum, Reimarochloa

Key Q – tribe *Andropogoneae*

Add to genus key: *Elionurus*, *Hackelochloa*.

1 Leaves ovate-lanceolate, 2-10 cm long, 2.5-7× as long as wide; plants weak-stemmed annuals, branching, decumbent, rooting at the lower nodes; [alien weeds].
  2 Leaves cordate-clasping at base; spikelets not paired, unaccompanied by a vestige ..... ***Arthraxon***
  2 Leaves tapering to a broadly cuneate base; spikelets paired (one of the pair sometimes vestigial) ..... ***Microstegium***
1 Leaves lanceolate to linear, either longer or proportionately narrower; plants either perennial or coarse annuals with erect and mostly unbranched culms.
  3 Spikelets embedded in the thickened rachis (the inflorescence thus like an ear of corn), or fitting into grooves in the thickened rachis (the inflorescence thus cylindrical and resembling a rat's tail), or the pistillate inflorescences enclosed in a hard, bead-like, pearly-white, modified bract.
    4 Spikelets unisexual, with male and female spikelets in separate inflorescences or in different parts of the same inflorescence.
      5 Internode narrower than and more-or-less enclosed by the female spikelet ..... ***Coix***
      5 Internode broader than and more-or-less enclosing the female spikelet.
        6 Racemes of mixed sex (female below, male above) ..... ***Tripsacum***
        6 Racemes of single sex ..... ***Zea***
    4 Spikelets, or at least one of each pair, bisexual.

7 Pedicels fused to the internode; [coarse alien grass of disturbed habitats] ..... ***Rottboellia***
7 Pedicels free from the internodes; [either a native coarse grass of pinelands or prairie-like areas, or a short alien grass of lawns and disturbed areas].
8 Sessile spikelet smooth or pitted; culms 50-200 cm tall; [native grass of pinelands or prairie-like areas] ..... ***Coelorachis***
8 Sessile spikelet with pectinate margins; culms 5-40 cm tall; [alien grass of lawns and disturbed areas] ..... ***Eremochloa***
3 Spikelets not embedded or fitting into grooves in the rachis, the rachis slender (the spikelets visibly separate and often pedicelled).
9 Pedicelled spikelet similar to the sessile spikelet, both fertile.
10 Spikelets falling in pairs together with sections of the disarticulating rachis ..... ***Saccharum***
10 Spikelets falling separately from the persistent rachis.
11 Panicle contracted, spikelike; glumes membranous ..... ***Imperata***
11 Panicle loose; glumes cartilaginous or coriaceous ..... ***Miscanthus***
9 Pedicelled spikelet differing from the sessile in shape and sex (sometimes represented only by a pedicel).
12 Spikelets awned, the awn 10-20 cm long.
13 First glume lacking glands; panicle open, the branches 5-8 cm long ..... ***Chrysopogon***
13 First glume with a row of punctate, concave glands; panicle contracted, spikelike ..... ***Heteropogon***
12 Spikelets awned or not, if awned the awn < 5 cm long.
14 Inflorescence a panicle, the branches not subtended by sheaths.
15 Pedicelled spikelet represented by pedicel only; apex of sheath bearing 2 auricles 1-10 mm long; [native] ..... ***Sorghastrum***
15 Pedicelled spikelet present, staminate; apex of sheath truncate; [alien] ..... ***Sorghum***
14 Inflorescence of 1-13 digitate (whorled) racemes borne at the summit of a peduncle, the peduncle subtended by a raceme sheath.
16 Racemes 1 per peduncle and raceme sheath ..... ***Schizachyrium***
16 Racemes 2-13 per peduncle and raceme sheath.
17 Pedicels of the pedicelled (reduced or absent) spikelets terete or slightly flattened and grooved on one side only ..... ***Andropogon***
17 Pedicels of the pedicelled (reduced or absent) spikelets strongly flattened and grooved on both sides, the central portion thin or membranous ..... ***Bothriochloa***

Aegilops Linnaeus 1753 (Goatgrass)

A genus of about 23 species, annuals, of w. Asia east to the Mediterranean region. References: Saufferer in FNA (2007a); Tucker (1996)=Z.

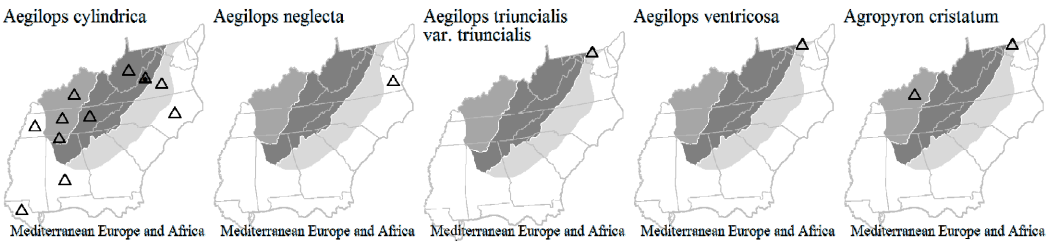
1 Glumes unawned (with a tooth to ca. 3 mm long); spikes moniliform ..... ***A. ventricosa***
1 Glumes awned; spikes narrowly cylindrical to ovoid (not moniliform).
2 Spikes narrowly cylindrical, about 3 mm in diameter ..... ***A. cylindrica***
2 Spikes ovoid, broadest at the base, 4-13 mm in diameter at the broadest point.
3 Upper spikelets 4-5 mm long ..... ***A. neglecta***
3 Upper spikelets 7-9 mm long ..... ***A. triuncalis*** *var.* ***triuncalis***

* ***Aegilops cylindrica*** Host, Jointed Goat Grass. Disturbed areas; native of Mediterranean Europe and w. Asia. [= C, F, FNA, G, HC, K, Z]
* ***Aegilops neglecta*** Requien ex Bertoloni, Small Goat Grass, Three-awned Goatgrass. Disturbed areas; native of Mediterranean Europe and w. Asia. Reported from Arlington County, VA. [= FNA, Z; = *A. ovata* Linnaeus – C, G, HC, apparently misapplied; = *A. geniculata* Roth – K, apparently misapplied]
* ***Aegilops triuncialis*** Linnaeus *var.* ***triuncialis***, Barbed Goatgrass. Disturbed areas; native of Mediterranean Europe east to w. and c. Asia. Known from MD. [= FNA; < *A. triuncialis* – HC, K]
* ***Aegilops ventricosa*** Tausch, Swollen Goatgrass. Disturbed areas; native of Mediterranean Europe. Known from DE. [= FNA]

Agropyron Gaertner 1770 (Crested Wheatgrass)

A genus of about 15 species, perennials, of Eurasia. References: Barkworth in FNA (2007a).

* ***Agropyron cristatum*** (Linnaeus) Gaertner, Crested Wheatgrass. Disturbed areas; native of Eurasia. [= C, F, FNA, G; > *A. cristatum* – HC; > *A. desertorum* – HC]



Agrostis Linnaeus 1753 (Bentgrass)

A genus of about 220 species, primarily temperate. References: Harvey in FNA (2007a); Tucker (1996)=Z. [also see *Lachnagrostis* and *Polypogon*]

1 Palea 1/2-3/4 as long as the lemma, 0.6-1.2 mm long; plants introduced, often (though not always) in disturbed habitats; plants flowering June-October; [subgenus *Agrostis*].
  2 Ligule mostly 0.5-2 mm long, truncate; panicle branches naked towards the base, diffuse when in fruit, the spikelets well-separated.....***A. capillaris***
  2 Ligule mostly 2.5-6 mm long, acute, rounded, or truncate; panicle branches (some of them) with spikelets to near the base, the spikelets usually agglomerated.
    3 Leaves 3-8 mm wide; inflorescence triangular-ovoid, the branches widely spreading at maturity, usually reddish; plant with rhizomes, without stolons .....***A. gigantea***
    3 Leaves mostly 1-3 mm wide; inflorescence narrowly ovoid, the branches ascending at maturity, usually tan; plant without rhizomes, with or without stolons.....***A. stolonifera***
1 Palea < 2/5 as long as the lemma, 0-0.5 mm long; plants native, typically in more or less natural habitats; plants flowering March-November; [subgenus *Vilfa*].
  4 Lemma usually awned (sometimes unawned), the awn inserted near the tip, 4-10 mm long, straight, very delicate and flexuous; annual, flowering April-June.....***A. elliottiana***
  4 Lemma awned or not, the awn (when present) inserted either near the middle of the lemma or near the apex, 0-6 mm long, straight or bent, neither delicate nor flexuous; perennial, flowering March-November.
    5 Lemma with a (2-) 3-5 mm long, geniculate awn.
      6 Anthers 1.0-1.5 mm long; spikelets 1.7-3.0 mm long; plant loosely cespitose, with stolons to 25 cm long.....***A. canina***
      6 Anthers 0.5-0.8 mm long; spikelets 2.0-4.o mm long; plant densely cespitose .....***A. mertensii***
    5 Lemma awnless or with a 0-3 mm long awn, this often straight (rarely geniculate in *A. scabra*).
      7 Spikelets 1.2-2 mm long; anthers 0.3-0.6 mm long; lemma never awned; plants flowering March-July .....***A. hyemalis***
      7 Spikelets 1.8-3.5 (-3.7) mm long; anthers 0.3-1.5 mm long; lemma awnless or awned; plants flowering June-November.
        8 Leaves (at least the basal) mostly involute, 1-2 (-3) mm wide; panicle branches mostly forking well beyond the middle; anthers 0.4-0.8 mm long .....***A. scabra***
        8 Leaves flat, 2-6 mm wide; panicle branches mostly forking at or below the middle; anthers 0.3-1.2 mm long.
          9 Lemma 1.8-3 mm long, minutely but copiously scabrous (at 20× or more); anthers 0.7-1.2 mm long; spikelets (2.3-) 2.7-3.5 (-3.7) mm long, usually clustered near the tips of the branchlets; panicle branches scabrous; culms to 15 dm tall; [of wet savannas and other wet habitats of the Coastal Plain].....***A. altissima***
          9 Lemma 1.4-2 mm long, glabrous; anthers 0.3-0.6 mm long; spikelets (1.8-) 2.2-2.7 (-3.2) mm long, usually not clustered near the tips of the branchlets; panicle branches glabrous to scabrous; culms to 10 dm tall; [of various habitats, nearly throughout our area].....***A. perennans***

Agrostis altissima (Walter) Tuckerman, Coastal Bog Bentgrass. Wet savannas, sinkhole ponds, edges of swamp forests. October-November. MA (?) and NJ south to se. LA, primarily on the Coastal Plain. [= F, HC, Z; < *A. perennans* – RAB, FNA GW, K, WH; = *A. perennans* var. *elata* (Pursh) A. Hitchcock – C, G, S]

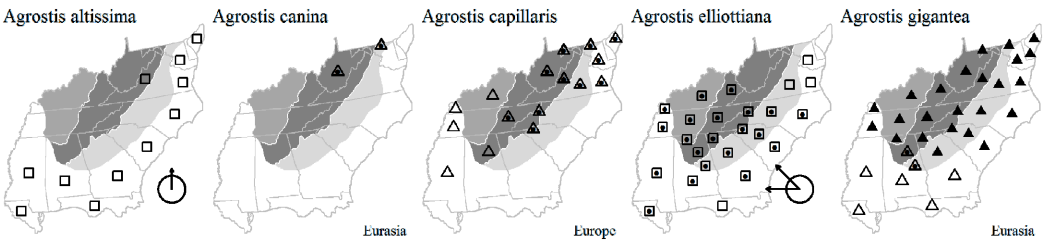
* ***Agrostis canina*** Linnaeus, Brown Bentgrass, Velvet Bentgrass. Roadsides, open areas, lawns; native of Eurasia. Naturalized in North America to DE, se. PA (Rhoads & Klein 1993), WV, and TN (Kartesz 1999). [= C, F, FNA, G, HC, K, WV]

* ***Agrostis capillaris*** Linnaeus, Rhode Island Bentgrass, Colonial Bentgrass, Browntop. Meadows, roadsides, disturbed areas; native of Europe (and possibly n. North America). June-August. [= C, FNA, K, Z; = *A. tenuis* Sibthorp – RAB, G, HC, S, W, WV; > *A. tenuis* var. *tenuis* – F]

Agrostis elliottiana J.A. Schultes, Elliott's Bentgrass, Southern Bentgrass. Dry soils of barrens, fields, and rock outcrops. April-June. MD west to s. OH, and e. KS, south to Panhandle FL (Gadsden County) and c. TX. [= RAB, C, F, FNA, G, HC, K, S, W, WH, Z]

Agrostis exarata Trinius, Spike Bentgrass. Disturbed areas; native of w. North America, a waif in e. North America. Reported for very widely scattered sites in e. North America, including Leslie County, KY (Kartesz (2010). [= FNA] {not keyed or mapped}

* ***Agrostis gigantea*** Roth, Redtop, Black Bentgrass. Fields, roadsides, disturbed areas; native of Eurasia. June-October. [= C, F, FNA, K, W, Z; < *A. stolonifera* – RAB, GW; = *A. stolonifera* Linnaeus var. *major* (Gaudin) Farwell – G; = *A. alba* – HC, WV, misapplied; >< *A. alba* – S, misapplied]



Agrostis hyemalis (Walter) Britton, Sterns, & Poggenburg, Ticklegrass, Small Bentgrass. Roadsides, other disturbed habitats. March-July. ME west to WI, south to FL and TX. [= F, FNA, K, WH, WV, Z; < *A. hyemalis* – RAB (also see *A. scabra*); = *A. hyemalis* var. *hyemalis* – C, G; = *A. hiemalis* – GW, HC, orthographic variant; < *A. hiemalis* – S, W, orthographic variant (also see *A. scabra* var. *scabra*] {FL}

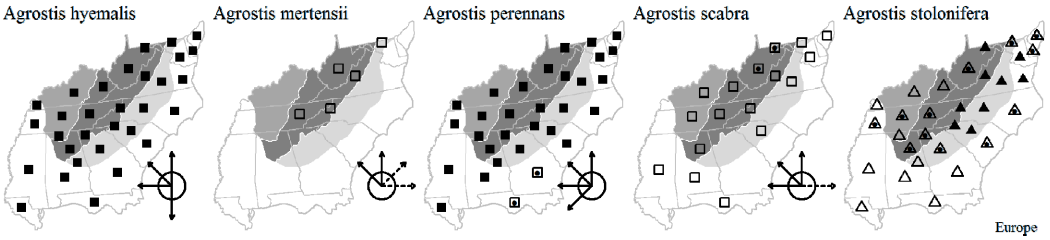
Agrostis mertensii Trinius, Arctic Bentgrass. In thin soil of high elevation rocky summits. July-August. Circumboreal, in North America south to ME (Mt. Katahdin), NH (White Mountains), VT, NY (Adirondack Mountains), WV (Spruce Knob), TN (Roan Mountain, Abrams Creek), NC (Roan Mountain, Big Yellow Mountain, Black Mountains), QC, BC, CO, UT (?), and AK. [= C, FNA, K, W, Z; > *A. borealis* Hartman – RAB, HC, S, WV; > *A. borealis* Hartman var. *americana* (Scribner) Fernald – F, G]

Agrostis perennans (Walter) Tuckerman, Upland Bent, Autumn Bentgrass. Woodlands, forests, roadsides. August-October. NL (Newfoundland) west to MN, south to n. FL and TX; c. Mexico south to c. South America. [= HC, WV, Z; < *A.*

perennans – RAB, FNA, GW, K, W, WH (also see *A. altissima*); = *A. perennans* var. *perennans* – C, G, S; > *A. perennans* var. *perennans* – F; > *A. perennans* var. *aestivalis* Vasey – F]

Agrostis scabra Willdenow, Fly-away Grass, Rough Bentgrass. {habitats}. June-November. Throughout North America, though mainly in cooler climates; ne. Asia. [= FNA, GW, K, WH, Z; < *A. hyemalis* – RAB, W; = *A. hyemalis* (Walter) Britton, Sterns, & Poggenburg var. *scabra* (Willdenow) Blomquist – C; > *A. scabra* var. *scabra* – F; = *A. hyemalis* (Walter) Britton, Sterns, & Poggenburg var. *tenuis* (Tuckerman) Gleason – G; = *A. scabra* var. *scabra* – HC]

* ***Agrostis stolonifera*** Linnaeus, Creeping Bentgrass. Disturbed areas, wet, moist, or dry; native of Europe. June-October. [= K; > *A. stolonifera* var. *stolonifera* – C, G; > A. stolonifera var. palustris (Hudson) Farwell – C; < *A. stolonifera* – FNA, GW, RAB, W, WH (also see *A. gigantea*); > *A. alba* Linnaeus var. *alba* – F, misapplied; > *A. alba* Linnaeus var. *palustris* (Hudson) Persoon – F, misapplied; > *A. stolonifera* – HC, Z; = *A. alba* – S, misapplied; > *A. stolonifera* var. *compacta* Hartman – G; > *A. palustris* Hudson – HC, WV, Z]



Aira Linnaeus 1753 (Hair Grass)

A genus of 8-9 species, annuals, native of Europe, n. Africa, and w. Asia. References: Wipff in FNA (2007a); Tucker (1996)=Z.

1 Panicle dense and spike-like, 0.5-4.1 cm long, 0.3-0.7 cm wide, the branches short and appressed to ascending ..... ***A. praecox***
1 Panicle open, 1.2-13.5 cm long, 1.5-10 cm wide, the branches elongate, diffusely spreading or ascending.
  2 Pedicels usually 1-2× as long as the spikelets; lemma of both the lower floret and the upper floret with an awn 2-4 mm long ..... ***A. caryophyllea***
  2 Pedicels usually 2-8× as long as the spikelets; lemma of upper floret with an awn 1.5-2.5 mm long, lemma of the lower floret awnless or with a minute awn < 1 mm long ..... ***A. elegantissima***

* ***Aira caryophyllea*** Linnaeus, Silver Hair Grass. Fields, roadsides, disturbed areas; native of Europe. May. [= RAB, C, G, HC, K, WH, Z; = *Aira caryophyllea* var. *caryophyllea* – FNA; = *Aspris caryophyllea* (Linnaeus) Nash – S]

* ***Aira elegans*** Willdenow ex Kunth, Elegant Hair Grass. Fields, roadsides, disturbed areas; native of Europe. May-June. [= RAB, G, HC, K; = *Aira elegantissima* Schur – C, Z; = *Aira caryophyllea* Linnaeus var. *capillaris* (Mertens & W.D.J. Koch) Mutel – FNA; = *Aspris capillaris* (Host) A.S. Hitchcock – S]

* ***Aira praecox*** Linnaeus, Early Hair Grass, Spike Hairgrass. Fields, roadsides, disturbed areas; native of Europe. Reported for NC by Burk (1961), and recently collected in the NC Sandhills (B.Sorrie, pers.comm. 2004). [= C, G, HC, K, Z]

Alloteropsis J. Presl 1828

A genus of 5-8 species, annuals and perennials, native of tropical Asia and Australia. References: Hall in FNA (2003a).

* ***Alloteropsis cimicina*** (Linnaeus) Stapf, Bugseed Grass. Disturbed areas; native of se. Asia. Naturalized in FL Panhandle and ne. FL. [= FNA, WH]

Linnaeus 1753 (Foxtail Grass)

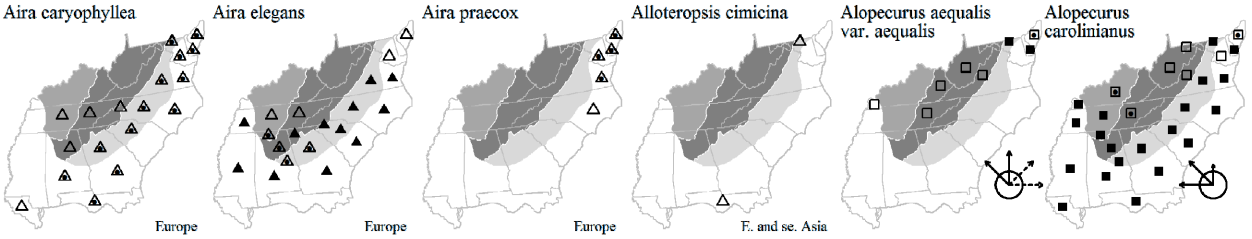
A genus of about 36 species, north temperate and temperate South America. References: Tucker (1996)=Z.

1 Glumes 4-6 mm long, acute or acuminate.
  2 Glumes with hairs < 1.0 mm long on the keel, merely scabrous towards the tip ..... ***A. myosuroides***
  2 Glumes with hairs 1.0-1.5 mm long on the keel, including towards the tip ..... ***A. pratensis***
1 Glumes 2-3.2 mm long, obtuse or truncate.
  3 Awn about as long as the glumes (at most exceeding the glumes by 1 mm) ..... ***A. aequalis*** *var.* ***aequalis***
  3 Awn longer than the glumes, exceeding the glumes by 1.5-3.5 mm.
    4 Anthers 0.4-0.7 mm long; annual ..... ***A. carolinianus***
    4 Anthers 1.3-2 mm long; perennial ..... ***A. geniculatus***

Alopecurus aequalis Sobolewski *var.* ***aequalis***, Short-awn Foxtail Grass. Wet swales, wet meadows, distches, shores. Circumboreal, south in North America to NJ, w. VA, IN, MO, and CA. [= F, K; < *A. aequalis* – C, G, HC]

Alopecurus arundinaceus Poiret, Creeping Meadow Foxtail. Pastures, disturbed areas. Native of Eurasia. Reported for Bell County, KY (Kartesz 2010). [= FNA] {not keyed or mapped}

Alopecurus carolinianus Walter, Carolina Foxtail Grass. Moist fields, ditches, forests. April-May. MA west to BC, south to n. FL and CA. [= RAB, C, F, G, GW, HC, K, WH, WV, Z; = *A. ramosus* Poiret – S]



* ***Alopecurus geniculatus*** Linnaeus, Water Foxtail Grass. Disturbed areas; native of Eurasia. [= C, F, G, HC; > *A. geniculatus* var. *geniculatus* – K]

* ***Alopecurus myosuroides*** Hudson, Slender Foxtail Grass. Moist fields; native of Europe. April-May. [= RAB, C, F, G, HC, K, S, WV, Z]

* ***Alopecurus pratensis*** Linnaeus, Meadow Foxtail. Roadsides, fields; native of Eurasia. May-July. Reported for Piedmont of nc. GA (Jones & Coile 1988), for scattered locations in PA (Rhoads & Klein 1993), and for VA, KY, WV, MD, and DE (Kartesz 1999). Reported for Ashe County, NC (Poindexter & Murrell 2008). [= C, F, G, HC, K, WV]

Ammophila Host 1809 (Beach-grass)

A genus of 2-3 species, rhizomatous perennials, north temperate. References: Barkworth in FNA (2007a); Tucker (1996)=Z.

1 Ligule 10-35 mm long ..... ***A. arenaria***
1 Ligule 1-4.6 mm long ..... ***A. breviligulata***

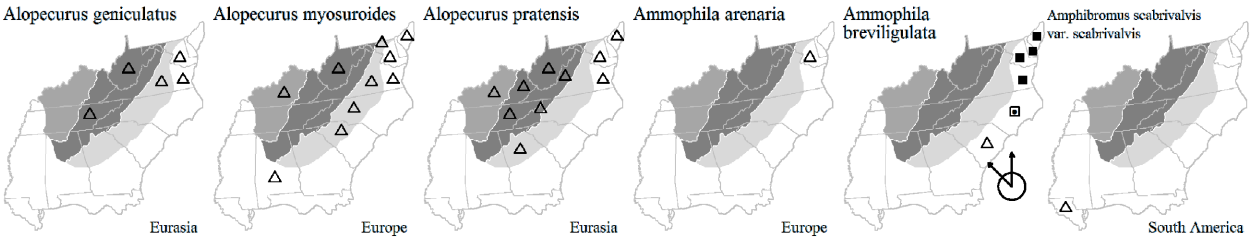
* ***Ammophila arenaria*** (Linnaeus) Link, European Beach-grass. Dunes, disturbed areas; native of Europe. Introduced in MD and PA (Kartesz 1999). [= C, F, FNA, HC, K]

Ammophila breviligulata Fernald, American Beach-grass. Dunes. August-September. NL (Newfoundland) south to about Cape Hatteras, Dare County, NC, and on shores around the Great Lakes; planted further south. As a native grass, *Ammophila* ranged south only to NC, where it was rare; it is now commonly planted ("sprigged") in the Carolinas as a sand-binder and is now common south into SC. [= K; < *A. breviligulata* – RAB, F, G, HC, S; = *A. breviligulata* ssp. *breviligulata* – FNA; ? *A. breviligulata* – C, Z]

Amphibromus Nees 1843

A genus of about 12 species, annuals and perennials, native of Australia, New Zealand, and South America. References: Jacobs in FNA (2007a).

* ***Amphibromus scabrivalvis*** (Trinius) Swallen *var.* ***scabrivalvis***, Rough Amphibrome. Disturbed areas; native of South America. Established in Tangipahoa Parish, LA. [= FNA; < *Amphibromus scabrivalvis* – K; < *Helictotrichon scabrivalve* (Trinius) G. Tucker]



Amphicarpum Kunth 1829 (Peanut-grass)

The genus consists only of the two species treated here, remarkable for their dimorphic spikelets, some of them cleistogamous and subterranean, others aerial and chasmogamous. A series of publications over the past century make *Amphicarpum* one of the best studied "useless" grasses anywhere (Holm 1896; Weatherwax 1934; Gray & Fairbrothers 1971; McNamara & Quinn 1977; Cheplick & Quinn 1982, 1983, 1986, 1987, 1988a, 1988b; Cheplick 1989). References: Wipff in FNA (2003a).

1 Leaf blades hirsute with pustular-based hairs on both surfaces, the margins ciliate (and also slightly cartilaginous-thickened); [of moist to wet, peaty or sandy-peaty soils] ..... ***A. amphicarpon***
1 Leaf blades glabrous, the margins cartilaginous-thickened; [of seasonally flooded natural ponds] ..... ***A. muhlenbergianum***

Amphicarpum amphicarpon (Pursh) Nash, Pinebarrens Peanut-grass. Wet, peaty, open soils, especially peat-burns in pocosin edges, primarily in the outer Coastal Plain, responding strongly to fire. August-October. An Atlantic Coastal Plain endemic, scattered and rather rare, from e. MA to GA. If one carefully excavates young plants in spring or summer, they will generally be found to be connected to the remnants of the previous year's subterranean spikelet. [= FNA; = *Amphicarpum purshii* Kunth – RAB, C, F, G, GW, HC, K; = *Amphicarpon amphicarpon* (Pursh) Nash – S]

Amphicarpum muhlenbergianum (J.A. Schultes) Hitchcock, Florida Peanut-grass, Blue Maiden-cane. Natural depression ponds, flatwoods ponds, clay-based Carolina bays. August-October. A Southeastern Coastal Plain endemic: FL and s. AL north to se. NC, rare north of s. GA. First found in NC in the late 1980's by M. Boyer. [= RAB, FNA, GW, HC; = *A. muehlenbergianum* – K, orthographic variant; = *Amphicarpon floridanum* Chapman – S]

Andropogon Linnaeus 1753 (Broomsedge, Bluestem)

A genus of about 100-110 species, mainly tropical. [also see *Bothriochloa* and *Schizachyrium*]

The difference between this treatment and that in RAB may cause some users to react with skepticism, dismay, or alarm, but I am confident that it represents a much truer description of the genus. Campbell's work (1983, et seq.) has greatly clarified the taxonomy of *Andropogon* in e. North America. Great confusion and disagreement were previously the rule in dealing with the *A. virginicus*-*A. glomeratus* complex. Campbell's careful morphologic work has provided workable technical characters which distinguish the taxa he recognizes.

I have generally followed Campbell (1983, et seq.) in his circumscriptions of taxa. I disagree, however, with his strongly morphologic species concept and the basis for his decisions regarding the rank of the taxa (species, variety, and "variant," an informal, English name for a subvarietal entity). Campbell bases the rank recognition of taxa on their "morphological distance" from one another, as determined by the sum of non-matching characters out of 33 characters analyzed. In general, he regards species as separated by a morphologic distance of 9 or more, varieties by 6 or more, and variants by 3 or more. Such an approach fails to take into account additional evidence of the ecological preferences, geographic distributions, reproductive isolation, evolutionary pathways, and population biology of the taxa.

Evidence presented by Campbell (1983) is useful in determining a more meaningful assignment of taxonomic rank. For instance, he states that "there are ample opportunities for gene flow between taxa because they frequently grow together and flower at the same time of day and (mostly) at the same time of year. I have observed two taxa growing within one to three meters of one another over our hundred times. In only five of these opportunities for hybridization were there plants whose intermediate morphology suggested that they were hybrids. In the rare instances where hybridization does take place, there are few mature hybrid individuals. I have found only twelve putative hybrid individuals in the five localities where hybridization is suspected. The parents outnumber these hybrids by between five and one hundred or more to one." In discussing *A. virginicus* var. *glaucus* (here treated as *A. capillipes*) he states "the drylands variant ... produces generally shorter raceme sheaths, racemes, and spikelets; its flowers are more frequently chasmogamous, and unlike the wetlands variant, it has no hairs below the raceme sheath. In addition, it grows in better-drained soil and has a narrower geographic range ... I have seen these taxa growing within one to three meters of one another at three localities in northwestern Florida. At only one of these was there difficulty in classifying any individual: a single plant on a slope between a bog inhabited by the wetlands variant and a roadside lined with the drylands variant..."

Some additional examples would be Campbell's discussion of several closely related taxa in the *A. glomeratus* complex. "*Andropogon glomeratus* var. *glomeratus* and the robust variant of var. *pumilus* have inflorescences so similar in shape that most previous workers have united them and have overlooked the differences between them. The robust variant is taller, usually with rather smooth sheaths and with shorter, more ciliate, and darker ligules, narrower raceme sheaths, and lower glume keels that are scabrous below the middle. Although both taxa grow in wet sites, the robust variant is weedier, shows a greater tolerance for drier conditions and various soil types, and has a wider geographic range." His discussion of *A. glomeratus* var. *glaucopsis* and var. *hirsutior* is also worth repeating. "Often the two grow together in populations of thousands of individuals. Because they grow together so frequently and are morphologically so alike, the possibility that they are not distinct taxa but merely genetic segregates of one another has been carefully considered. Based on observations of several hundred seedlings grown from seeds from both taxa (growing together in nature), there is no evidence for [mere] genetic segregation. The glaucousness/greenness and pubescence/glabrousness of the stem sheaths are discernible in the seedlings within a few weeks of germination."

Taxa differing in numerous morphologic characters, with different (though overlapping) geographic ranges, with different ecological preferences (often rather narrowly segregated by hydrology), and (when they do occur in proximity to one another) showing little or no sign of introgression or hybridization are probably better treated as biological species. Thus, I have treated a number of Campbell's varieties as species. Several of his "variants" also seem to warrant taxonomic recognition, at varietal or specific rank; in fact, he subsequently elevated several (Campbell 1986). References: Campbell (1983)=Z; Campbell in FNA (2003a). Key adapted in part from Z.

Identification notes: A thorough understanding of the architecture of the inflorescences of *Andropogon* is necessary in order to identify them successfully. The parts will be described, beginning from the apex of a branch of the inflorescence. Spikelets occur in pairs, the sessile spikelet (usually just referred to as the **spikelet**) and the **pedicelled spikelet**, which is usually vestigial or absent (except in *A. gerardii*) and sterile (except in *A. gerardii*, where it is staminate). The first or **lower glume** of the sessile spikelet has two **keels**, and the presence and location of antrorse prickle hairs (scabrousness) is an important character in the *A. glomeratus* complex. The length of the sessile spikelet is an important character; it should be measured exclusive of the **awn**, borne at the apex of the lemma. Awn length is also a useful taxonomic character. The pedicelled spikelet is borne on the **pedicel**, which is attached at the base of the sessile spikelet and typically angles away from it at about a 45 degree angle. The **rachis internode** extends from the base of one sessile spikelet to the next sessile spikelet above, breaking apart (upon dehiscence) just below the next spikelet and remaining attached to the sessile spikelet below. The **dispersal unit** consists of a sessile spikelet sitting in the V shape

formed by (on one side) the pedicel and pedicelled spikelet and (on the other side) the rachis internode. Both the pedicel and the rachis internode are usually pubescent with long hairs, and the color of those hairs and their distribution are useful characters.

While the dispersal units are still attached to one another, the rachis internodes form a continuous and more-or-less straight **rachis**. The dispersal units attached together in an unbranched sequence are termed a **raceme**, whose length is a useful character. Two or more racemes are attached digitately at the summit of the **peduncle** (in *Schizachyrium* only a single raceme is found). The number of racemes attached is an important character. A **raceme sheath** subtends the peduncle, often more or less surrounding the peduncle and the racemes. The length of the peduncle (distance between the points of attachment of the raceme sheath and the racemes) is an important character. The length and width (at its widest point) of the raceme sheath are very useful characters, used throughout the key. The racemes, peduncle and subtending raceme sheath make up an **inflorescence unit**. The overall inflorescence is more-or-less complexly branched; its overall size and shape are very useful in recognizing the various taxa, but variation in such a subjective (and environmentally plastic) character has added to the taxonomic confusion in *Andropogon*. The use of inflorescence shape in the key has been minimized, but is often mentioned in the discussion of each species. The number of inflorescence units per plant varies from species to species, in some species rarely exceeding 10, in others ranging upwards to 500 or 600. The absence or presence of hairs immediately below the raceme sheath is useful in some groups.

There are several important characters of the foliage. *A. capillipes* and *A. glaucopsis* have culm sheaths and leaf blades that are strongly glaucous; this is usually very obvious, but can be tested for by running the finger along the surface of the leaf (a white coating of wax will come off on the finger). The key often calls for the ligule length; measure the longest portion of the undivided portion of the ligule. The ligule often has an erose or ciliate upper margin; measure the length of the ciliations. The length of leaf blade is measured from the ligule to the leaf apex; do not include the leaf sheath, which is often long and (especially late in the year) only loosely sheathing the culm or even divergent it. Whether the culm is antrorsely scabrous or smooth is better determined by touch than by sight. Choose several mid-culm sheaths, run one's finger downwards and upwards along the sheath surface (near the collar is best). If the sheath is antrorsely scabrous one will feel a somewhat greater resistance to moving the finger downwards than upwards.

1 Pedicellate spikelet staminate, as large as the sessile, fertile spikelet; sessile spikelets > 7 mm long; [section *Andropogon*]..... ***A. gerardii***
1 Pedicellate spikelet sterile, vestigial or absent; sessile spikelets < 7 mm long; [section *Leptopogon*].
2 Leaves strongly glaucous (often nearly white with a powdery wax that can be rubbed off on the fingers), glabrous.
3 Ligules (0.9-) 1.5 (-2.0) mm long, with ciliations 0-0.2 mm long; leaf blades usually (33-) avg. 40 (-75) cm long; pubescence beneath raceme sheaths moderate to dense; raceme sheaths (2.0-) 2.4-3.6 (-4.4) cm long, (1.3-) 2.0-2.5 (-3.0) mm wide..... ***A. glaucopsis***
3 Ligules (0.2-) 0.4 (-0.5) mm long, with ciliations 0.3-1.2 mm long; leaf blades (12-) avg. 19 (-38) cm long; pubescence beneath raceme sheaths absent to dense; raceme sheaths (2.1-) 2.9-4.3 (-6.0) cm long, (2.7-) 3.1-3.8 (-5.5) mm wide.
4 Summit of branchlet below attachment of raceme sheath pubescent with hairs 2-4 mm long; raceme sheaths (2.4-) 3.2-4.8 (-6.0) cm long; spikelets (3.0-) 3.5-3.9 (-4.4) mm long; racemes (1.5-) 2.0-3.0 (-4.0) cm long; leaves 2.5-6.5 mm wide, averaging 5 mm; upper floret lemma awn 0.9-2.1 mm long, averaging 1.4 mm..... ***A. capillipes*** *var.* ***1 ["wetland variant"]***
4 Summit of branchlet below attachment of raceme sheath glabrous; raceme sheaths (2.1-) 2.6-3.8 (-4.9) cm long; spikelets (2.6-) 3.2-3.5 (-3.9) mm long; racemes (1.4-) 1.7-2.4 (-3.2) cm long; leaves 2-5 mm wide, averaging 3.5 mm; upper floret lemma awn 0.6-1.5 mm long, averaging 1.1 mm..... ***A. capillipes*** *var.* ***2 ["dryland variant"]***
2 Leaves green (to somewhat glaucous, but never powdery white), pubescent or glabrous.
5 Upper culm sheaths distinctly broadened and strongly overlapping, often largely hiding the raceme sheaths before senescence (but in some forms with the raceme sheaths strongly exserted); culms mostly < 1 m tall (to 1.4 m tall)..... ***A. elliottii***
5 Upper culm sheaths reduced, not strongly overlapping, not hiding the raceme sheaths after anthesis; culms mostly > 1 m tall (except *A. perangustatus*, *A. tracyi*, and small forms of *A. virginicus*).
6 Many or all peduncles longer than the subtending raceme sheaths at maturity, racemes then fully exserted above the apex of the raceme sheath.
7 Inflorescence branches arching outwards in pronounced curves; racemes (1.2-) 1.5-2.1 (-2.6) cm long; awn (0.2-) avg. 0.7 (-1.1) cm long; spikelets (4.1-) 4.4-4.6 (-5.0) mm long..... ***A. brachystachyus***
7 Inflorescence branches erect; racemes (2.2-) 2.6-6 cm long; awn 0.5-2.0 cm long; spikelets (4.3-) 4.9-6.5 (-7.5) mm long.
8 Lower glumes more or less folded; stamen 1; racemes (2.2-) 2.6-4.3 (-5.3) cm long; awn (0.5-) avg. 0.8 (-1.6) cm long; spikelets (4.3-) 4.9-5.4 (-6.1) mm long ..... ***A. arctatus***
8 Lower glumes flat; stamens 3; racemes 3-6 cm long; awn 1-2 cm long; spikelets (4.5-) 5-6.5 (-7.5) mm long ..... ***A. ternarius*** *var.* ***ternarius***
6 Peduncles all shorter than the subtending raceme sheaths at maturity, at least the bases of the racemes not exserted above the apex of the raceme sheath.
9 Inflorescence units with (2-) 4-7 (-13) racemes; raceme sheaths (4.1-) 5.3-8.0 (-10-1) mm wide; hairs of the rachis internode and pedicel yellow-tawny when dry ..... ***A. mohrii***
9 Inflorescence units with 2-5 (-7) racemes; raceme sheaths (1.5-) 2.0-4.8 (-6.3) mm wide; hairs of the rachis internode and pedicel gray to whitish when dry.
10 Postflowering peduncles < 10 mm long.
11 Culm sheaths antrorsely scabrous (often hirsute as well); leaf blades usually > 35 cm long.
12 Ligules (0.6-) 0.8 (-1.3) mm long (usually < 1 mm long), with ciliations 0.2-0.9 mm long; raceme sheaths (1.5-) 2.0-2.5 (-3.0) mm wide (usually < 2.5 mm wide); keels of first glume often scabrous below the middle ..... ***A. tenuispatheus***
12 Ligules (0.7-) 1.2 (-2.2) mm long (usually > 1 mm long), with ciliations 0.0-0.3 mm long; raceme sheaths (2.0-) 2.4-3.4 (-4.7) mm wide (usually > 2.5 mm wide); keels of first glume scabrous only above the middle, smooth below.
13 Inflorescences oblong to obpyramidal; spikelets (3.8-) 4.1-4.4 (-5.0) mm long; anthers usually not marcescent within spikelet; mature peduncles (4 -) 11-35 (-60) mm long (usually some of them > 10 mm long)..... ***A. glomeratus*** *var.* ***glomeratus***
13 Inflorescences (linear to) oblong; spikelets (3.4-) 3.6-3.8 (-4.6) mm log; anthers usually marcescent within spikelets; peduncles (2-) 3-5 (-8) mm long..... ***A. glomeratus*** *var.* ***hirsutior***
11 Culm sheaths not scabrous (often hirsute); leaf blades < 35 cm long (except in *A. glomeratus* var. *pumilus*).
14 Leaves glabrous.
15 Ligules (0.8-) 1.1 (-1.5) mm long, with ciliations 0-0.1 mm long; basal leaves often filiform, < 1.5 mm wide, strongly erect..... ***A. perangustatus***
15 Ligules (0.2-) 0.5 (-0.8) mm long, with ciliations 0.2-1.3 mm long; basal leaves usually > 2 mm wide, soon arching.

16 Culm internodes green (or glaucous just below the node only); raceme sheaths (2.2-) 2.5-3.8) (-4.5) cm long, (1.7-) 2.4-3.1) (-4.0) mm wide; peduncles (1-) 4-9 (-30) mm long; racemes 2 (-3) per inflorescence unit..... ***A. virginicus*** *var.* ***decipiens***

16 Culm internodes glaucous; raceme sheaths (2.8-) 3.3-4.7 (-6.7) cm long, (3.0-) 3.2-3.8 (-5.2) mm wide; peduncles (2-) 3-4 (-6) mm long; racemes 2-4 (-7) per inflorescence unit, at least some inflorescence units (especially at culm and branch apices) with 3 or more racemes..... ***A. virginicus*** *var.* ***virginicus*** *['smooth variant']*

14 Leaves pubescent, at least on the margin near the collar.

17 Keels of first glume often scabrous below the middle; leaves usually > 44 cm long..... ***A. tenuispatheus***

17 Keels of first glume scabrous only above middle; leaves usually < 31 cm long.

18 Pubescence of young culm sheaths appressed; spikelets usually > 4 mm long; hairs on rachis internode and sterile pedicel dense, long; callus hairs 1.5-5 mm long..... ***A. longiberbis***

18 Pubescence of young culm sheaths spreading; spikelets mostly < 4 mm long; hairs on rachis internode and sterile pedicel rather sparse and short; callus hairs 1-2.5 mm long.

19 Raceme sheaths (2.2-) 2.5-3.8 (-4.5) cm long, (1.7-) 2.4-3.1 (-4.0) mm wide; racemes 2 (3) per inflorescence unit; spikelets (3.0-) 3.3-3.6 (-4.0) mm long..... ***A. virginicus*** *var.* ***decipiens***

19 Raceme sheaths (2.3-) 3.4-5.2 (-6.7) cm long, (2.7-) 3.3-4.0 (-5.5) mm wide; racemes 2-5 (-7) per inflorescence unit; spikelets (2.9-) 3.7-3.9 (-4.7) mm long..... ***A. virginicus*** *var.* ***virginicus***

10 Postflowering peduncles > 15 mm long.

20 Culm sheaths antrorsely scabrous (often hirsute as well).

21 Ligules (1.0-) 1.2 (-2.0) mm long, with ciliations 0-0.3 mm long; keels of first glume scabrous only above middle..... ***A. glomeratus*** *var.* ***glomeratus***

21 Ligules (0.6-) 0.8 (-1.3) mm long, with ciliations 0.2-0.9 mm long; keels of first glume often scabrous below middle..... ***A. tenuispatheus***

20 Culm sheaths not scabrous (often hirsute).

22 Culms < 1.2 m tall; leaf blades < 30 cm long and < 3 mm wide; inflorescence units rarely > 20/culm.

23 Raceme sheaths (2.2-) 2.5-3.8 (-4.5) cm long; spikelets (3.0-) 3.3-3.6 (-4.0) mm long; leaf blades (2.5-) 3.6 (-5.5) mm wide..... ***A. virginicus*** *var.* ***decipiens***

23 Raceme sheaths (2.6-) 4.1-6.6 (-8.5) cm long; spikelets (3.0-) 3.4-5.1 (-5.5) mm long; leaf blades (0.8-) 1.8 (-3.0) mm wide.

24 Ligules (0.8-) 1.1 (-1.5) mm long, with ciliations 0-0.1 mm long..... ***A. perangustatus***

24 Ligules (0.2-) 0.4 (-0.5) mm long, with ciliations (0.1-) 0.2-0.8 mm long..... ***A. tracyi***

22 Culms usually > 1.2 m tall; leaf blades often > 30 cm long and > 3 mm wide; inflorescence units usually > 20/culm.

25 Inflorescence branches arching outwards in pronounced curves; awn mostly < 1 cm long; spikelets (4.1-) 4.4-4.6 (-5.0) mm long; anther > 1.7 mm long..... ***A. brachystachyus***

25 Inflorescence branches erect; awn mostly >1 cm long; spikelets (3.0-) 3.3-3.8 (-4.5) mm long; anther < 1.5 mm long.

26 Raceme sheaths (1.5-) 2.0-2.5 (-3.0) mm wide; keels of first glume often scabrous below middle; culms to 2.5 m tall; leaves to 109 cm long and 9.5 mm wide..... ***A. tenuispatheus***

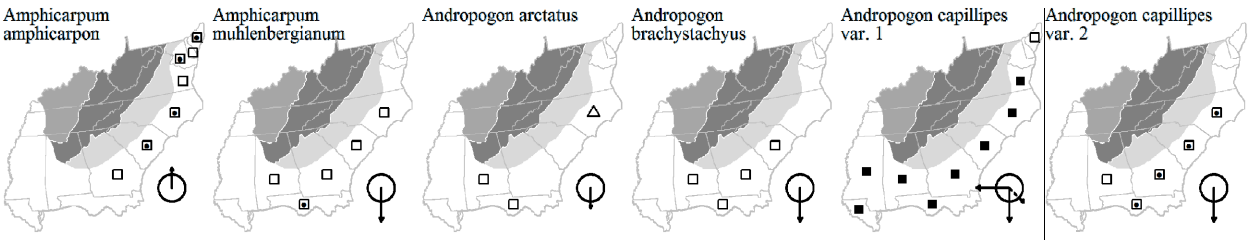
26 Raceme sheaths (1.7-) 2.4-3.1 (-4.0) mm wide; keels of first glume scabrous only above middle; culms < 1.7 m tall; leaves < 35 cm long and 5.5 mm wide..... ***A. virginicus*** *var.* ***decipiens***

Andropogon arctatus Chapman, Florida Bluestem. Pinelands, rarely moist disturbed ground. This curious record from Pamlico County, NC (the specimen at GH, collected by Randolph and Randolph in 1922, annotated as *A. arctatus* by Campbell) is likely a waif. The species is native to pinelands from n. FL west to w. Panhandle of FL and adjacent s. AL, south to s. FL. [= FNA, HC, K, S, Z]

Andropogon brachystachyus Chapman, Shortspike Bluestem. Moist to wet pinelands, natural pond margins, bogs, disturbed roadsides. Se. SC (McMillan et al. 2002) south to FL, south to s. FL, west to e. FL Panhandle. *A. brachystachyus* is considered by some to range north to NC. [= FNA, K, Z; = *A. brachystachys* – GW, HC, S, orthographic variant]

Andropogon capillipes Nash *var.* ***1***, Wetland White Bluestem. Wet savannas, ditches adjacent to savannas, depressional wetlands. September-October. S. NJ south to s. FL and west to e. TX; also in the Bahamas (Sorrie & LeBlond 1997). Campbell (1983) informally describes two "variants" of this species (which he treats at the varietal level, as *A. virginicus* var. *glaucus*). *A. capillipes* is clearly a species distinct from *A. virginicus*; moreover, the substantial morphological and ecological differences between Campbell's two "variants" (which he describes as nearly always sharply distinct, even when growing in close proximity) warrant recognition as good species, or at least as varieties. [< *A. virginicus* – RAB; < *A. virginicus* var. *glaucus* Hackel – F, FNA; < *A. capillipes* – GW, HC, K, S; = *A. virginicus* var. *glaucus* "wetlands variant" – Z; = *A. virginicus* var. *dealbatus* Mohr ex Hackel]

Andropogon capillipes Nash *var.* ***2***, Dryland White Bluestem. Dry to mesic pine flatwoods, sandhills, adjacent roadbanks. September-October. Se. NC south to s. FL and west to s. AL. See *A. capillipes var. 1* for discussion of these two taxa. The type of *A. capillipes* (collected by A.H. Curtiss in FL) is of this taxon; Nash (1900) states that it occurs "in dry soil, North Carolina to Florida" and emphasizes that it is "abundantly distinct from *A. virginicus*, to which it is related." [< *A. virginicus* – RAB; < *A. virginicus* var. *glaucus* Hackel – F, FNA; < *A. capillipes* – GW, HC, K, S; = *A. virginicus* var. *glaucus* "drylands variant" – Z]



Andropogon elliottii Chapman. Dry to moist forests, woodlands, fields, and disturbed areas. September-October. S. NJ west to s. IN, s. IL, s. MO, south to s. FL and TX. Campbell (1983) argued that the name *A. elliottii* should be replaced by *A.*

gyrans; Ward (2004c) argues for retention of the traditional *A. elliottii*. [= HC, WV; > *A. elliottii* – RAB, S; > *A. campyloracheus* Nash – RAB, S; = *A. gyrans* Ashe – C, W; = *A. gyrans* var. *gyrans* – FNA, K, Z; > *A. elliottii* var. *elliottii* – F, G; > *A. elliottii* var. *gracilior* Hackel – F, G; > *A. elliottii* var. *projectus* Fernald & Griscom – G]

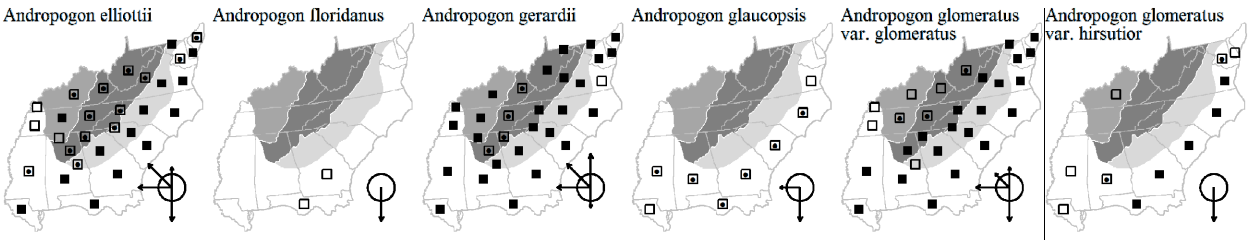
Andropogon floridanus Scribner, Florida Bluestem. Longleaf pine sandhills. September-October. S. GA west to FL Panhandle, south to s. FL. Reported for e. and s. GA (FNA, Jones & Coile 1988). [= FNA, HC, K, S] {not yet keyed}

Andropogon gerardii Vitman, Big Bluestem, Turkeyfoot. In a wide variety of habitats, usually rather dry, such as sandhills, glades, cliffs, and rock outcrops, in the Piedmont in woodlands, former prairie-like sites, woodlands, open forests, and river-scour grasslands, in the Mountains in glades, riverside scour areas, and rarely in grassy balds, ascending to at least 1600 m over mafic rocks (on Old Field Bald, Watauga and Ashe counties, NC). July-October. QC west to SK, south to FL and AZ. Some favor treating *A. hallii* Hackel as a subspecies of *A. gerardii* (Wipff 1996c). I do not agree, but if that course is followed, then our eastern taxon should be known as *A. gerardii* ssp. *gerardii*. [= RAB, C, FNA, G, GW, HC, K, W; > *A. gerardii* var. *gerardii* – F; = *A. provincialis* Lamarck – S; = *A. gerardi* – WV, orthographic variant]

Andropogon glaucopsis Elliott, Chalky Bluestem. Wet savannas, pine flatwoods, ditches, wet disturbed sites. September-October. Se. VA south to c. peninsular FL and west to e. TX. The extent of the western Gulf Coastal Plain distribution (to the West Gulf Coastal Plain of w. LA and e. TX) is based on specimens (at BRIT) and sight records (B. Sorrie, pers. comm.). Although sometimes included in the past in either *A. glomeratus* or *A. virginicus*, this species is distinctive and easily recognized in the field (even from a car at 60 m.p.h.) by the combination of blue color, height of well over 1 m (taller than the other glaucous bluestems), and semi-bushy inflorescence. [= GW, K; < *A. virginicus* – RAB; = *A. virginicus* var. *glaucopsis* (Elliott) A.S. Hitchcock – F, HC; = *A. glomeratus* var. *glaucopsis* (Elliott) A.S. Hitchcock – FNA, Z; < *A. glomeratus* – S]

Andropogon glomeratus (Walter) Britton, Sterns, & Poggenburg *var.* ***glomeratus***. Swamps, wet savannas, pine flatwoods, wet disturbed sites. September-October. S. MA south to c. peninsular FL and west to s. MS, primarily on the Coastal Plain, but scattered inland to w. PA, WV, c. KY, c. TN and AR. [= FNA, K, Z; < *A. virginicus* – RAB; = *A. virginicus* var. *abbreviatus* (Hackel) Fernald & Griscom – C, F, G, GW, WV; < *A. glomeratus* – HC, S, W]

Andropogon glomeratus (Walter) Britton, Sterns, & Poggenburg *var.* ***hirsutior*** (Hackel) C. Mohr. Wet savannas, pine flatwoods, adjacent ditches, other wet disturbed sites. September-October. E. MD south to c. peninsular FL west to se. LA. This taxon should be recognized at the specific level, but the appropriate combination has not been made. [= FNA, K, Z; < *A. virginicus* – RAB; ? *A. virginicus* var. *glaucopsis* (Elliott) A.S. Hitchcock – G, misapplied; = *A. virginicus* var. *hirsutior* (Hackel) A.S. Hitchcock; < *A. glomeratus* – HC, S]



Andropogon longiberbis Hackel, Longbeard Bluestem. Dry sandy soils of sandhills and dunes. September-October. Se. NC south to s. and w. FL, and in the Bahamas. [= FNA, HC, K, S, Z]

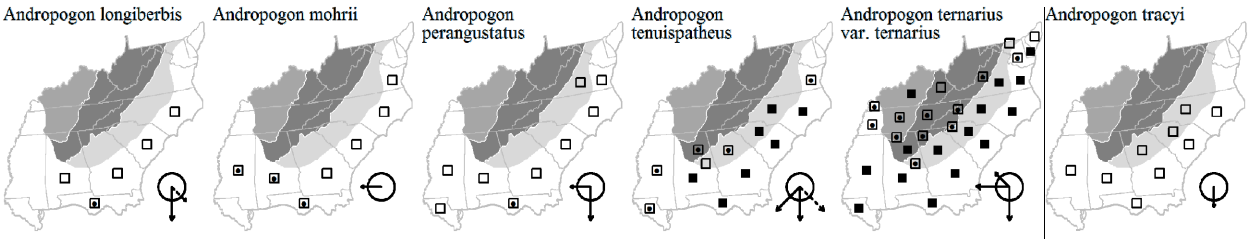
Andropogon mohrii (Hackel) Hackel ex Vasey, Tawny Bluestem, Bog Bluestem. Wet savannas, sphagnous bogs. September-October. Se. VA south to n. FL, west to LA. [= RAB, C, F, G, GW, HC, K, S; = *A. liebmannii* Hackel var. *pungensis* (Ashe) C.S. Campbell – FNA, Z]

Andropogon perangustatus Nash, Narrow-leaved Bluestem. Clay-based Carolina bays and boggy wetlands. August-October. E. VA south to c. peninsular FL, east to e. TX. Growth form, general appearance, and habitat (dense bluish tussocks with very narrow leaves and long ligules, growing in wet areas such as clay-based Carolina bays) make *A. perangustatus* readily recognizable. [= HC, S; = *A. gyrans* Ashe var. *stenophyllus* (Hackel) C.S. Campbell – FNA, K, Z; = *A. elliottii* Chapman var. *stenophyllus* (Hackel) D.B. Ward]

Andropogon tenuispatheus (Nash) Nash. Maritime wet grasslands, brackish marsh edges, moist disturbed sites. September-October. Se. VA and c. OK south to s. FL and w. TX, also south into Central America and the Caribbean. [< *A. virginicus* – RAB; = *A. glomeratus* (Walter) Britton, Sterns, & Poggenburg var. *pumilus* Vasey ex Dewey – FNA, K, Z ("robust variant"); < *A. glomeratus* – HC, S]

Andropogon ternarius Michaux *var.* ***ternarius***, Splitbeard Bluestem. Dry to moist soils. September-October. Var. *ternarius* ranges from DE west to KY and s. MO, south to FL and TX. Var. *cabanisii* (Hackel) Fernald & Griscom is endemic in s. and c. peninsular FL. [= FNA, K, Z; < *A. ternarius* – RAB, C, G, W; > *A. ternarius* var. *ternarius* – F; > *A. ternarius* var. *glaucescens* (Scribner) Fernald & Griscom – F; = *A. ternarius* – HC, S]

Andropogon tracyi Nash, Tracy's Bluestem. Dry sandy or clayey soils of sandhills, disturbed sites. September-October. E. NC south to s. FL and west to MS. [= FNA, HC, K, S, Z]



Andropogon virginicus Linnaeus *var.* ***decipiens*** C.S. Campbell, Deceptive Bluestem. Savannas, flatwoods, maritime wet grasslands, disturbed pinelands. September-October. Se. VA south to s. FL and west to w. FL; also in the Bahamas (Sorrie & LeBlond (1997). [= FNA, K, Z (1986); < *A. virginicus* – RAB, S; < *A. virginicus* var. *virginicus* – F, G, HC; = *A. virginicus* var. *virginicus* – Z (1983 – "deceptive variant")]

Andropogon virginicus Linnaeus *var.* ***virginicus***, Old-field Broomstraw, Broomsedge, "Sedge Grass", "Sage Grass". Old fields, roadbanks, disturbed sites. September-October. MA west to MI and e. KA, south to FL and e. TX, and in the Caribbean and Central America. Campbell (1983) recognized 3 "variants" within *A. virginicus* var. *virginicus*; the "deceptive variant" he later (1986) described formally as var. *decipiens* (see above). The "old-field variant" is the common "variant" in our area, occurring abundantly throughout the state. It has green stem internodes and the leaves usually pubescent, at least on the margins near the collar. The "smooth variant" is known only from the Coastal Plain and is apparently rare in our area, known from NC and SC (Berkeley and Marion counties; P. McMillan, pers. comm.). It has glaucous stem internodes and glabrous leaves. It is unclear whether the "smooth variant" warrants taxonomic recognition. [= FNA, K, Z ("oldfield variant" and "smooth variant"); < *A. virginicus* – RAB, S, W; < *A. virginicus* var. *virginicus* – C, WV; < *A. virginicus* var. *virginicus* – G, HC (also see var. *decipiens*); >< *A. virginicus* var. *virginicus* – F; > *A. virginicus* var. *tetrastachyus* (Elliott) Hackel – F]

Anthenantia Palisot de Beauvois 1812 (Silkyscale)

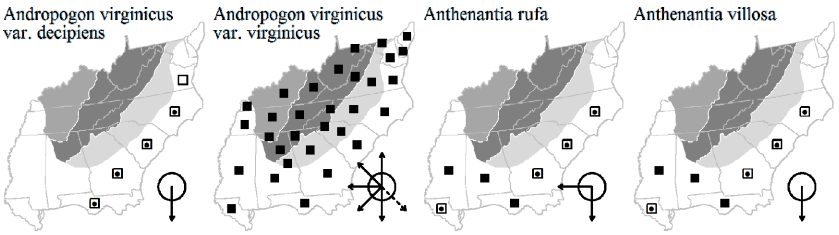
A genus of 3 species, of se. North America (or 4-5 species of se. North America and tropical America, if *Leptocoryphium* is included in *Anthenantia*). Clayton & Renvoize (1986) state that "*Anthenantia* is the etymologically correct version of three alternative spellings given by Beauvois." References: Wipff in FNA (2003a); Crins (1991)=Z; Kral (2004)=Y; Clayton & Renvoize (1986).

1 Leaves weakly if at all geniculate and auriculate at junction of blade and sheath, ascending to erect (lacking a sharp bend outward at the summit of the sheath), medium green; blade (3-) 4-8 (-10) mm wide, the proximal margins glabrous or sometimes ascending pilose-ciliate; pigmentation of leaves, spikelets and their trichomes variously reddish or purplish; fertile lemma red-brown to nearly black, leaf tip with a very short taper to a blunt or rounded apex; lower sheaths crowded and keeled (therefore distichous) ..... ***A. rufa***

1 Leaves strongly geniculate and auriculate at junction of blade and sheath, spreading, usually squarrose (with a sharp bend outward at the summit of the sheath), yellowish green,; blade 4-10 (-15) mm wide, the proximal margins ciliate at least basally with ascending strumose-hirsute cilia; pigment of leaves, spikelets and their trichomes usually with little or any red; fertile lemma brown; leaf tip with a long taper to a sharp apex; lower sheaths not crowded, keeled, or distichous ..... ***A. villosa***

Anthenantia rufa (Nuttall) J.A. Schultes, Purple Silkyscale. Wet savannas in the outer Coastal Plain, seepage bogs and moist sandhill-pocosin ecotones in the fall-line sandhills. September-October. Se. NC south to n. FL and west to w. LA. *A. rufa* inhabits much wetter habitats than the similar *A. villosa*, and is more typical of the outer Coastal Plain. Plants without culms are reminiscent of the Liliaceae. [= FNA, Y; = *Anthaenantia rufa* – RAB, GW, HC, K, S, Z, orthographic variant]

Anthenantia villosa (Michaux) Palisot de Beauvois, Green Silkyscale. Sandhills, especially in submesic swales. September-October. Se. NC south to s. FL and west to e. TX. *A. villosa* is found in drier habitats than *A. rufa*, most typically in upland swales in the sandhills. Kral (2004) has segregated a new species, *A. texana* Kral, of the w. Gulf Coastal plain, previously confused with *A. villosa*. [= Y; < *Anthaenantia villosa* – RAB, HC, K, S, Z, orthographic variant; < *Anthenantia villosa* – FNA]



Anthoxanthum Linnaeus 1753 (Vernal Grass)

A genus of about 50 species (as here circumscribed to include *Hierochloe*), perennials and annuals, of temperate, boreal, and arctic regions. Tucker (1996), Soreng et al. (2003), and Allred & Barkworth in FNA (2007a) all include *Hierochloe* into a more broadly circumscribed *Anthoxanthum*. References: Allred & Barkworth in FNA (2007a); Tucker (1996)=Z; Soreng et al. (2003)=Y.

1 Glumes subequal; lowest 2 florets staminate

2 Hairs on the apex of the bisexual florets< 0.5 mm long, or sometimes with some longer hairs and then theses distributed only near the midrib ..... ***A. hirtum***

2 Hairs on the apex of the bisexual florest 0.5-1 mm long, evenly distributed ..... ***A. nitens*** *ssp.* ***nitens***

1 Glumes unequal, the lower shorter than the upper; lowest 2 florets sterile.

3 Annual, geniculate; ligules 0.5-2 mm long; glumes glabrous; leaves 1-2 mm wide ..... ***A. aristatum***

3 Perennial, erect; ligules (1-) 2-3 mm long; glumes villous throughout or at least on the keel; leaves 2-5 mm wide ..... ***A. odoratum***

* ***Anthoxanthum aristatum*** Boissier, Annual Vernal Grass. Roadsides, disturbed areas; native of Europe. April-June. [= RAB, C, FNA, G, HC, K, S, WH, Z; = *A. puelii* Lecoq & Lamotte – F, WV]

Anthoxanthum hirtum (Schrank) Y. Schouten & Veldkamp, Hairy Holygrass, Sweetgrass, Vanilla Grass. Fens, wet calcareous meadows, high elevation pastures and openings, saltmarsh edges (DE). April-August. A circumboreal species and subspecies, widespread in n. Eurasia and n. North America, ranging south in North America to NJ, MD, PA, OH, IN, IL, IA, SD, CO, UT, NM, and CA, with several disjunct occurrences in North Carolina, in Long Hope Valley, Ashe County, the Nantahala River Bogs, Macon County, and Pond Mountain, Ashe County. The report by S ("recorded by Chapman from Statesville, N.C.") can be discounted; the record reflects a collection made in the mountains by Mordecai E. Hyams, a botanist and herb trader based in Statesville. Belden et al. (2004) document the first occurrence in Virginia. The sweet, vanilla-like odor of this grass is responsible for various folk uses – by Native Americans for making fragrant baskets, in Scandinavia strewn on church floors on festival days. [= FNA; < *Hierochloe odorata* (Linnaeus) Palisot de Beauvois – C, F, G, HC, WV; > *H. hirta* (Schrank) Borbás ssp. *arctica* (J. Presl) G. Weimarck – K; < *Torresia odorata* (Linnaeus) A.S. Hitchcock – S; < *Anthoxanthum nitens* (Weber) Y. Schouten & Veldkamp – Z; *? Anthoxanthum nitens* (Weber) Y. Schouten & Veldkamp spp. *nitens* – Y; > *H. odorata* var. *fragrans* (Willdenow) Richter (the North American plants)] {revise Y and Z synonymy}

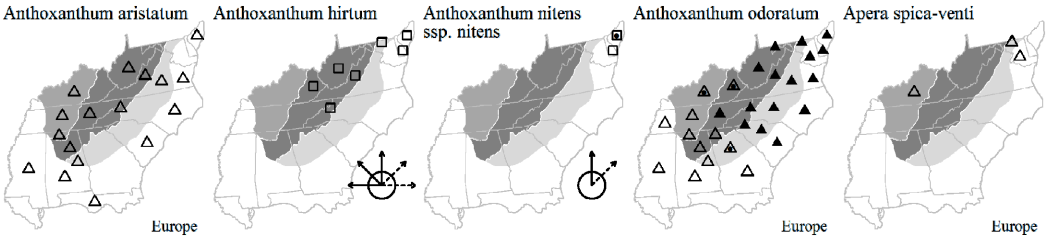
Anthoxanthum nitens (Weber) Y. Schouten & Veldkamp *ssp.* ***nitens***, Vanilla Sweetgrass. Wet meadows, marshes, roadsides; sometimes interpreted as native in ne. North America and sometimes as an introduction from Europe. NL (Labrador) south to DE; n. Europe. [= FNA; < *Hierochloe odorata* (Linnaeus) Palisot de Beauvois – C, F, G, HC] {add Y and Z synonymy}

* ***Anthoxanthum odoratum*** Linnaeus, Sweet Vernal Grass Lawns, roadsides, disturbed areas; native of Europe. April-June. *A. odoratum* is a familiar grass of suburban areas and roadsides, and its pollen is known as a major cause of spring hay fever. From a letter from Charles Darwin to J.D. Hooker, in June 1855: "Have just made out my first grass, hurrah! hurrah! I must confess that fortune favours the bold, for, as good luck would have it, it was the easy *Anthoxanthum odoratum*: nevertheless it is a great discovery; I never expected to make out a grass in all my life, so hurrah! It has done my stomach surprising good..." [= RAB, C, F, FNA, G, HC, S, W, WV, Z; = *A. odoratum* ssp. *odoratum* – K]

Apera Adanson 1763 (Windgrass)

A genus of 3 species, of temperate Europe and w. Asia. References: Allred in FNA (2007a).

* ***Apera spica-venti*** (Linnaeus) Palisot de Beauvois, Common Windgrass. Disturbed areas; native of Europe. Reported for se. PA (Rhoads & Klein 1993), MD, and KY (Kartesz 1999). [= FNA, C, HC, K; = *Agrostis spica-venti* Linnaeus – F, G]



Aristida Linnaeus 1753 (Three-awn Grass)

A genus of about 250-300 species, widespread in the tropics, subtropics, and warm temperate zones. References: Allred in FNA (2003a); Allred (1986)=Z; Allred (1984, 1985); Peet (1993)=Y; Ward (2001)=X; Henrard (1929)=Q; Kesler, Anderson, & Hermann (2003)=V. Key adapted, in part, from Z.

Identification notes: The awns must be dry and relatively mature to assume their characteristic positions (immature awns and moist mature awns are erect and parallel). It is sometimes useful to dry a collection unpressed. Beware, however, that drying followed by dispersal can take place very quickly under the right conditions (such as the dashboard of a hot car)!

1 Plant a perennial, forming dense tussocks, the leaves primarily basal, usually very numerous, mostly > 3 dm long, 0.5-1.5 mm wide, almost always tightly involute; flowering only in the growing season following fire.
- 2 Base of blade and collar (and often the upper sheath) with conspicuous tuft or bearding of woolly to villous pubescence (sometimes deciduous on foliage more than a year old); leaves usually glabrous above the basal 2 cm of the blade; [of s. SC south] ..... ***A. beyrichiana***
- 2 Base of blade, collar, and upper sheath lacking a conspicuous tuft of woolly to villous pubescence; leaves with 2 lines of villous pubescence on either side of the midrib on the lower surface extending nearly or entirely the length of the blade (sometimes deciduous on foliage more than a year old); [of n. SC and NC] ..... ***A. stricta***

1 Plant an annual or perennial, forming small tufts (or solitary), the leaves primarily cauline, usually few, mostly < 3 dm long (if as long as 3 dm then > 2 mm wide), flat to slightly folded, but not wiry; flowering not strongly triggered by fire.
- 3 First glume 3-7 nerved.
  - 4 Central awn of the lemma (8-) 12-65 (-70) mm long, the lateral awns as long or nearly so ..... ***A. oligantha***
  - 4 Central awn of the lemma (9-) 12-25 (-30) mm long, the lateral awns 1-4 mm long (or even lacking) ..... ***A. ramosissima***
- 3 First glume 1-2-nerved.
  - 5 Central awns spirally coiled at the base (above the awn column), like a corkscrew, ½ to 3 full turns (when dry).
    - 6 Lateral awns 5-13 mm long, spreading ..... ***A. basiramea***
    - 6 Lateral awns 1-4 mm long, erect
      - 7 First glume 1/2 to 2/3 as long as the second glume; lemma 6-11 mm long, glabrous to scaberulous ..... ***A. curtissii***
      - 7 First glume as long as or nearly as long as the second glume; lemma 3-8 mm long, sparsely appressed-pubescent ..... ***A. dichotoma***
  - 5 Central awns straight to curved (or contorted at the base).

8 Lateral awns < ½ as long as the central awn.
9 Inflorescences 15-25 cm wide; loosely cespitose perennial, unbranched upwards ..... ***A. patula***
9 Inflorescences 1-6 cm wide; annuals, much branched above the base.
10 Awns flattened at the base ..... ***A. adscensionis***
10 Awns terete at the base.
11 Lemmas 8-22 mm long; central awn curved ca. 180 degrees at the base ..... ***A. ramosissima***
11 Lemmas 2.5-10 mm long; central awn curved ca. 90 degrees at the base.
12 Central awn (8-) 12-27 mm long; lateral awns (1-) 6-18 mm long ..... ***A. longespica** var**. geniculata***
12 Central awn mostly 1-10 (-14) mm long; lateral awns 0-5 (-8) mm long ..... ***A. longespica** var**. longespica***
8 Lateral awns > ½ as long as the central awn.
13 Sheaths lanose or floccose (the hairs kinked and intertwined); nodes of the panicle axis with tufts of lanose or floccose hairs..... ***A. lanosa***
13 Sheaths glabrous to pilose (the hairs straight and usually appressed, not intertwined); nodes of the panicle axis glabrous or pilose.
14 Awn column (the connivent awns twisted together) or lemma beak (slender, narrowed, and twisted portion of lemma body below the awns) 7-30 mm long; lemma body (including the beak, if present) separated from the awns (or awn column) by an articulation zone, the awns (or awn column) disarticulating at maturity from the lemma.
15 Panicle spiciform, broadest near the middle, dense, the spikelets overlapping strongly; awns (10-) 20-30 mm long, borne at the summit of a twisted lemma beak 7-30 mm long; culms simple or with very few branches; plants perennial ..... ***A. spiciformis***
15 Panicle almost corymbiform, broadest above the middle, open, the spikelets overlapping only slightly; awns 30-40 mm long, not including the 8-15 mm long column formed by the twisting together of the 3 awn bases; culms often much-branched; plants annual..... ***A. tuberculosa***
14 Awn column or lemma beak absent or < 7 mm long; lemma body not separated from the awns by an articulation zone.
16 Main lower branches of the panicle divergent from the culm and with pulvini ..... ***A. purpurea** var. **longiseta***
16 Main lower branches of the panicle (or pedicels in racemose species) ascending to appressed and lacking pulvini.
17 Plants with thick rhizomes; basal sheaths shredding into persistent fibers; [of wet pine flatwoods of FL] ... ***A. rhizomorpha***
17 Plants tufted, not rhizomatous; basal sheaths not shredding into persistent fibers; [collectively of various habitats].
18 Spikelets borne singly at each node of the main axis, the inflorescence thus a spike or raceme ..... ***A. mohrii***
18 Spikelets 2 or more per node of the main axis at most nodes (a few nodes may have single spikelets), often with side branches present as well, the inflorescence thus a panicle (less commonly a raceme).
19 First glume 1/3-¾ the length of the second glume..... ***A. gyrans***
19 First glume > ¾ the length of the second glume.
20 Central awn 15-40 mm long; first glume prominently 2-keeled, (8-) 9-14 mm long when mature ..... ***A. palustris***
20 Central awn 8-25 mm long; first glume either 1-keeled and 6-14 mm long, **or** weakly 2-keeled and 5.5-9 (-10) mm long when mature.
21 Central awn about 2× as thick as the lateral awns, divergent to reflexed; first glume 1-keeled or weakly 2-keeled; [moist to wet habitats].
22 Basal internode of the culm 0.3-0.6 mm wide; most nodes of the inflorescence with 1-2 spikelets; all awns spreading, the central spirally twisted basally and often contorted by as much as 180 degrees (best seen in fresh material); central awn 15-20 mm long, lateral awns 11-16 mm long, the ratio of the lateral:central awn length 0.69-0.80; lemma callus beard 0.6-1.0 mm long..... ***A. simpliciflora***
22 Basal internode of the culm 0.7-1.2 mm wide; most nodes of the inflorescence with 3 or more spikelets; central awn spreading to slightly deflexed, not spirally twisted basally, the lateral awns ascending to erect (best seen in fresh material); central awn 13-22 mm long, lateral awns 8-15 mm long, the ratio of the lateral:central awn length 0.55-0.69; lemma callus beard 0.2-0.6 mm long..... ***A. virgata***
21 Central awn < 1.5× as thick as the lateral awns, erect to divergent; first glume 1-keeled (rarely weakly 2-keeled); [dry habitats].
23 Culms mostly > 10 dm tall and 3-6 mm in diameter near the base; awns 8-15 mm long; panicle branches > 4 cm long; callus ca. 1.0 mm long..... ***A. condensata***
23 Culms 5-8 (-10) dm tall and 1-4 mm in diameter near the base; awns 12-25 mm long; panicle branches 1-4 cm long; callus 0.4-0.8 mm long.
24 First glume 1-4 mm longer than the second glume (rarely about equal to it); awns 15-25 mm long, straight or slightly contorted at the base; leaf blades 1-3 mm wide, usually curling ..... ***A. purpurascens***
24 First glume shorter than or about equal to the second glume; awns 12-18 mm long, spirally contorted at the base; leaf blades about 1 mm wide, usually not curling ..... ***A. tenuispica***

* ***Aristida adscensionis*** Linnaeus, Sixweeks Three-awn. {habitat in our area unknown}; native of w. United States. Reported for SC (FNA). {further investigate} [= F, FNA, G, HC, K]

* ***Aristida basiramea*** Engelmann ex Vasey, Forktip Three-awn. Sandy soils; probably introduced, native of mw. United States. ME and ON south to SC (FNA), FL (Wunderlin & Hansen 2003), AL, TX, and CO (FNA). [= F, FNA, G, HC, K; = *A. basiramea* var. *basiramea* – C] {FL}

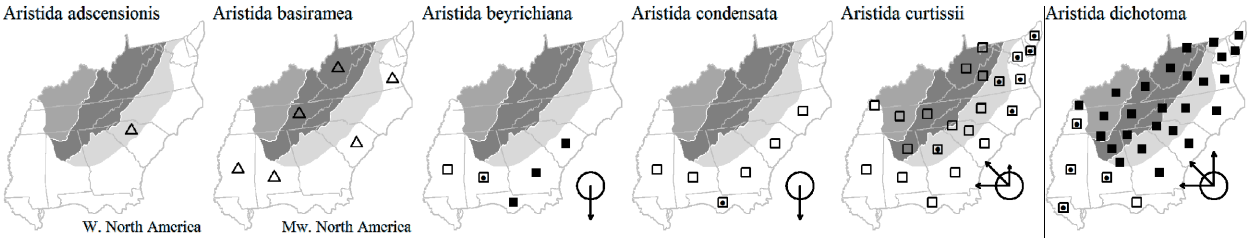
Aristida beyrichiana Trinius & Ruprecht, Southern Wiregrass. Sandhills, savannas, from very dry to seasonally saturated soils. September-November. S. SC south to s. FL, west to s. MS. See Peet (1993) for discussion of the taxonomy and ecology of this species; also see comments under *A. stricta*, which also apply here. Ward (2001) proposes varietal status for *A. stricta* and *A. beyrichiana*. [= K, Y; < *A. stricta* – RAB, FNA, GW, HC, S, V, Z; = *A. stricta* Michaux var. *beyrichiana* (Trinius & Ruprecht) D.B. Ward – X]

Aristida condensata Chapman, Big Three-awn. Dry sandy soils of sandhills. August-October. Sc. NC south to s. FL, west to s. MS (Sorrie & Leonard 1999). [= RAB, FNA, HC, K, S, Z]

Aristida curtissii (A. Gray ex S. Watson & Coulter) Nash, Curtiss's Three-awn. Roadsides, disturbed areas, bare eroding soil. August-October. ME west to WY, south to n. FL, AR, OK, and CO, perhaps largely or entirely adventive in our area. See Z for a discussion of the rationale for reducing *A. curtissii* to a variety of *A. dichotoma*. C reduces it to a variety of the more western *A. basiramea* Engelmann ex Vasey. For now, and for simplicity, I prefer to retain the two as species. [= RAB, G, HC, S; =

A. basiramea Engelmann ex Vasey var. *curtissii* (A. Gray ex S. Watson & Coulter) Shinners – C; = *A. dichotoma* Michaux var. *curtissii* A. Gray – F, FNA, K, W, WV, Z]

Aristida dichotoma Michaux, Fork-tip Three-awn. Roadsides, fields, disturbed areas, bare eroding soil. August-October. ME west to WI, south to n. FL and TX. See *A. curtissii* for comments. [= RAB, C, G, HC, S; = *A. dichotoma* var. *dichotoma* – F, FNA, K, W, WV, Z]



Aristida gyrans Chapman, Corkscrew Three-awn. Dry pinelands. E. GA and w. Panhandle FL, south to s. FL. In Bryan, Long, and Montgomery counties in e. GA (Sorrie 1998b), and in wc. GA (J. Allison, pers. comm.). [= FNA, HC, K, S]

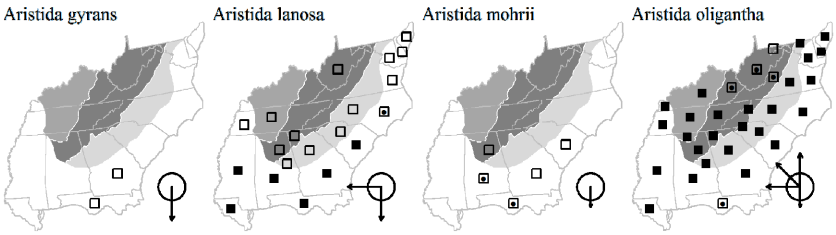
Aristida lanosa Muhlenberg ex Elliott, Woollysheath Three-awn. Dry sandy soils of sandhills and fields. August-October. NJ south to FL, west to TX, north in the interior to MO and OK. [= RAB, C, FNA, G, HC, K, S, WV, Z; > *A. lanosa* var. *lanosa* – F; > *A. lanosa* var. *macera* Fernald & Griscom – F]

Aristida longespica Poiret *var.* ***geniculata*** (Rafinesque) Fernald, Eastern Slim-spike Three-awn. Cp (FL, GA, NC, SC, VA), Pd (GA, NC, SC, VA), Mt (NC, SC, VA), {WV}: disturbed areas; common? August-October. The distribution and habitats of the 2 varieties in our area are poorly known, pending further field and herbarium investigation. [= C, F, FNA, HC, K, Z; < *A. longespica* – RAB, W, WV; > *A. intermedia* Scribner & Ball – F, G, S; > *A. longespica* – G]

Aristida longespica Poiret *var.* ***longespica***, Eastern Slim-spike Three-awn. Cp (DE, FL, GA, NC, SC, VA), Pd (DE, GA, NC, SC, VA), Mt (NC, SC, VA), {WV}: disturbed areas; common. August-October. The distribution and habitats of the 2 varieties in our area are poorly known, pending further field and herbarium investigation. [= C, F, FNA, HC, K, Z; < *A. longespica* – RAB, G, W, WV; = *A. longespica* – S]

Aristida mohrii Nash, Mohr's Three-awn. Sandhills. August-October. Panhandle FL and sw. GA west to s. AL; apparently disjunct in SC (Chesterfield and Richland counties). [= FNA, HC, K, S, Z]

Aristida oligantha Michaux, Prairie Three-awn. Roadsides, fields, disturbed areas. August-October. VT west to SD, south to FL and TX, scattered elsewhere as a weed. [= RAB, C, F, FNA, G, HC, K, S, W, WV, Z]



Aristida palustris (Chapman) Vasey, Longleaf Three-awn. Wet pine savannas, limesink depressions. August-October. Se. NC south to FL, west to TX; apparently disjunct on the Cumberland Plateau of KY. [= C, FNA, K, S, Z; = *A. affinis* (Schultes) Kunth – RAB, F, G, GW, HC, misapplied]

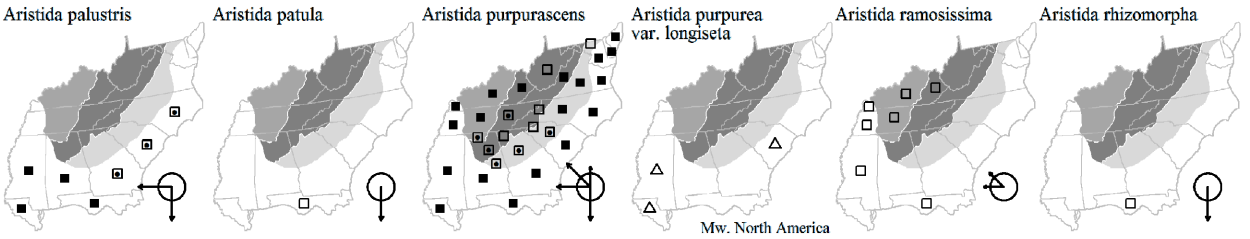
Aristida patula Chapman ex Nash, Tall Three-awn. Dry to moist sandy soils of pond margins, pinelands, dunes. Endemic to FL Panhandle (Dixie, Franklin, Gadsden, Leon, Taylor, and Wakulla counties) (Wunderlin & Hansen 2006) and peninsula. [= FNA, GW, HC, K, S]

Aristida purpurascens Poiret, Arrowfeather. Dry habitats, especially in dry sandy soils. August-October. MA west to WI and KS, south to FL and TX. In the Sandhills occurring in two forms, one green, the other strongly glaucous-blue. [= RAB, C, G, HC, S, W, WV; > *A. purpurascens* var. *purpurascens* – F; > *A. purpurascens* var. *minor* Vasey – F; = *A. purpurascens* var. *purpurascens* – FNA, K, Z]

* ***Aristida purpurea*** Nuttall *var.* ***longiseta*** (Steudel) Vasey, Red Three-awn. Disturbed areas; adventive from further west. August-October. Also reported from NC, but the collection is from a Soil Conservation Service test nursery, and there is no evidence of naturalization. [= C, FNA, K, Z; > *A. longiseta* var. *robusta* Merrill – F; = *A. longiseta* Steudel – G, HC]

Aristida ramosissima Engelmann ex A. Gray. Pine flatwoods. East to Panhandle FL (Bay County) (Wunderlin & Hansen 2004), c. TN, and e. KY (FNA). [= C, F, FNA, G, HC, K, S]

Aristida rhizomorpha Swallen, Florida Three-awn. Wet pine flatwoods. FL endemic, north to Baker, Duval, and Nassau counties. [= FNA, HC, K]



Aristida simpliciflora Chapman, Southern Three-awn, Chapman's Three-awn. Wet pine savannas. Sw. GA west through the FL Panhandle and c. AL to s. MS (Sorrie & Leonard 1999), and south into c. peninsular FL; also in se. NC, where apparently disjunct (it should be searched for in SC). *A. simpliciflora* was believed to be a Gulf Coastal Plain endemic until found by R. LeBlond in 1999 in wet savannas in se. NC (Green Swamp savannas, Brunswick County; Old Dock Savanna, Columbus County; and The Neck Savanna, Pender County). It is reported for sw. GA (Jones & Coile 1988, Kartesz 1999). Harper also reports it for c. GA. [= FNA, HC, K, S, Z]

Aristida spiciformis Elliott, Bottlebrush Three-awn, Spike Three-awn. Wet pine savannas and seepage areas. August-October. E. SC (McMillan et al. 2002) south to FL, west to MS. Allred (1986) also reports this species from NC, but the documentation is unknown to me. [= RAB, FNA, GW, HC, K, S, Z]

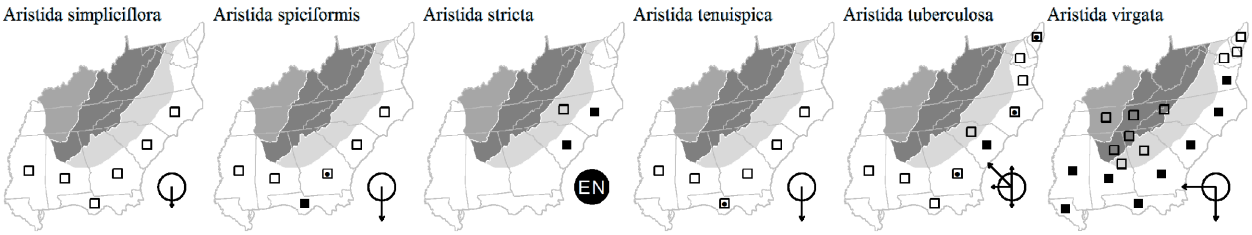
Aristida stricta Michaux, Carolina Wiregrass, Pineland Three-awn. Coastal Plain pinelands of nearly all sorts, ranging from the driest white-sand sandhills to seasonally saturated pine savannas dominated by a mixture of longleaf pine and pond pine, largely or entirely replaced in the wettest savannas by *Sporobolus teretifolius*, *Sporobolus pinetorum*, *Muhlenbergia expansa*, *Ctenium aromaticum*, and *Calamovilfa brevipilis*; also in Piedmont areas adjacent to the Coastal Plain and formerly supporting fire-maintained longleaf pine woodlands. September-November. Ne. NC (south of Albemarle Sound and the Roanoke River), south to ne. SC (Lee and Kershaw counties). *A. stricta* was the keystone species of much of the upland Coastal Plain of the Carolinas. Its flammable foliage facilitated the spread of lightning-set fires that maintained the biologically rich pine savanna, sandhill, and pine flatwood ecosystems once widespread in our area. Though still locally common in parts of the Sandhill region and in portions of Brunswick, Pender, Onslow, and Carteret counties, NC, *A. stricta* is much rarer than formerly. The conversion of vast acreages of former pinelands to agriculture, pine tree farms, and developed areas has taken its toll over the years. In the twentieth century, suppression of fire has also led to the destruction of *A. stricta*. More recently, pine-straw raking is leading to the serious decline of A. *stricta* in its few remaining strongholds on public lands. *A. stricta* has little tolerance for ground disturbance. See Peet (1993) for discussion of the taxonomy and ecology of this species. Ward (2001) proposes varietal status for *A. stricta* and *A. beyrichiana*. [= K, Y; < *A. stricta* – RAB, FNA, GW, HC, S, V, Z (also see *A. beyrichiana*); = *A. stricta* var. *stricta* – X]

Aristida tenuispica A.S. Hitchcock, Southern Arrowfeather. Sandy habitats. August-October. NC south to FL and west to MS. [= HC, S; = *A. purpurascens* Poiret var. *tenuispica* (A.S. Hitchcock) Allred – FNA, K, Z]

Aristida tuberculosa Nuttall, Seabeach Needlegrass. Sandhills, coastal dunes (in VA), other dry, sandy habitats such as sandy roadsides. August-October. Se. NH south to NJ and disjunct in e. VA in the outer Coastal Plain; from sc. NC south to Panhandle FL and west to s. MS (Sorrie & Leonard 1999), mostly in the inner Coastal Plain; and also near the Great Lakes in sw. MI, n. IN, n. IL, s. WI, se. MN, and e. IA. The curious trimodal distribution is unexplained. [= RAB, C, F, FNA, G, HC, K, S, Z]

Aristida virgata Trinius. Moist to wet savannas, mountain bogs (Henderson Co., NC), other moist habitats. August-October. S. NJ south to FL, west to TX, primarily on the Coastal Plain. [= RAB, C, F, G, GW, HC, S; = *A. purpurascens* Poiret var. *virgata* (Trinius) Allred – FNA, K, Z]

Allred (1986) reports the collection of several additional non-native species from our area, including *A. divaricata* Willdenow from sw. United States (from a Soil Conservation Service test nursery in Chapel Hill, NC) and uncertainly identified material of an Australian species (from a wool-combing mill at Jamestown, Berkeley County, SC). There is no evidence that either are naturalized.



Arrhenatherum Palisot de Beauvois 1812 (False Oatgrass)

A genus of about 6 species, perennials, of the Mediterranean region and e. Asia. References: Hatch in FNA (2007a); Tucker (1996)=Z.

1 Base of culm consisting of a series of adjacent (moniliform) corms 5-10 mm in diameter .....***A. elatius*** *var.* ***bulbosum***
1 Base of culm not swollen or cormose, 2-4 mm thick .....***A. elatius*** *var.* ***elatius***

* ***Arrhenatherum elatius*** (Linnaeus) J. & K. Presl *var.* ***bulbosum*** (Willdenow) Spenner, Tuber Oatgrass, Onion Couch. Habitat in our area not known; native of Europe. This variety was apparently cultivated for the edible tubers in Bronze Age

Europe (Tucker 1996). Cited for VA in HC. [= C, F, G, HC, K, WV, Z; = *A. elatius* ssp. *bulbosum* (Willdenow) Schübl. & G. Martens – FNA; < *A. elatius* – GW, W; = *A. elatius* var. *tuberosum* Thiel. – S]

* ***Arrhenatherum elatius*** (Linnaeus) J. & K. Presl *var.* ***elatius***, Tall Oatgrass. Meadows, fields, roadsides; native of Europe. May-June. [= C, F, G, HC, K, S, WV, Z; < *A. elatius* – RAB, GW, W; = *A. elatius* ssp. *elatius* – FNA]

Arthraxon Palisot de Beauvois 1812 (Basket Grass)

References: van Welzen (1981)=Y; Thieret in FNA (2003a); Kiger (1971)=Z.

Identification notes: Sometimes confused (especially before flowering) with *Microstegium*, but *Arthraxon* has distinctly cordate-clasping leaves, which *Microstegium* lacks. Also vegetatively similar to *Oplismenus*.

* ***Arthraxon hispidus*** (Thunberg) Makino *var.* ***hispidus***, Basket Grass. Moist ditches, bottomlands, disturbed areas; native of se. Asia. September-October. Like *Microstegium*, *Arthraxon* appears to be steadily increasing its abundance in our area. [= FNA, Y; < *A. hispidus* – C, GW, K, Z; > *A. hispidus* var. *cryptatherus* (Hackel) Honda – RAB, F, G, HC, W]

Arundinaria Michaux 1803 (Cane)

A genus of 3 species, woody grasses (bamboos), native of se. United States. *Arundinaria* was much reduced by the foraging of free-range livestock in the eighteenth and early nineteenth centuries and by fire suppression in the late nineteenth century and throughout the twentieth century. "Canebrakes," large areas dominated by cane, were described in many historical accounts and apparently occupied large parts of the landscape of the Coastal Plain, also occurring in the Piedmont and low Mountains. References: Ward (2009c)=V; Clark & Triplett in FNA (2007a); Tucker (1988)=Y; McClure (1973)=Z; McClure (1963); Judziewicz et al. (2000)=X; Triplett, Weakley, & Clark (2006)=Q. The key is adapted from Q.

1 Primary branches with 0-1 compressed basal internodes (in the basalmost 1 cm or so); culm internodes usually sulcate (with a groove extending upwards from the node, sometimes partly obscured by the branch); culm leaves deciduous; culms to 10 m tall; rhizomes lacking air canals; foliage leaf blades 0.8-1.3 cm wide ..... ***A. gigantea***

1 Primary branches with 2-5 compressed basal internodes (in the basalmost 1 cm or so); culm internodes usually terete; culm leaves persistent to tardily deciduous; culms to 4 m tall; rhizomes with or without longitudinal air canals (visible in cross-section as a cylinder of hollow canals 1 mm or less from the outer surface); foliage leaf blades 0.8-2 cm wide.

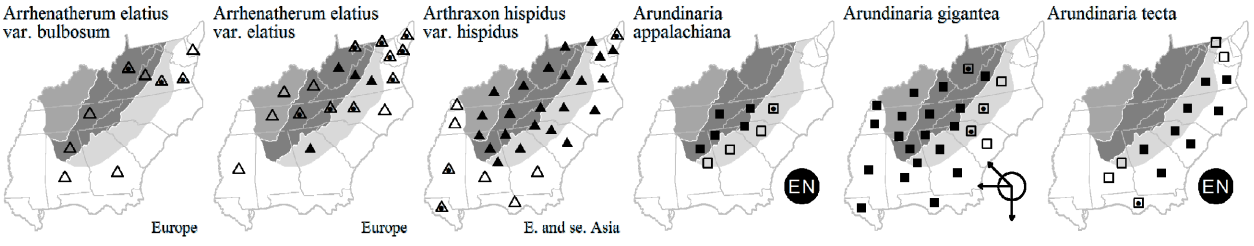
2 Foliage blades chartaceous, deciduous, abaxial surfaces pilose or glabrous, weakly tessellate; primary branches usually < 35 cm long, basal nodes of primary branches not developing secondary branches; top knot blades 12-22.5 cm long; rhizomes with or without air canals ..... ***A. appalachiana***

2 Foliage blades coriaceous, persistent, abaxial surfaces densely pubescent or glabrous, strongly tessellate; primary branches usually > 50 cm long, basal nodes of primary branches developing secondary branches; top knot blades 20-30 cm long; rhizomes with air canals..... ***A. tecta***

Arundinaria appalachiana Triplett, Weakley, & L.G. Clark, Hill Cane. Dry to moist forests on slopes. Noted as distinctive as long ago as 1900 by R.M. Harper, W.C. Coker, W.W. Ashe, and C.D. Beadle, this distinctive plant of the Appalachians has only recently been described as a species (Triplett, Weakley & Clark 2006). The short plants (often only knee-high, though sometimes head-high) on mountain slopes south of Asheville are autumn-deciduous, whereas both our other species are evergreen. [= FNA, Q, V; < *A. gigantea* (Walter) Walter – RAB, GW; < *A. gigantea* ssp. *tecta* (Walter) McClure – K, X, Z; < *A. tecta* – HC, S, Y; = *A. tecta* var. *decidua* Beadle in L.H. Bailey]

Arundinaria gigantea (Walter) Muhlenberg, Giant Cane, River Cane. Swamps, floodplain. April-July. S. OH south to FL and e. TX. There has been much disagreement over the recognition of one, two, or several taxa of cane in the Southeastern United States. This species reaches heights of 6-7 (-10) m and is supposed to flower only once every 40-50 years. *A. macrosperma* Michaux is controversial, sometimes considered to be a synonym of *A. gigantea* or to represent hybridization or introgression between *A. gigantea* and *A. tecta*. [= F, FNA, HC, Q, S, WV, Y; < *A. gigantea* – RAB, C, GW (also see *A. tecta*); = *A. gigantea* ssp. *gigantea* – K, Z; > *A. gigantea* ssp. *gigantea* – X; > *A. gigantea* (Walter) Muhlenberg ssp. *macrosperma* (Michaux) McClure – X; = *A. macrosperma* Michaux – V]

Arundinaria tecta (Walter) Muhlenberg, Switch Cane, Small Cane. Savannas, pocosins, canebrakes, generally (but not solely) in wetlands. April-July. Primarily a Southeastern Coastal Plain endemic: e. MD to FL and s. AL. *A. tecta* is a smaller plant than *A. gigantea* (normally 1-2 m tall, but reaching heights of up to 4 m where fire-suppressed), and flowers more frequently, supposedly every 3-4 years (Tucker 1988), probably actually in response to fire. [= FNA, Q; < *A. gigantea* (Walter) Muhlenberg – RAB, C, GW; < *A. tecta* – F, HC, S, Y; < *A. gigantea* ssp. *tecta* (Walter) McClure – K, X, Z; = *A. gigantea* (Walter) Muhlenberg –V]



Arundo Linnaeus 1753 (Giant Reed)

A genus of 3 species, widespread in the tropics, subtropics and warm-temperate areas. References: Allred in FNA (2003a).

* ***Arundo donax*** Linnaeus, Giant Reed. Disturbed areas; native of the Old World. September-October. Horticultural forms with leaves transversely striped white and green have been treated as var. *versicolor*, but are are better considered as only a form or cultivar. [= RAB, F, FNA, K, S; > *A. donax* var. *donax* – HC; > *A. donax* var. *versicolor* (P. Miller) Stokes – HC]

Avena Linnaeus 1753 (Oats)

A genus of about 29 species, native of temperate and boreal Eurasia and n. Africa. References: Baum in FNA (2007a); Tucker (1996)=Z.

1 Florets disarticulating from the glumes at maturity (the glumes remaining attached to the plant); lemmas pubescent with brown hairs; lemmas with long bent awns; callus bearded with hairs up to ¼ as long as the lemmas.....***A. fatua***
1 Florets not disarticulating from the glumes at maturity; lemmas glabrous or scabrous (rarely spoarsely strigose); lemmas unawned or with relatively straight awns; callus glabrous.....***A. sativa***

* ***Avena fatua*** Linnaeus, Wild Oats. Disturbed areas; native of Europe and c. Asia. {needs herbarium checks; no records shown on VA Atlas}. [= C, F, FNA, G, HC, K]
* ***Avena sativa*** Linnaeus, Oats. Fields and disturbed areas, commonly cultivated; native of Middle East. May-June. An important crop, but apparently only a weed until transported from the Middle East to the moister central Europe, where cultivated beginning about 3000 BP (Hancock 2004). [= RAB, FNA, G, HC, K, S, W, Z; > *A. sativa* var. *orientalis* (Schreber) Alefeld – F; > *A. sativa* var. *sativa* – F]

Avenella Koch ex Steudel 1840 (Hairgrass)

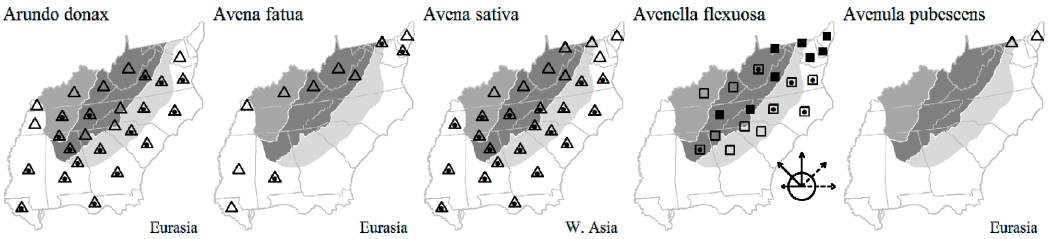
A monotypic genus, perennial, circumboreal, formerly often included in *Deschampsia*. References: Chiapella (2007); Barkworth in FNA (2007a).

Avenella flexuosa (Linnaeus) Drejer, Common Hairgrass, Wavy Hairgrass. Grassy balds, high elevation rocky summits, rocky or sandy woodlands. April-August. Circumboreal, ranging south in North America to n. GA, OH, WI, and MN; disjunct in AR and OK, and in Mexico. [= *Deschampsia flexuosa* – RAB, C, FNA, G, HC, W, WV, Z; > *D. flexuosa* (Linnaeus) Trinius var. *flexuosa* – F, K; = *Aira flexuosa* Linnaeus – S]

Avenula (Dumortier) Dumortier 1868

A genus of about 30 species, perennials, mainly European. References: Tucker in FNA (2007a).

* ***Avenula pubescens*** (Hudson) Dumortier, Downy Oatgrass. Disturbed areas; native of Eurasia. [> *Avenula pubescens* ssp. *pubescens* – FNA; > *Avenula pubescens* ssp. *laevigata* (Schur) Holub – FNA; = *Helictotrichon pubescens* (Hudson) Bess. ex Pilger – C, HC, K; = *Avena pubescens* Hudson – F, G]



Axonopus Palisot de Beauvois 1812 (Carpet Grass)

A genus of ca. 100 species, primarily tropical and subtropical. Phylogenetic studies suggest that *Axonopus* may be included in *Paspalum*. References: Barkworth in FNA (2003a).

1 Spikelets 4-6 mm long.....***A. furcatus***
1 Spikelets 1.5-2.8 mm long.
2 Spikelets 1.5-2.2 mm long; leaf blades mostly 8-10 mm wide.....***A. compressus***
2 Spikelets 2.2-2.8 mm long; leaf blades mostly 2-4 (-6) mm wide.....***A. fissifolius***

Axonopus compressus (Swartz) Palisot de Beauvois, Southern Carpet Grass. Lawns; probably introduced. Reported for VA by HC. Sometimes used as a lawn grass in the deep South. [= FNA, HC, K, S; ***Paspalum***]

Axonopus fissifolius (Raddi) Kuhlm., Common Carpet Grass. Sandy forests, roadsides, lawns. June-October. VA south to FL, west to TX and OK, and extending into tropical America. [= FNA, K; *? A. affinis* Chase – RAB, GW, HC, W; = ***Paspalum fissifolium*** Raddi]

Axonopus furcatus (Flügge) A.S. Hitchcock, Big Carpetgrass. Sandy forests, bottomlands, roadsides, lawns. July-October. Se. VA south to FL, west to TX and AR. [= RAB, C, F, FNA, G, GW, HC, K, S; = ***Paspalum furcatum*** Flügge]

Bambusa Schreber 1789 (Bamboo)

A genus of ca. 100 species, trees and shrubs, native to tropical and subtropical Asia. References: Stapleton in FNA (2007a).

1 Culm leaves with auricles absent or very small and rounded; basal internodes not swollen, not much longer than those above ..... ***B. multiplex***
1 Culm leaves with auricles well-developed, to 5 cm long and 1.5 cm wide; basal internodes swollen, much shorter than the internodes above ... ***B. vulgaris***

* ***Bambusa multiplex*** (Loureiro) Raeuschel ex Schultes & Schultes f, Hedge Bamboo, Dwarf Bamboo. Disturbed areas; native of se. Asia. Reported as naturalized or persistent in portions of the southeastern United States, including GA, FL Panhandle, and FL peninsula. [= FNA, HC]

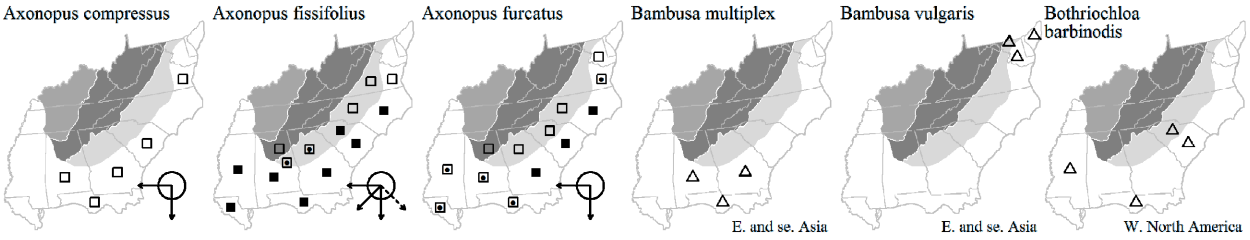
* ***Bambusa vulgaris*** Schrader ex J.C. Wendland, Common Bamboo. Disturbed areas; native of tropical Asia. Reported for SC (Kartesz 1999). {investigate} [= FNA, HC, K]

Bothriochloa Kuntze 1891 (Beardgrass, Cane Bluestem)

A genus of ca. 35 species, widespread in tropical and subtropical regions of the Old and New World. References: Allred in FNA (2003a); Vega (2000)=Z; Allred & Gould (1983)=Y. Key adapted from Allred in FNA (2003a).

1 Sessile spikelets 4.5-8.5 mm long
  2 Rachises 5-10 cm long, with many branches ..... ***B. barbinodis***
  2 Rachises usually < 5 cm long, with 3-8 branches ..... ***B. hybrida***
1 Sessile spikelets 3-4.5 mm long.
  3 Pedicellate spikelets much shorter than the sessile spikelets.
    4 Panicles reddish when mature; hairs below the sessile spikelets sparse and ca. ¼ as long as the spikelets, not obscuring the spikelets ..... ***B. bladhii***
    4 Panicles silvery-white or tannish when mature, hairs below the sessile spikelets dense and > ½ as long as the spikelets, somewhat obscuring the spikelets
      5 Panicles 9-20 cm long; sessile spikelets 3-4× as long as thick; leaves basally disposed; culm usually < 2 mm in diameter ..... ***B. laguroides*** *ssp.* ***torreyana***
      5 Panicles 4-12 (-14) cm long; sessile speikelets 4-6× as long as thick; leaves evenly distributed on the culm; culm usually 2-4 mm in diameter..... ***B. longipaniculata***
  3 Pedicellate spikelets about as long as the sessile spikelets.
    6 Rachises longer than the branches ..... ***B. bladhii***
    6 Rachises shorter than the branches.
      7 Lower glumes of the sessile spikelets with a dorsal pit ..... ***B. pertusa***
      7 Lower glumes of the sessile spikelets without a dorsal pit ..... ***B. ischaemum*** *var.* ***songarica***

* ***Bothriochloa barbinodis*** (Lagasca y Segura) Herter, Cane Bluestem, Pinhole Bluestem. Disturbed areas; native of w. United States. [= FNA, K; > *Bothriochloa perforata* (Trinius ex E. Fournier) Herter – Z; = *Andropogon barbinodis* Lagasca y Segura – HC; > *Bothriochloa barbinodis* (Lagasca y Segura) Herter var. *perforata* (Trinius ex E. Fournier) Gould; > *Andropogon perforatus* Trinius ex E. Fournier]



* ***Bothriochloa bladhii*** (Retzius) S.T. Blake, Australian Bluestem. Disturbed areas; native of subtropical Asia and Africa. Reported from e. TN (according to specimen cited by FNA and Z) and Alachua County, FL (immediately south of our area). [= FNA, K, WH, Z] {synonymy incomplete}

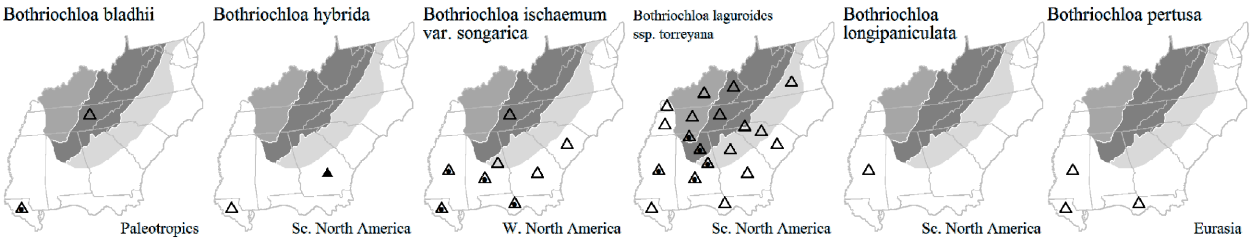
* ***Bothriochloa hybrida*** (Gould) Gould. Roadsides; native of TX south into Mexico. Described as "widespread and well-established along roadsides in Georgia" (Carter, Baker, & Morris 2009). [= *Andropogon hybrida* Gould] {synonymy incomplete}

* ***Bothriochloa ischaemum*** (Linnaeus) Keng *var.* ***songarica*** (Ruprecht ex Fischer & C.A. Meyer) Celarier & Harlan, King Ranch Bluestem. Disturbed places; native of western North America. Reported for SC (Kartesz 1999) and GA (Carter, Baker, & Morris 2009). [= K, Z; < *B. ischaemum* – FNA]

* ***Bothriochloa laguroides*** (A.P. de Candolle) Herter *ssp.* ***torreyana*** (Steudel) Allred & Gould, Silver Bluestem. Disturbed areas; native of c. and sw. United States and Mexico. Reported for SC (Kartesz 1999), ne. GA (Jones & Coile 1988; Allred & Gould 1983), e. TN, and c. TN (Chester et al. 1993), in some cases as *B. saccharoides* var. *torreyana*. [= FNA, K, Y, Z; = *B. saccharoides* (Sw.) Rydberg var. *torreyana* (Steudel) Gould]

* ***Bothriochloa longipaniculata*** (Gould) Allred & Gould, Longspike Silver Bluestem. Disturbed areas; native of LA to TX, south to Mexico and Panama. [= FNA, K]

* ***Bothriochloa pertusa*** (Linnaeus) A. Camus, Pitted Bluestem. Disturbed areas; native of Eurasia. Introduced at scattered sites in e. North America, including FL, LA, MD, and MS (FNA, Kartesz 1999). [= FNA, K, Z; = *Andropogon pertusus* (Linnaeus) Willdenow – HC] {FL} {synonymy incomplete}



Bouteloua Lagasca y Segura 1805 (Grama)

A genus of about 40 species, of the Western Hemisphere. References: Herrera Arrieta, Peterson, & de la Cerda Lemus (2004)=X; Columbus (1999)=Z; Gould (1979)=Y; Wipff in FNA (2003a); Snow in FNA (2003a). Key based in part on Wipff in FNA (2003a)

1 All spikelets unisexual, plants usually dioecious; [introduced species] ..... ***B. dactyloides***
1 Lowest floret in each spikelet bisexual, the upper staminate or sterile; [introduced or native species].
2 Panicle branches deciduous; disarticulation occurring at the base of the branch (the branch therefore falling whole); spikelets 2-3 per branch, appressed to the branch; [native species of limestone habitats, also with introduced populations]; [subgenus *Bouteloua*] ..... ***B. curtipendula*** *var.* ***curtipendula***
2 Panicle branches persistent; disarticulation occurring above the glumes (the individual florets therefore falling); spikelets >6 per branch, pectinately disposed; [rare introductions]; [subgenus *Chondrosum*].
3 Panicle branches terminating in a spikelet ..... ***B. gracilis***
3 Panicle branches extending beyond the base of the terminal spikelets ..... ***B. hirsuta*** *var.* ***hirsuta***

Bouteloua curtipendula (Michaux) Torrey *var.* ***curtipendula***, Side-oats Grama. Dry rocky slopes and bluffs over calcareous rocks (such as limestone) or ultramafic rocks (such as serpentine), limestone glades. July-September. S. CT west to MT, south to VA, e. TN, nw. GA, AL, Panhandle FL (Gadsden County), TX, AZ, and CA; also in Central and South America. The older literature refers to *B. curtipendula* as introduced in SC, but the single specimen documenting its occurrence there appears to be from experimental plantings at Clemson University; there is apparently no evidence of its establishment. *B. curtipendula* occurs on serpentine in the Piedmont of GA (Allison, pers. comm.). Var. *caespitosa* Gould & Kapadia is cespitose rather than rhizomatous and occurs in sw. United States. [= C, FNA, K, Y; < *B. curtipendula* – RAB, F, G, HC, S, W, WV]

* ***Bouteloua dactyloides*** (Nuttall) J.T. Columbus, Buffalo Grass. Lawns, disturbed areas; native of from w. North America. [= Z; = *Buchloe dactyloides* (Nuttall) Engelmann – C, F, FNA, G, HC, K]

* ***Bouteloua gracilis*** (Willdenow ex Kunth) Lagasca y Segura ex Griffiths, Blue Grama. Disturbed areas; native of w. North America. Reported for SC (Gould 1979). [= F, FNA, K, Y; > *Bouteloua gracilis* var. *gracilis* – HC]

Bouteloua hirsuta Lagasca y Segura *var.* ***hirsuta***, Hairy Grama. Disturbed areas; native of w. North America. Present in the FL peninsula (Wunderlin & Hansen 2003), where native in maritime grasslands; reported for SC and GA (Kartesz 1999). [= K, Y; < *Bouteloua hirsuta* – F, HC; = *Bouteloua hirsuta* ssp. *hirsuta* – FNA]

Brachyelytrum Palisot de Beauvois 1812 (Shorthusk)

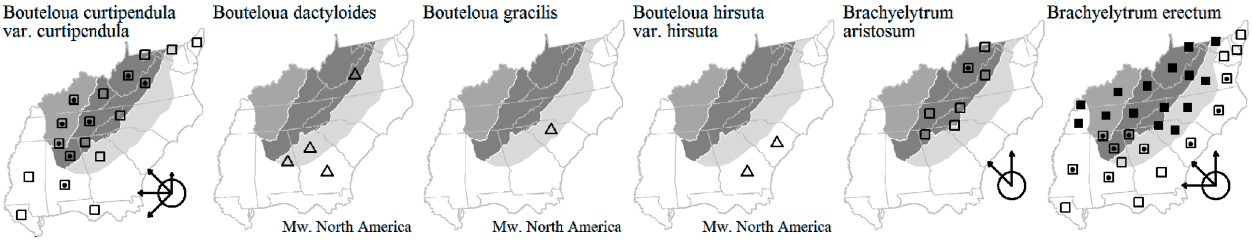
The only other species of the genus is *B. japonicum* Hackel, of s. Japan, Korea, and ec. China (Saarela et al. 2003, Tucker 1988). References: Stephenson & Saarela in FNA (2007a); Saarela et al. (2003)=Z; Tucker (1988)=Y; Stephenson (1971); Voss (1972); Campbell, Garwood, & Specht (1986). Key based in part on Saarela et al. (2003).

1 Lemmas hirsutulous or minutely scabrous, the longest hairs (0.06-) 0.08-0.14 (-0.2) mm long (not evident at 10×); lemma (0.7-) 0.8-1.2 (-1.4) mm wide; widest leaf blade (8-) 10-14 (-16) mm wide; second glume (0.6-) avg. 1.2 (-3.0) mm long; [Mountains] ..... ***B. aristosum***
1 Lemmas hirsute with hairs (0.2-) 0.4-0.8 (0.9) mm long (easily seen at 10×); lemma (0.8-) 1.1-1.5 (-1.8) mm wide; widest leaf blade (9-) 11-17 (-20) mm wide; second glume (0.2-) avg. 2.2 (7.0) mm long; [widely distributed in our area] ..... ***B. erectum***

Brachyelytrum aristosum (Michaux) Trelease in Branner & Coville, Northern Shorthusk. Moist forests, mostly at moderate to high elevations, such as northern hardwoods and spruce-fir. July-August. NL (Newfoundland), QC, ON, and MN south to n.

NJ, PA, n. OH, n. IN, and s. WI, and in the mountains to sw. NC, e. TN, nw. SC, and ne. GA. In MI, *B. aristosum* flowers about 10 days before co-occurring *B. erectum*, with strongly synchronized anthesis of each species occurring on a single day (Stephenson 1971)). Reputed intermediates and hybrids between the two taxa are apparently based on the use of ambiguous characters. [= FNA, Z; = *Brachyelytrum septentrionale* (Babel) G. Tucker – K, Y; < *B. erectum* – RAB, G, HC, S, W; = *B. erectum* var. *septentrionale* Babel – F; = *B. erectum* var. *glabratum* (Vasey ex Millspaugh) Koyama & Kawano – C; > *B. aristosum* var. *glabratum* Vasey – WV]

Brachyelytrum erectum (Schreber ex Sprengel) Palisot de Beauvois, Common Shorthusk. Mesic forests, in the Mountains at lower elevations than *B. septentrionale*). June-August. MA, NY, OH, MI, and s. WI south to Panhandle FL and e. TX. [= FNA, K, WV, Y, Z; < *B. erectum* – RAB, G, HC, S, W (also see *B. aristosum*); = *B. erectum* var. *erectum* – C, F]



Brachypodium Palisot de Beauvois 1812

A genus of about 18 species , mainly Mediterranean Europe and n. Africa. References: Piep in FNA (2007a).

* ***Brachypodium sylvaticum*** (Hudson) Palisot de Beauvois *ssp.* ***sylvaticum***, Slender False Brome. Roadsides and yards; native of Europe. [= FNA; < *B. sylvaticum* – HC, K]

Briza Linnaeus 1753 (Quaking Grass)

A genus of about 20 species, annuals and perennials, native of Eurasia and South America. References: Snow in FNA (2007a); Tucker (1996)=Z.

1 Plant perennial; ligules ca. 0.5 mm long ..... ***B. media***
1 Plant annual; ligules 3-13 mm long.
  2 Spikelets 10-20 mm long ..... ***B. maxima***
  2 Spikelets 2-7 mm long ..... ***B. minor***

* ***Briza maxima*** Linnaeus, Greater Quaking Grass. Disturbed areas; native of the Mediterranean region. Reported in e. GA (Jones & Coile 1988). [= FNA, K] {synonymy incomplete}
* ***Briza media*** Linnaeus, Perennial Quaking Grass. Disturbed areas; native of Europe. Reported for scattered locations in PA (Rhoads & Klein 1993), MD, DE, and AL (Kartesz 1999). [= FNA, C, F, G, HC, K]
* ***Briza minor*** Linnaeus, Lesser Quaking Grass. Fields, disturbed areas; native of Europe. April-June. [= RAB, C, F, FNA, G, GW, HC, K, S, Z]

Bromus Linnaeus 1753 (Brome-grass)

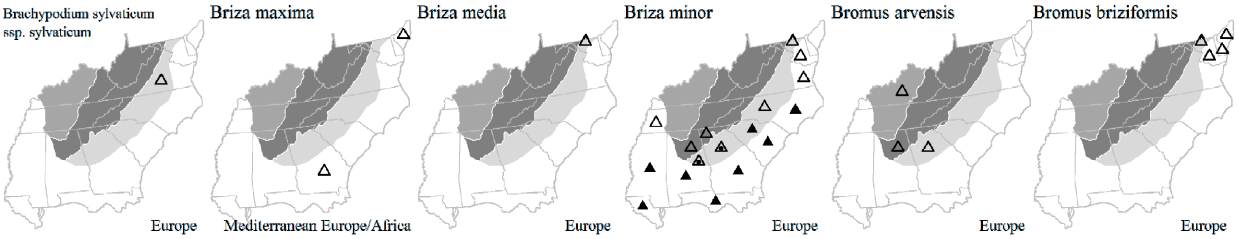
A genus of about 150 species, north temperate and South American. References: McNeill (1976); Sales (1993, 1994)=Z; Tucker (1996)=Y; Pavlick (1995)=X; McKenzie & Ladd (1995); Pavlick & Anderton in FNA (2007a).

1 Lemmas compressed and strongly keeled (the whole spikelet thus strongly laterally flattened); first glume 3-9-nerved; [section *Ceratochloa*] ..... ***B. catharticus*** *var.* ***catharticus***
1 Lemmas rounded or weakly keeled (the whole spikelet therefore terete to somewhat laterally flattened); first glume either 3-5-nerved or 1-3-nerved.
  2 First glume 3-5 nerved (at least 3 nerves well-developed).
    3 Lemma awn 2-3 mm long; plant perennial; [native species of dry woodlands]; [section *Bromopsis*] ..... ***B. kalmii***
    3 Lemma awn 3-12 mm long (or 0-6 mm long in *B. secalinus*); plant annual; [introduced species of disturbed habitats]; [section *Bromus*].
      4 Panicle compact, the lateral branches erect or ascending, the pedicels < 10 mm long (shorter than the spikelets)
        5 Lemmas 3-5 mm wide; inflorescence ovoid in outline ..... ***B. hordeaceus*** *ssp.* ***hordeaceus***
        5 Lemmas 1.5-2 mm wide; inflorescence obovoid in outline ..... ***B. scoparius***
      4 Panicle relatively open, the lateral branches erect, ascending, or spreading, the pedicels > 15 mm long (longer than the spikelets).
        6 Margins of the lemmas involute in fruit, wrapping around the grain, exposing the rachilla ..... ***B. secalinus***
        6 Margins of the lemmas gaping, overlapping in fruit.
          7 Panicle branches erect or ascending, relatively stiff and straight ..... ***B. racemosus***
          7 Panicle branches spreading (at least the lower), either relatively stiff and straight, or flexuous and lax.
            8 Panicle branches stiff; lemma awns 5-12 mm long, straight ..... ***B. commutatus***
            8 Panicle branches flexuous and lax; lemma awns 7-15 mm long, flexuous ..... ***B. japonicus***
  2 First glume 1 (-3) nerved (only 1 nerve well-developed).

9 Longer lemma awns 10-60 mm long; plants annual; [introduced species of disturbed habitats]; [section *Genea*].
10 Panicle dense, spikelike ..... ***B. rubens***
10 Panicle open, not spikelike.
11 First glume 13-20 mm long; second glume 20-30 mm long; lemma awns 35-60 mm long ..... ***B. rigidus***
11 First glume 5-14 mm long; second glume 8-17 mm long; lemma awns 10-30 mm long.
12 First glume 7-14 mm long; second glume 9-17 mm long; lemma awns 18-30 mm long ..... ***B. sterilis***
12 First glume 5-7 mm long; second glume 8-11 mm long; lemma awn (7-) 10-17 mm long ..... ***B. tectorum***
9 Longer lemma awns 1-6 (-8) mm long; plants perennial; [native and introduced species, collectively of disturbed and natural habitats]; [section *Bromopsis*].
13 Plants with creeping rhizomes, forming clonal colonies; both surfaces of leaves glabrous or glabrescent ..... ***B. inermis***
13 Plants not strongly rhizomatous, the stems solitary or tufted; surfaces of leaf blades usually pubescent (sometimes sparsely so).
14 Pedicels erect or ascending, mostly shorter than the spikelet; leaves 2-3 mm wide; [introduced, of disturbed habitats] ..... ***B. erectus***
14 Pedicels ascending at first, later arching-drooping, mostly longer than the spikelet; leaves 4-15 mm wide; [native, mostly of forests].
15 Lemmas glabrous (or very minutely pubescent) on the back, hairy along the lower margins with long hairs ..... ***B. ciliatus***
15 Lemmas uniformly hairy over the entire back-surface (or rarely entirely glabrous).
16 Culms with 10-20 leaves, often weak and leaning or reclining; junction of sheaths and base of leaf blades with 2 well-developed flanges prolonged into auricles or divergent spurs; second glume primarily 5-nerved; flowering late, with anthesis August-October ..... ***B. latiglumis***
16 Culms with 6-10 leaves, erect; junction of sheaths and base of leaf blades lacking flanges or auricles; second glume primarily 3-nerved; flowering earlier, anthesis from May-August.
17 Underleaf surfaces with a conspicuous satiny sheen (when fresh); summit of sheath opposite the ligule with a conspicuous tuft of hairs ..... ***B. nottowayanus***
17 Underleaf surfaces lacking a conspicuous satiny sheen; summit of sheath opposite the ligule lacking a conspicuous tuft of hairs ..... ***B. pubescens***

* ***Bromus arvensis*** Linnaeus. Disturbed areas; native of Europe. Reported as introduced for nc. GA (Jones & Coile 1988), for VA, MD, PA, and NJ (Kartesz 1999), and for KY (Campbell 2007). [= C, F, FNA, HC, K] {not yet keyed}

* ***Bromus briziformis*** Fischer & C.A. Meyer, Rattlesnake Brome. Disturbed areas; native of Europe. Late May-July. Reported as an introduction in ne. North America, south to MD, NJ, PA, DE (Kartesz 1999). [= FNA, K; = *B. brizaeformis* – C, F, G, NC, orthographic variant] {not yet keyed}



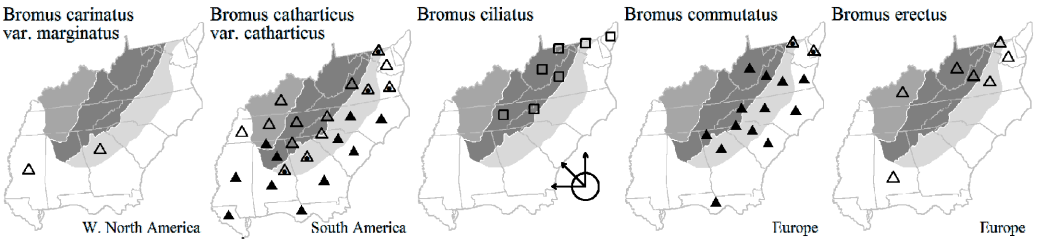
* ***Bromus carinatus*** Hooker & Arnott *var.* ***marginatus*** (Nees) Barkworth & Anderton, Mountain Brome. Reported by Jones & Coile (1988) for nc. GA and by FNA for MS. [= FNA; < *B. catharticus* – C; = *B. marginatus* Nees ex Steudel – K] {not yet keyed}

* ***Bromus catharticus*** Vahl *var.* ***catharticus***, Rescue Grass. Disturbed areas; native of South America. April-June. [= FNA; ? *B. catharticus* – RAB, F, G, HC, K, W, X, Y; *? Bromus willdenowii* Kunth – C; ? *Bromus unioloides* Kunth – S]

Bromus ciliatus Linnaeus, Fringed Brome. Seepage areas, edges of fens, moist areas near high elevation creeks, grassy balds, high elevation woodlands, mostly over mafic or calcareous rocks. July-August. Widespread in n. North America: NL (Labrador) to AK, south in the east to PA, and in the mountains to NC. Known in NC only from Bluff Mountain and Long Hope Valley, Ashe and Watauga counties, and Roan Mountain, Mitchell County. [= RAB, C, FNA, G, HC, S, W, WV, X, Y; > *Bromus ciliatus* var. *ciliatus* – F, K; = *Bromopsis ciliata* (Linnaeus) Holub]

* ***Bromus commutatus*** Schrader, Hairy Chess, Meadow Brome. Disturbed areas; native of Europe. May-June. The relationship and relative distribution of this species and *Bromus racemosus* is poorly known for our area. See *Bromus racemosus* for further comments. [= C, F, FNA, HC, K, S, WV, X, Y; < *Bromus commutatus* – RAB (also see *Bromus racemosus*); < *Bromus racemosus* – G, W]

* ***Bromus erectus*** Hudson, Short-branched Brome. Disturbed areas; native of Europe. [= C, F, FNA, G, HC, K, S, WV, X; = *Bromopsis erecta* (Hudson) Fourrier]



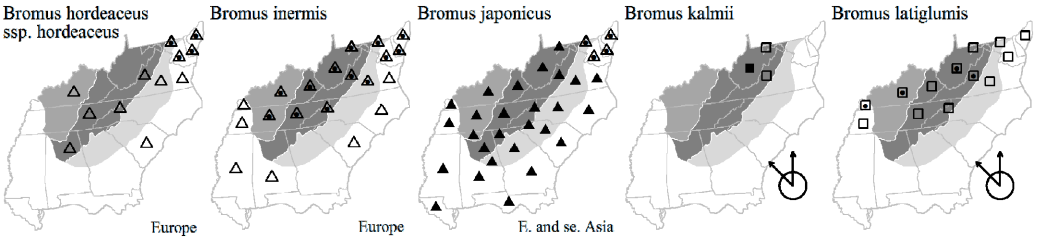
* ***Bromus hordeaceus*** Linnaeus *ssp.* ***hordeaceus***, Soft Chess, Lopgrass. Disturbed areas; native of Europe. July. [= FNA, K, X; *? Bromus mollis* Linnaeus – RAB, F, G, HC, misapplied; < *Bromus hordeaceus* – C, Y]

* ***Bromus inermis*** Leysser, Smooth Brome, Hungarian Brome. Disturbed areas; native of Europe. June-July. [= RAB, C, FNA, G, HC, S, W, WV, X, Y; > *Bromus inermis* var. *inermis* – F; > *Bromus inermis* ssp. *inermis* var. *inermis* – K; = *Bromopsis inermis* (Leysser) Holub]

* ***Bromus japonicus*** Thunberg ex Murray, Japanese Chess. Disturbed areas; native of Asia. May-June. [= RAB, C, FNA, G, K, S, W, WV, X, Y; > *Bromus japonicus* var. *japonicus* – F, HC; > *Bromus japonicus* var. *porrectus* Hackel – F, HC]

Bromus kalmii A. Gray, Kalm Brome, Canada Brome. Forests and woodlands, shale woodlands and barrens, grassy ridgetop oak forests. ME west to SD, south to MD, w. VA, and IA. Distinctive for its few leaves (usually 3-4) clustered near the base, the spikelets large and approximate to one another in a narrow, nodding panicle. [= C, F, FNA, G, HC, K, X]

Bromus latiglumis (Shear) A.S. Hitchcock, Riverbank Brome, Auricled Brome, Hairy Woodbrome, Flanged Brome. Alluvial soils along rivers. August-October. Widespread in ne. North America, from ME to MT, south to NC and OK. Flowering many weeks later than co-occurring *B. pubescens*. In NC apparently only along large rivers flowing west through the Appalachians into the Mississippi River drainage, notably the New and the French Broad. [= F, FNA, G, HC, K, WV, X; < *Bromus purgans* Linnaeus – RAB; = *Bromus altissimus* Pursh – C; < *Bromus latiglumis* – Y (also see *Bromus nottowayanus*)]



Bromus nottowayanus Fernald, Satin Brome, Nottoway River Brome, Virginia Brome. Moist forests, especially along small stream bottoms. June-August. The range of this species is poorly known, owing to confusion between it, *B. pubescens* and *B. latiglumis*. It is apparently known from MD, VA, and NC, west to TN, IL, IN, MO, and AR. McKenzie & Ladd (1995) report on the biology and taxonomy of this species. [= C, F, FNA, HC, K, X; < *Bromus purgans* Linnaeus – RAB; < *Bromus latiglumis* – Y; = *Bromopsis nottowayana* (Fernald) Holub]

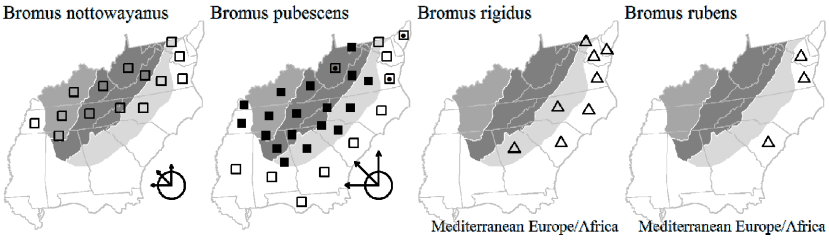
Bromus pubescens Muhlenberg ex Willdenow, Common Eastern Brome, Canada Brome. Mesic forests, generally on rocky slopes. May-August. Widespread in e. North America: s. ON west to AB, south to FL and AZ. [= C, FNA, K, W, X, Y; < *Bromus purgans* Linnaeus – RAB, S, misapplied (also see *Bromus latiglumis* and *Bromus nottowayanus*); = *Bromus purgans* Linnaeus – F, G, WV, misapplied; > *Bromus purgans* var. *purgans* – HC; > *Bromus purgans* var. *laeviglumis* (Scribner ex Shear) Swallen – HC; = *Bromus laeviglumis* – S, misapplied (?); = *Bromopsis pubescens* (Muhlenberg ex Willdenow) Holub]

* ***Bromus racemosus*** Linnaeus, Smooth Brome. Disturbed areas; native of Europe. May-June. The relative distribution, abundance, and habitats in our area of this species and *B. commutatus* poorly understood. Additional characters are as follows (from Stace 2010): lemmas 7-9 mm long (vs. 7.5-11 mm long in *B. commutatus*), anthers 1.5-3.5 mm long (vs. 1.3-2.5 mm long), spikelets 10-18 mm long (vs. 15-30 mm long), all panicle branches <4 cm long (vs. some panicle branches > 4 cm long). [= C, F, FNA, HC, K, X; < *Bromus commutatus* – RAB; < *Bromus racemosus* – G, W (also see *Bromus commutatus*)] {not yet mapped}

* *Bromus ramosus* Hudson. Introduced. Reported for DC and MS (Kartesz 1999). [= FNA, K] {not yet keyed or mapped}

* ***Bromus rigidus*** Roth, Ripgut Brome, Ripgut Grass. Disturbed areas; native of Mediterranean Europe. April. [= RAB, C, F, G, HC, K; < *Bromus diandrus* Roth – FNA, Y; *? Bromus diandrus* var. ?? – Z]

* ***Bromus rubens*** Linnaeus, Foxtail Chess, Red Brome. Waste areas near wool-combing plants, other disturbed areas; native of Mediterranean Europe. The SC occurrences come from areas around wool-combing plants, and were likely introduced on wool from w. United States, where this European species is well-established. Reported introduced in VA and MD (Kartesz 1999) as *B. madritensis*. [= C, FNA, G, X; *? Bromus madritensis* Linnaeus – F, misapplied; < *B. rubens* – K; < *B. madritensis* Linnaeus – K; = *Bromus madritensis* ssp. *rubens* (Linnaeus) Husnot]



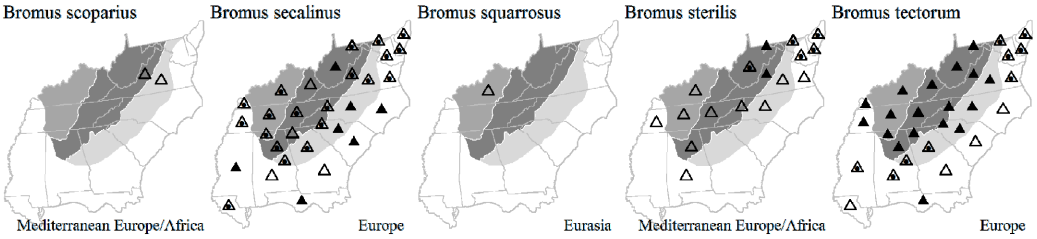
* ***Bromus scoparius*** Linnaeus, Broom Brome. Disturbed areas; native of s. Europe. [= FNA, K] {add to synonymy}

* ***Bromus secalinus*** Linnaeus, Cheat, Common Chess, Ryebrome. Disturbed areas; native of Europe. May-June. [= RAB, C, F, FNA, G, HC, K, S, W, WV, X, Y]

* *Bromus squarrosus* Linnaeus, Squarrose Brome. Reported for KY and NJ (Kartesz 1999). Native of Eurasia. [= FNA, K] {not yet keyed}

* ***Bromus sterilis*** Linnaeus, Barren Brome, Poverty Brome, Cheatgrass. Disturbed areas; native of southern Europe. May-June. [= RAB, C, F, FNA, G, HC, K, S, W, WV, X, Y, Z]

* ***Bromus tectorum*** Linnaeus, Downy Brome, Downy Chess, Downy Cheat, Junegrass, Cheatgrass. Disturbed areas; native of Europe. April-June. [= RAB, C, F, FNA, G, HC, K, S, W, WV, X, Y; *? Bromus tectorum* ssp. *tectorum* – Z]



Calamagrostis Adanson 1763 (Reed-grass)

A genus of about 230 species, north and south temperate. References: Marr, Hebda, & Greene in FNA (2007a); Tucker (1996)=Z; Greene (1980). Key based on FNA.

1 Callus hairs > 1.3× as long as the lemma; rachilla prolonged beyond the palea; [rare introduction from s. NJ northwards].....***C. epigejos***
1 Callus hairs < 1.2× as long as the lemma; rachilla not prolonged beyond the palea; [natives, sometimes weedy, widespread].
2 Awns attached on the upper 2/5 of the lemmas, 0.5-2 mm long, straight.....***C. coarctata***
2 Awns attached on the lower ½ of the lemmas, 0.9-6 mm long, straight or bent.
3 Awns usually exserted, (2.8-) 3-6 mm long; callus hairs 0.3-0.7× as long as the lemma.
4 Leaves (1-) 2-3 (-4) mm wide; plant densely tufted, delicate, culms 10-55 (-60) cm tall, with 2-3 nodes; [high elevation rock outcrops and glades] .....***C. cainii***
4 Leaves (2-) 3-8 (-12) mm wide; plant rhizomatous or loosely tufted, coarse, culms (60-) 75-120 cm tall, with 3-5 nodes; [low to moderate elevation forests and woodlands].
5 Leaves glaucous above and below; leaf collars glabrous..... ***C. porteri*** *ssp.* ***insperata***
5 Leaves glaucous above, dark green below; leaf collars with prominent tufts of hairs .....***C. porteri*** *ssp.* ***porteri***
3 Awns usually not exserted, 0.9-3.1 (-4) mm long; callus hairs (0.5-) 0.7-1.2 (-1.5)× as long as the lemma.
6 Callus hairs < 1 mm long, 0.2-0.3× as long as the lemma..... ***C. pickeringii***
6 Callus hairs > 1 mm long, (0.5-) 0.7-1.2 (-1.5)× as long as the lemma
7 Glumes smooth (or scabrous on the keel only); awns stout, readily distinguished from the callus hairs .....
.....***C. stricta*** *ssp.* ***inexpansa***
7 Glumes scabrous on the keel and often also the surface; awns delicate, difficult to distinguish from the callus hairs.
8 Spikelets 2.5-4 mm long; lemmas usually shorter than the glumes; glumes rounded to broadly keeled, with raised midveins; glume apices usually acute, rarely acuminate .....***C. canadensis*** *var.* ***canadensis***
8 Spikelets 2-3 mm long; lemmas usually about as long as the glumes; glumes rounded, midveins not raised; glume apices acute .....***C. canadensis*** *var.* ***macouniana***

Calamagrostis cainii A.S. Hitchcock, Cain's Reed-grass. High elevation rocky summits. July-September. Endemic to a few mountain-tops in the Southern Appalachians, *C. cainii,* once thought to be endemic to Mount LeConte, TN, was discovered at two sites in NC in 1989 and 1990 – Mount Craig, Yancey County, and Craggy Pinnacle, Buncombe County (Wiser 1991). This species is more likely to be mistaken (especially superficially) for an *Agrostis* than for any of the other *Calamagrostis* in our area, but is distinguishable by its larger spikelets (5-6 mm long, rather than 1.3-2 mm) and the presence of a callus beard. [= FNA, HC, K, W, Z]

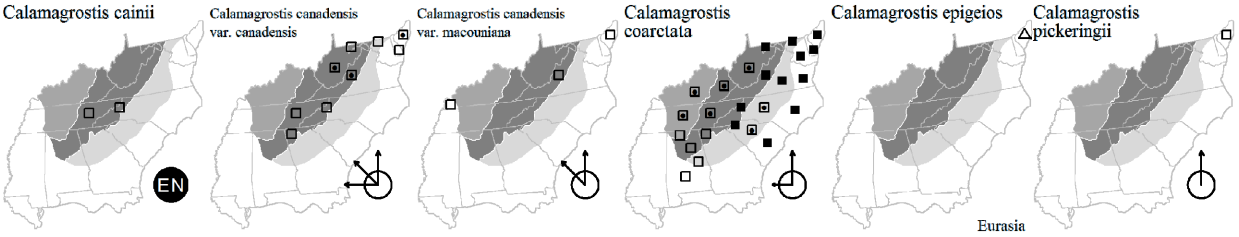
Calamagrostis canadensis (Michaux) Palisot de Beauvois *var.* ***canadensis***, Bluejoint, Canada Reed-grass. Wet meadows along streams, high elevation openings, such as grassy balds and cliff bases. August. Widespread and common across n. North America, reaching its southern limit in the east in w. NC, e. TN (Chester et al. 1993), and ne. GA (Rabun Bald, Rabun County). [= FNA, G, HC, K; < *C. canadensis* – RAB, C, S, W, WV, Z; > *C. canadensis* var. *canadensis* – F; > *C. canadensis* var. *robusta* Vasey – F]

Calamagrostis canadensis (Michaux) Palisot de Beauvois *var.* ***macouniana*** (Vasey) Stebbins. Bottomlands. NL (Newfoundland) and AB south to NJ, PA, VA?, OH, w. KY, IL, MO, NE, WY, OR. Reported for VA (FNA), the documentation unknown. Reported south to NJ and KY only (Kartesz 1999). {investigate} [= F, FNA, G, HC, K; < *C. canadensis* – C, Z; = *C. macouniana* (Vasey) Vasey]

Calamagrostis coarctata Eaton, Nuttall's Reed-grass. Savannas, bogs, and other wet sites. July-October. ME and NY south to n. GA (Jones & Coile 1988), AL, and LA, primarily on the Coastal Plain. The replacement of the familiar name *C. cinnoides* is necessary for nomenclatural reasons (Kartesz 1999); a proposal may be made to conserve the name *C. cinnoides* (Barkworth, pers. comm., 2009). [= K; = *C. cinnoides* (Muhlenberg) W.P.C. Barton – RAB, C, F, FNA, G, GW, HC, S, W, WV, Z; = *C. coarctata* Eaton – K]

* ***Calamagrostis epigejos*** (Linnaeus) Roth, Bushgrass, Feathertop. Disturbed areas; native of Eurasia. [= C, G, FNA; = *C. epigeios* – HC; > *C. epigeios* var. *epigeios* – F, K2; > *C. epigeios* var. *georgica* (K. Koch) Grisebach – F, K2]

Calamagrostis pickeringii A. Gray, Pickering's Reedgrass. Bogs. NL west to ON, south to NY and s. NJ. [= C, F, FNA, G, HC]



Calamagrostis porteri A. Gray *ssp.* ***porteri***, Porter's Reed-grass. Dry to dry-mesic forests, forest edges, cliff bases. NY to AL, in the Appalachians, with disjunct populations s. MO and w. AR; it was first reported from NC by Ware (1973). This species is typically sterile unless disturbed by fire or mechanically; it is therefore probably more common than collections indicate. In addition to the key characters above, it can be distinguished from *C. canadensis* by its having leaf sheaths pubescent at the summit (Matthews & Radford 1985). [= FNA, K; = *C. porteri* – C, HC, W, WV; *? C. porteri* – G, Z]

Calamagrostis porteri A. Gray *ssp.* ***insperata*** (Swallen) C.W. Greene. Rock outcrops; rocky woodlands. OH and MO south to TN and AR. [= FNA, K; = *C. insperata* Swallen – C, HC]

Calamagrostis stricta (Timm) Koeler *ssp.* ***inexpansa*** (A. Gray) C.W. Greene. Mt (WV): {habitat}. NL (Newfoundland) and NL (Labrador) west to AK, south to NY, OH, n. WV (Preston and Randolph counties), IA, AZ, and CA; ne. Asia. [= FNA, K; < *C. stricta* – C; ? *C. neglecta* (Ehrhart) Gaertner, Mey., & Scherb. var. *neglecta* – F; = *C. inexpansa* A. Gray – G, HC]

Calamovilfa (A. Gray) Hackel ex Scribner & Southworth 1890 (Sandreed)

A genus of 5 species, of e. and c. North America. Reeder & Ellington (1960) studied various anatomic features of *Calamovilfa*, and determined that its closest relative was *Sporobolus*. A molecular phylogenetic study of *Sporobolus* and closely related genera suggests that *Calamovilfa* should be included in *Sporobolus* (Ortiz-Diaz & Culham 2000). References: Thieret in FNA (2003a); Thieret (1966)=Z. Key based in part on Thieret in FNA (2003a).

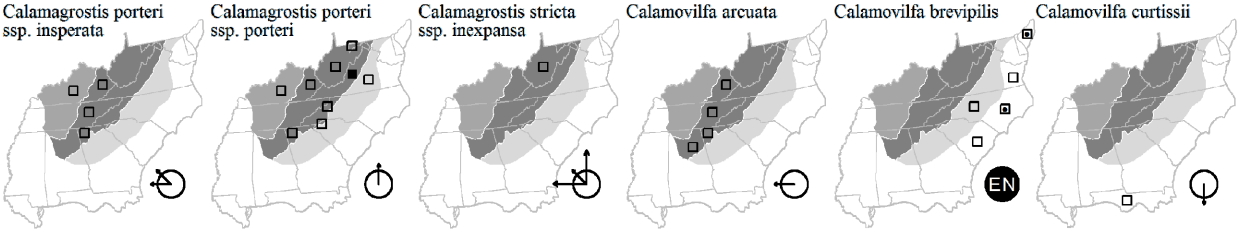
Identification notes: Superficially somewhat similar to *Sporobolus pinetorum*, *S. floridanus,* and *S. curtissii* (herbarium specimens of the two species have been regularly confused), *Calamovilfa* is distinguished by its leaves tapered to either end and long-acuminate (vs. parallel-margined and abruptly acute in *Sporobolus*) and tendency to form larger, clonal patches (*Sporobolus* forms wiregrass-like bunches or clumps). In flower or fruit, the *Calamovilfa* can be distinguished by characters of the spikelet, by vegetative characters, or by its coarser, generally taller culms, with the panicle branches usually spreading (rather than always ascending in *Sporobolus*). The three have very similar bases, unlike any other grasses in our area – the lower leaf sheaths are indurated and shiny, forming a hard, polished, knotty, and fire-proof covering over the short-creeping rhizome. *Aristida stricta* has a somewhat similar base, but less indurated, less creeping, and with an unpolished appearance. *Calamovilfa brevipilis* also has a cartilaginous, pale yellow annulum surrounding the outer (abaxial) surface of the juncture of the sheath and leaf, a structure not visible in the other species. Positive identification in sterile condition is not difficult.

1 Panicles narrow, the branches appressed-ascending; [Coastal Plain of FL] ..... ***C. curtissii***
1 Panicles broad, the bracnches ascending-spreading; [either of the Coastal Plain of SC northwards, or of the interior].
  2 Spikelets 6.0-7.4 mm long; glumes acute to acuminate, usually arcuate; lemmas 5.5-7.0 mm long, usually arcuate; [river scour areas in the rocky inland parts of the South]..... ***C. arcuata***
  2 Spikelets 4.0-5.8 mm long; glumes acute, straight; lemmas 4.0-5.4 mm long, straight; [pineland habitats of the Coastal Plain of SC northwards] ..... ***C. brevipilis***

Calamovilfa arcuata K.E. Rogers, Cumberland Sandreed. Riverside scours. Ouachita Mountains of w. AR and e. OK; Cumberland Plateau of TN (Morgan and Cumberland counties), KY (McCreary County), and AL (Blount County). [= FNA, K]

Calamovilfa brevipilis (Torrey) Scribner, Pinebarren Sandreed. Savanna-pocosin ecotones, sandhill seepage bogs, pocosins, boggy powerline rights-of-way. June-October. A "bimodal endemic", with two areas of distribution: Pine Barrens of NJ and the Coastal Plain (very rarely lower Piedmont) of e. NC, n. SC, and s. VA. Var. *heterolepis* Fernald, no longer considered valid, refers to the NC-SC material; var. *calvipes* Fernald, no longer considered valid, refers to the VA material. Like *Aristida stricta,* this grass is dependent on fire for flowering (it will also sometimes flower in response to mowing or other disturbance). Suppression of the natural fire regime has led to its substantial decline and the severe contraction of its range in the Southeast, since fire exclusion in its seepage or ecotone habitat leads to rapid invasion by shrubs and competitive elimination of *Calamovilfa* and many other herbs. [= RAB, C, FNA, G, GW, K, S, Z; > *C. brevipilis* var. *brevipilis* – F, HC; > *C. brevipilis* var. *heterolepis* Fernald – HC; > *C. brevipilis* var. *calvipes* Fernald – F, HC]

Calamovilfa curtissii (Vasey) Scribner, Curtiss's Sandreed. Moist pinelands and edges of natural ponds. FL Panhandle and e. peninsular FL. *C. curtissii* is a closely related sibling species of *C. brevipilis*. [= FNA, GW, HC, K, S, Z]



Cenchrus Linnaeus 1753 (Burgrass, Sandspur)

A genus of about 16 species, primarily tropical and subtropical. References: Stieber & Wipff in FNA (2003a); Ward (2010b)=Y; Crins (1991)=Z. Key based in part on FNA.

Identifications note: Spikelets of *Cenchrus* are subtended by an involucre of spines and/or bristles which are (in most of our species) fused into a **bur**. Bristles are narrow-based and terete. Spines are broad-based, and somewhat flattened (not terete) in cross-section, at least basally.

1 Involucre of bristles only, these not fused into a bur; perennial, to 2 m tall ..... ***C. myosuroides***
1 Involucre of spines fused into a coherent bur, sometimes also with bristles; annual or perennials, to 1 m tall.
  2 Spines in a single whorl, subtended by numerous smaller, narrower, free outer bristles.
    3 Spines fused at the base only, the lower surfaces with 1-3 grooves..... ***C. biflorus***
    3 Spines fused for >1/3 their length, the lower surfaces not grooved.
      4 Rachis internodes 0.8-1.7 mm long; most of the outer bristles equal to or slightly longer than the flattened inner bristles (spines) ..... ***C. brownii***
      4 Rachis internodes 2-4 mm long; most of the outer bristles much shorter than the flattened inner bristles (spines)..... ***C. echinatus***
  2 Spines in multiple whorls or irregular in their disposition (if few and in a single whorl, then not subtended by smaller, narrower bristles).
    5 Plants perennial, long-lived, clump-forming; burs not imbricate, usually glabrous; leaf blades 1-3.5 mm wide..... ***C. gracillimus***
    5 Plants annual or perennial, short-lived and not clump-forming; burs imbricate, usually pubescent, leaf blades (1-) 3-14.2 mm wide.
      6 Burs (excluding the spines) 9-16 mm long, 4-6 mm wide, the spines 4-8 mm long; spikelets 1 (-2) per bur, concealed; leaf blades 3-14 mm wide ..... ***C. tribuloides***
      6 Burs (excluding the spines) 5.5-12 mm long, 2.5-6 mm wide, the spines 2-7 mm long; spikelets 2-4 per bur, exserted at the tip; leaf blades 1-5 (-7) mm wide.
        7 Spines stout, 6-10 (-40), 2-5 mm long; spikelets 3.5-6 mm long..... ***C. incertus***
        7 Spines slender, 45-75, 3.5-7 mm long; spikelets 6-8 mm long ..... ***C. longispinus***

* ***Cenchrus biflorus*** Roxburgh, Indian Sandbur. Disturbed areas, ballast; native of Africa and s. Asia. Reported from ballast in Mobile, AL; perhaps only a waif. [= FNA, HC]

*? ***Cenchrus brownii*** Roemer & J.A. Schultes. Disturbed areas, maritime grasslands. Se. United States (NC, GA, AL, and FL); West Indies, Central America, n. South America. The sole known NC specimen was collected in 1885 by Gerald McCarthy in NC "in locis navalibus et vastis." [= FNA, K, WH, Y; ? *C. viridis* Sprengel – HC, S, misapplied]

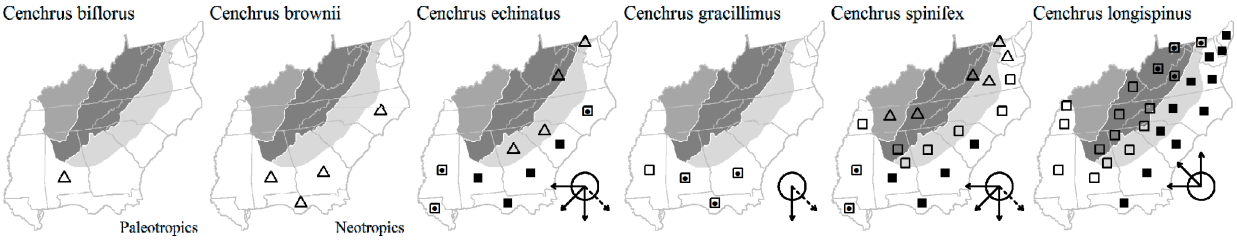
Cenchrus echinatus Linnaeus, Southern Sandspur, Bristly Sandspur, Hedgehog Grass. Fields, roadsides, disturbed areas. June-October. NC (and DC?) south to FL, west to CA, south into the tropical America. The basis for the record for w. VA in FNA is not clear. [= RAB, C, FNA, HC, K, S, WH, Y, Z]

Cenchrus gracillimus Nash, Sandhill Sandspur. Longleaf pinelands, other sandy habitats. N. FL, s. and e. GA, s. AL, and s. MS; West Indies (Cuba, Jamaica). [= FNA, HC, K, S, WH, Y]

Cenchrus incertus M.A. Curtis, Coastal Sandspur. Fields, roadsides, disturbed areas. July-October. VA south to FL, west to AR and KS, south into tropical America. Ward (2010b) argues convincingly that the name *C. spinifex* is very uncertainly applied to our species and should not be taken up. [= RAB, C, F, G, HC, S, Y, Z; = *C. spinifex* Cavanilles – FNA, K]

Cenchrus longispinus (Hackel) Fernald, Northern Sandspur, Common Sandspur. Fields, roadsides, disturbed areas, lawns. June-October. ME west to OR, south to FL, TX, and CA. [= RAB, C, F, FNA, K, W, Z; = *C. pauciflorus* Bentham – G, HC, S, WV, misapplied]

* ***Cenchrus myosuroides*** Kunth. Roadsides, disturbed areas; native of further south. December. SC south to FL, west to TX, south into the West Indies and other parts of tropical America. [= RAB, FNA, HC, K, S, Y, Z]



Cenchrus tribuloides Linnaeus, Dune Sandspur. Dunes, sandy fields, sandy woodlands in the outer Coastal Plain. August-October. NY (Long Island) south to FL, west to TX, south into tropical America. This is the sandspur so familiar to (and disliked by) beach-goers in our area. [= RAB, C, F, FNA, HC, K, S, W, WH, Y, Z]

Chasmanthium Link 1827 (Spanglegrass, Spikegrass)

A genus of 5 species endemic to se. North America. References: Sánchez-Ken & Clark in FNA (2003a); Yates (1966a, 1966c)=Z.

1 Panicle branches elongate, pendulous; spikelets (15-) 20-40 mm long, with 6-20 flowers..... ***C. latifolium***
1 Panicle branches short, erect or ascending; spikelets 5-18 mm long, with 2-8 (-11) flowers.
  2 Fully-developed spikelets 12-18 mm long, 8-12 mm wide.
    3 Axils of the spikelets and panicle branches glabrous; empty lemmas 9 (-12); [se. NC south to c. peninsular FL and e. FL Panhandle]..... ***C. nitidum***

3 Axils of the spikelets and panicle branches with a tuft of long hairs; empty lemmas 2-4; [w. FL Panhandle west to e. LA (Florida parishes)] ..... ***C. ornithorhynchum***

2 Fully-developed spikelets 4-9 mm long, 3-7 mm wide.

4 Collar (junction of leaf and sheath) glabrous or nearly so; leaves 3-7 mm wide ..... ***C. laxum***

4 Collar (junction of leaf and sheath) pilose; leaves 6-12 mm wide.

5 Inflorescence with divergent branches; [outer Coastal Plain calcareous sites from SC southwards] ..... ***C. sessiliflorum*** *var.* ***1***

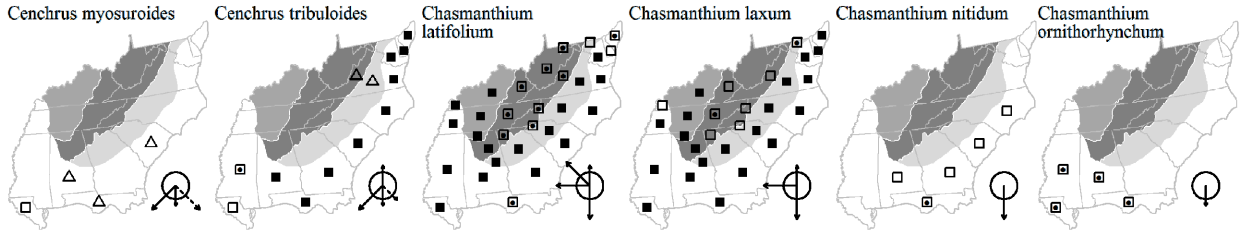
5 Inflorescence with appressed branches; [more widespread in our area] ..... ***C. sessiliflorum*** *var.* ***sessiliflorum***

Chasmanthium latifolium (Michaux) Yates, River Oats, Fish-on-a-pole. Riverbanks, streambanks, bottomland forests, seepages and glades over mafic or calcareous rock, usually in nutrient-rich soils. June-October. NJ, OH, IL, and KS south to FL and TX. [= C, FNA, GW, K, W, Z; = *Uniola latifolia* Michaux – RAB, F, G, HC, S, WV]

Chasmanthium laxum (Linnaeus) Yates, Slender Spikegrass. Savanna-pocosin ecotones, sandhill-pocosin ecotones, moist hardwood swamps, other moist habitats. June-October. Widespread in se. North America, north to s. NY, KY, and OK. See *C. sessiliflorum* for comments on the suggestion that these two taxa are only varietally distinct. [= C, FNA, GW, K, W, Z; = *Uniola laxa* (Linnaeus) Britton, Sterns, & Poggenburg – RAB, F, G, HC, S; = *Chasmanthium laxum* var. *laxum*]

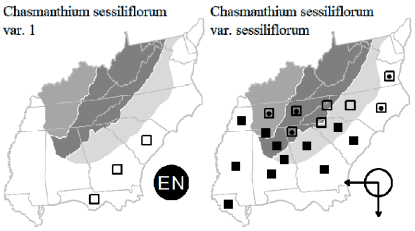
Chasmanthium nitidum (Baldwin) Yates, Shiny Spanglegrass. Blackwater swamp forests. September-November. A Southeastern Coastal Plain endemic: se. NC south to c. FL and west to se. AL. [= FNA, GW, K, Z; = *Uniola nitida* Baldwin – RAB, HC, S]

Chasmanthium ornithorhynchum (Steudel) Yates, Birdbill Spikegrass. Blackwater swamp forests. S. AL and w. FL Panhandle west to e. LA (Florida Parishes). Also reported for NC and SC (FNA 2003a). {investigate} [= FNA, GW, K, Z; = *Uniola ornithorhyncha* Steudel – S]



Chasmanthium sessiliflorum (Poiret) Yates *var.* ***1***, Coastal Hammock Longleaf Spikegrass. Calcareous hammocks. August-October. An additional taxon warrants recognition: it is characterized by divergent panicle branches and occurs in outer Coastal Plain calcareous sites (J. Allison, pers. comm.). [< *Chasmanthium sessiliflorum* (Poiret) Yates – C, FNA, GW, K, Z; < *Uniola sessiliflora* Poiret – RAB, F, G, HC; < *Uniola longifolia* Scribner – S; < *Chasmanthium laxum* (Linnaeus) Yates var. *sessiliflorum* (Poiret) L. Clark]

Chasmanthium sessiliflorum (Poiret) Yates *var.* ***sessiliflorum***, Longleaf Spikegrass. Moist hardwood forests, swamps, other moist habitats. August-October. Widespread in se. North America, north to se. VA, TN, AR, and OK. This species and *C. laxum* are morphologically somewhat similar, but their treatment as varieties of a single species is completely unwarranted. They frequently co-occur (especially on the Gulf Coastal Plain), growing side by side, and show no sign of intergradation. [< *Chasmanthium sessiliflorum* – C, FNA, GW, K, W, Z; < *Uniola sessiliflora* Poiret – RAB, F, G, HC; < *Uniola longifolia* Scribner – S; < *Chasmanthium laxum* (Linnaeus) Yates var. *sessiliflorum* (Poiret) L. Clark]



Chloris Swartz 1788 (Finger-grass, Chloris)

A genus 0f 55-60 species, annuals or perennials, mainly tropical and Southern Hemisphere. References: Barkworth in FNA (2003a). [also see *Eustachys*]. Key based partly on C.

1 Inflorescence verticillate, typically the panicle branches in 2-5 verticels; perennial; fertile lemma inconspicuously appressed-pilose; spikelets not imbricate ..... ***C. verticillata***

1 Inflorescence digitate, the panicle branches in a single verticel at the apex of the culm; annual; lemma conspicuously long-ciliate; spikelets imbricate ..... ***C. virgata***

* ***Chloris barbata*** Swartz, Swollen Windmill-grass. Cp (SC): disturbed areas, waste areas near wool-combing mills; rare, native of West Indies, e. Mexico, Central America, and South America. [= FNA, K1, K2] {FL} {not yet keyed}

* ***Chloris verticillata*** Nuttall, Windmill-grass. Cp (DE), Mt (VA, WV), {SC}: disturbed areas, bottomland fields; uncommon (rare in SC, VA, and WV), native of further west. [= C, F, G, HC, K]

* ***Chloris virgata*** Swartz, Feather Finger-grass, Showy Chloris. Pd (GA, NC, SC, VA), Cp (FL, GA): disturbed areas; rare, native of tropical America. [= RAB, C, F, G, HC, K]

* ***Chloris canterae*** Arechavaleta *var.* ***canterae***, Paraguayan Windmill-grass. Cp (GA): disturbed ground; rare, native of Paraguay. The epithet was originally spelled "*canterai*," but should be corrected to the genitive "*canterae*" by the provisions of the ICBN. [= K2; = *C. canterei* Arechavaleta var. *canterei* – K1; < *C. cantérai* – HC, orthographic variant] {not yet keyed}
* ***Chloris canterae*** Arechavaleta *var.* ***grandiflora*** (Rosengurtt & Izaguirre deArtucio) D.E. Anderson, Paraguayan Windmill-grass. Cp (SC): waste areas near wool-combing mills; rare, perhaps only a waif, native of Paraguay. [= K2; = *C. canterei* Arechavaleta var. *grandiflora* (Rosengurtt & Izaguirre deArtucio) D.E. Anderson – K1; < *C. cantérai* – HC, orthographic variant] {not yet keyed}
* ***Chloris cucullata*** Bisch. Cp (FL, SC): waste areas near wool-combing mills, other disturbed areas; rare, perhaps only a waif, native of sc. United States and Mexico. [= K1] {not keyed}
* ***Chloris divaricata*** R. Brown. Cp (SC): waste areas near wool-combing mills; rare, perhaps only a waif, native of {}. [= K1] {not keyed}
* ***Chloris gayana*** Kunth, Rhodes Grass. Cp (FL, SC): waste areas near wool-combing mills, other disturbed areas; rare, perhaps only a waif, native of Africa. [= F, HC, K1, S] {not keyed}
* ***Chloris pectinata*** Bentham. Cp (SC): waste areas near wool-combing mills; rare, perhaps only a waif, native of {}. [= K1] {not keyed}
* ***Chloris truncata*** R. Brown, Stargrass. Cp (SC): waste areas near wool-combing mills; rare, perhaps only a waif, native of Australia. [= HC, K1] {not keyed}
* ***Chloris ventricosa*** R. Brown. Cp (SC): waste areas near wool-combing mills; rare, perhaps only a waif, native of Australia. Also reported for VA (Hitchcock & Chase 1950; Kartesz 1999). [= HC, K1] {not keyed}

Chrysopogon Trinius 1820 (Goldbeard)

A genus of about 26 species, tropical and subtropical, all species except *C. pauciflorus* native to the Old World. References: Hall & Thieret in FNA (2003a); Veldkamp (1999).

Chrysopogon pauciflorus (Chapman) Bentham ex Vasey, Florida Goldbeard, Florida Rhaphis. Cp (FL, NC): sandhill; rare (NC Watch List), perhaps only introduced. FL and Cuba; its occurrence in se. NC (at Carolina Beach State Park) is plausible either as a native, disjunct occurrence or as an introduction. [= FNA, HC, K; = *Rhaphis pauciflora* (Chapman) Nash – S]

Cinna Linnaeus 1753 (Woodreed)

A genus of about 4 species, of temperate Eurasia, North America, and South America. References: Brandenburg in FNA (2007a); Brandenburg, Blackwell, & Thieret (1991); Tucker (1996)=Z; Brandenburg & Thieret (2000). [also see *Limnodea*]

1 Spikelets (3.5-) 4-6 (-7.5) mm long; glumes firm, subherbaceous, rather dull, hyaline only narrowly and marginally, the upper glume prominently 3-nerved ..... ***C. arundinacea***
1 Spikelets (2-) 2.5-4 (-5) mm long; glumes (at least the first and sometimes the second as well) glistening, hyaline except the midrib, the upper glume 1-nerved (very rarely 3-nerved) ..... ***C. latifolia***

Cinna arundinacea Linnaeus, Common Woodreed, Sweet Woodreed. Cp (DE, GA, KY, NC, SC, VA), Pd (DE, GA, NC, SC, VA), Mt (GA, KY, NC, SC, VA, WV): bottomland forests, rocky bars in rivers, tidal freshwater marshes, other low, wet habitats; common. August-October. NB and MN south to s. GA (Carter, Baker, & Morris 2009) and TX. [= RAB, C, FNA, G, GW, K, S, W, WV, Z; > *C. arundinacea* var. *arundinacea* – F, HC; > *C. arundinacea* var. *inexpansa* Fernald & Griscom – F, HC]

Cinna latifolia Grisebach, Drooping Woodreed, Slender Woodreed. Mt (NC, VA): moist forests at high elevations; uncommon (rare in NC and VA). June-August. Circumboreal, occurring in n. Eurasia and n. North America, south in North America to NC, TN, n. IL, MN, UT, NM, and CA. [= RAB, C, F, FNA, G, HC, K, W, WV, Z]

Coelorachis Brongniart 1831 (Jointgrass)

A genus of about 20 species, widespread in the Old World and New World tropics and subtropics. Generic circumscription has been controversial and uncertain. References: Allen in FNA (2003a); Veldkamp, Koning, & Sosef (1986)=Z.

1 Culms round in cross-section ..... ***C. cylindrica***
1 Culms compressed-keeled in cross-section.
  2 Lower glume with rectangular pits ..... ***C. tesselata***
  2 Lower glume smooth or with transverse ridges.
    3 Lower glume with transverse ridges ..... ***C. rugosa***
    3 Lower glume smooth ..... ***C. tuberculosa***

Coelorachis cylindrica (Michaux) Nash, Carolina Jointgrass. Pd (GA, NC, SC), Cp (FL, GA): open woodlands and roadsides, probably in areas formerly prairie-like and fire-maintained, perhaps now extirpated in portions of our area (including NC); rare. June-August. Fairly widespread in se. North America, north to NC and SC (at least formerly), MS, MO, and TX. [= C, FNA, K; = *Manisuris cylindrica* (Michaux) Kuntze – RAB, F, G, GW, HC; = *Manisuris campestris* (Nuttall) A.S. Hitchcock – S; = *Mnesithea cylindrica* (Michaux) Koning & Sosef – Z]

Coelorachis rugosa (Nuttall) Nash, Wrinkled Jointgrass. Cp (DE, FL, GA, NC, SC, VA), Pd (GA): limesink ponds (dolines), depression meadows, clay-based Carolina bays, wet savannas, disturbed areas (such as seeps in powerline rights-of-

way), always in places with a seasonally high water-table; uncommon (rare in DE, NC, SC, and VA). June-October. A Southeastern Coastal Plain endemic: s. NJ south to FL and west to TX. [= C, FNA, K; = *Manisuris rugosa* (Nuttall) Kuntze – RAB, F, G, GW, HC, S; = *Mnesithea rugosa* (Nuttall) Koning & Sosef – Z]

Coelorachis tesselata (Steudel) Nash, Pitted Jointgrass. Cp (FL, GA): wet savannas and bogs; rare. Southeasatern Coastal Plain endemic: sw. GA and FL west to e. LA. [= FNA, K; = *Manisuris tesselata* (Steudel) Scribner – GW, HC, S; = *Mnesithea tesselata* (Steudel) Koning & Sosef – Z]

Coelorachis tuberculosa (Nash) Nash, Smooth Jointgrass. Cp (FL, GA): pond margins; rare. Southeastern Coastal Plain endemic: sw. GA (Mitchell County) (Sorrie 1998b) west to s. AL, and in the FL peninsula. [= FNA, K; = *Manisuris tuberculosa* Nash – GW, HC, S; = *Mnesithea tuberculosa* (Nash) Koning & Sosef – Z]

Coix Linnaeus 1753 (Job's-tears)

A genus of about 5 species, native to tropical Asia. References: Thieret in FNA (2003a).

* *Coix lacryma-jobi* Linnaeus, Job's-tears, reported for se. PA by Rhoads & Klein (1993), TN (Thieret in FNA 2003a), and NJ (Kartesz 1999). [= FNA, K]

Coleataenia Grisebach 1879

A genus of 8 species, perennials, of s. North America and the West Indies to South America. Named as *Sorengia* by Zuloaga, Scataglini, & Morrone (2010), but this name proved to be illegitimate, and was replaced by *Coleataenia* (Soreng 2010). References: Zuloaga, Scataglini, & Morrone (2010)=X; Lelong (1986)=Z; Zuloaga & Morrone (1996)=Y; Soreng (2010)=V; Freckmann & Lelong in FNA (2003a).

1 Glumes and sterile lemmas not keeled along midvein; apices of fertile lemmas glabrous; panicle < 1 cm wide, 3-12 cm long; leaf blades 4-19 cm long, 1-4 mm wide, involute at maturity; culms wiry..... ***C. tenera***
1 Glumes and sterile lemmas keeled along midvein; apices of fertile lemmas with a minute tuft of stiff hairs; panicles < 1 to > 20 cm wide, 9-40 cm long; leaf blades 8-50 cm long, 2-12 mm wide, flat (sometimes drying involute); culms wiry to stout.
  2 Plants with rhizomes; fertile lemma 1.6-4 mm long.
    3 Rhizomes short, usually < 3 cm long; leaves 20-50 cm long, 4-18 mm wide; spikelets 2.5-3.9 mm long, acuminate; first glume with 3-5 green nerves..... ***C. anceps*** *ssp.* ***anceps***
    3 Rhizomes elongate, often > 4 cm long; leaves 10-30 (-40) cm long, 2-10 mm wide; spikelets 2.2-2.8 mm long, acute to short-acuminate; first glume with 1-3 green nerves..... ***C. anceps*** *ssp.* ***rhizomata***
  2 Plants with hard crowns, lacking rhizomes; fertile lemma 1.2-1.6 mm long.
    4 Ligule of white hairs 0.5-3 mm long; culms to 1 m long; cauline blades 2-8 mm wide, usually pilose adaxially near the base; spikelets 2.0-4.0 mm long.
      5 Ligules 1-3 mm long; spikelets 2.0-2.7 mm long, 2.5-4× as long as wide, often obliquely set on the pedicels..... ***C. longifolia*** *ssp.* ***longifolia***
      5 Ligules 0.5-1.5 mm long; spikelets 2.4-4.0 mm long, 3.5-5× as long as wide, erect on the pedicels..... ***C. longifolia*** *ssp.* ***combsii***
    4 Ligule a tawny membrane 0.5-1.0 mm long, often erose or lacerate, or with a minute ciliate fringe; culms to 1.8 m long; cauline blades 4-12 mm wide, usually glabrous; spikelets 1.6-2.8 mm long.
      6 Spikelets 2.4-2.8 mm long, long-acuminate, usually < 0.7 mm wide; fertile lemma often conspicuously stipitate..... ***C. species 1*** *ssp.* ***elongata***
      6 Spikelets 1.6-2.5 mm long, short-acuminate, usually > 0.7 mm wide; fertile lemma estipitate to short stipitate.
        7 Culms to 1 m long; mature panicle ½ to nearly as wide as long, the branches ascending to spreading; spikelets 1.6-2.2 mm long ..... ***C. species 1*** *ssp.* ***rigidula***
        7 Culms to 1.8 m long; mature panicle < 1/3 as wide as long, the branches erect; spikelets 2.0-2.5 mm long ..... ***C. species 1 ssp. 1***

Coleataenia anceps (Michaux) Soreng *ssp.* ***anceps***, Beaked Panic Grass. Mt (NC, SC, VA, WV), Pd (DE, NC, SC, VA), Cp (DE, FL, NC, SC, VA), {GA}: moist sandy woods, swamps, sloughs, roadsides, fields, waste places; common. June-October. NJ w. to IL, s. to FL and TX. The sheaths of ssp. *anceps* are glabrous to pilose, while those of ssp. *rhizomata* are often villous; the leaves of ssp. *rhizomata* also tend to be hairier. [= V; = *Sorengia anceps* (Michaux) Zuloaga & Morrone ssp. *anceps* – X; = *Panicum anceps* Michaux var. *anceps* – RAB, F, G, Z; < *P. anceps* – C, GW, K, W; = *P. anceps* ssp. *anceps* – FNA; = *P. anceps* – HC, S, WV]

Coleataenia anceps (Michaux) Soreng *ssp.* ***rhizomata*** (Hitchcock & Chase) Soreng, Small Beaked Panic Grass. Cp (FL, GA, NC, SC, VA): moist to dry sandy or loamy pinelands, ditches; common (rare in VA). July-October. Se. VA and KY s. to FL and TX. See note under ssp. *anceps*. [= V; = *Sorengia anceps* (Michaux) Zuloaga & Morrone ssp. *rhizomata* (Hitchcock & Chase) Zuloaga & Morrone – X; = *Panicum anceps* Michaux var. *rhizomatum* (A.S. Hitchcock & Chase) Fernald – RAB, F, G, Z; < *P. anceps* – C, GW, K; = *P. anceps* ssp. *rhizomatum* (A.S. Hitchcock & Chase) Freckmann & Lelong – FNA; = *P. rhizomatum* A.S. Hitchcock & Chase – HC, S]

Coleataenia longifolia (Torrey) Soreng *ssp.* ***combsii*** (Scribner & C.R. Ball) Soreng, Combs Panic Grass. Cp (DE, FL, GA, NC, SC, VA): pond shores, depression meadows, cypress savannas, marshes, low woods; uncommon (rare in DE and VA). July-October. Scattered on the outer Coastal Plain from se. MA, NJ, se. VA, se. NC, e. SC, e. GA, and FL, west to se. LA. First glumes of ssp. *combsii* typically are longer than 1.5 mm long, while those of ssp. *longifolia* are shorter than 1.5 mm long. [= V; = *Sorengia longifolia* (Torrey) Zuloaga & Morrone ssp. *combsii* (Scribner & C.R. Ball) Zuloaga & Morrone – X; = *Panicum longifolium* Torrey var. *combsii* (Scribner & C.R. Ball) Fernald – RAB, F, G; = *P. rigidulum* Bosc ex Nees ssp. *combsii* (Scribner & Ball) Freckmann & Lelong – FNA; = *P. rigidulum* Bosc ex Nees var. *combsii* (Scribner & C.R. Ball) Lelong – K, Z; < *P. longifolium* – C; = *P. combsii* Scribner & C.R. Ball – HC, S]

Coleataenia longifolia (Torrey) Soreng *ssp.* ***longifolia***, Long-leaved Panic Grass. Cp (DE, FL, GA, NC, SC, VA), Pd (GA, NC, SC, VA), Mt (NC, SC, VA): wet sandy or peaty soils of bogs, savannas, pond shores, depression meadows; common (uncommon in Piedmont, rare in Mountains). July-October. NS, NH, MA, PA, and IN south to FL, west to TX. See note under ssp. *combsii*. [= V; = *Sorengia longifolia* (Torrey) Zuloaga & Morrone ssp. *longifolia* – X; = *Panicum longifolium* Torrey var. *longifolium* – RAB, G; = *P. rigidulum* Bosc ex Nees ssp. *pubescens* (Vasey) Freckmann & Lelong – FNA; = *P. rigidulum* Bosc ex Nees var. *pubescens* (Vasey) Lelong – K, W, Z; < *P. longifolium* – C, GW; = *P. longifolium* – HC, S; > *P. longifolium* var. *longifolium* – F; > *P. longifolium* var. *pubescens* (Vasey) Fernald – F]

Coleataenia species 1 in prep. *ssp. 1* in prep., Dense Panic Grass. Cp (DE, FL, GA, NC, SC, VA): marshes, meadows, low woods, ditches, stream and pond shores, freshwater tidal shores; uncommon. September-October. Coastal Plain south from se. MA to FL, west to se. TX and AR; West Indies. Usually readily identified by its tall stature and compact inflorescence, somewhat resembling a large *P. hemitomon*, with which it occasionally occurs. [< *Coleataenia longifolia* (Torrey) Soreng ssp. *rigidula* (Bosc ex Nees) Soreng – V; < *Sorengia longifolia* (Torrey) Zuloaga & Morrone ssp. *rigidula* (Bosc ex Nees) Zuloaga & Morrone – X; = *P. agrostoides* Sprengel var. *condensum* (Nash) Fernald – RAB, F; < *P. rigidulum* – C, GW; < *P. rigidulum* Bosc ex Nees ssp. *rigidulum* – FNA; < *P. agrostoides* – G; = *P. condensum* Nash - HC, S; < *P. rigidulum* var. *rigidulum* – K, Z; = *Panicum rigidulum* Bosc ex Nees var. *condensum* (Nash) Mohlenbrock]

Coleataenia species 1 in prep. *ssp.* ***elongata*** (Pursh) Zuloaga & Morrone, Tall Flat Panic Grass. Pd (GA, NC, SC, VA), Cp (DE, GA, NC, SC, VA), Mt (GA, NC, SC, VA, WV): marshes, low woods, ditches, swamps, shores, meadows; common (uncommon in Coastal Plain, uncommon in Mountains, rare in DE). August-October. CT and NY west to IN, south to GA, LA, and ne. TX. [= *Coleataenia longifolia* (Torrey) Soreng ssp. *elongata* (Pursh) Soreng – V = *Sorengia longifolia* (Torrey) Zuloaga & Morrone ssp. *elongata* (Pursh) Zuloaga & Morrone – X; = *Panicum rigidulum* Bosc ex Nees var. *elongatum* (Pursh) Lelong – K, W, Z; = *P. stipitatum* Nash – RAB, F, HC, S, WV; = *P. rigidulum* Bosc ex Nees ssp. *elongatum* (Pursh) Freckmann & Lelong – FNA; < *P. rigidulum* – C, GW; = *P. agrostoides* Sprengel var. *elongatum* (Pursh) Scribner – G]

Coleataenia species 1 in prep. *ssp.* ***rigidula***, Redtop Panic Grass. Cp (DE, FL, GA, NC, SC, VA), Pd (DE, GA, NC, SC, VA), Mt (WV): wet sandy or peaty soils low woods, meadows, marshes, shores, swamps, ditches; common. July-October. ME and MI south to FL and TX; also in CA and BC; Central America. [< *Coleataenia longifolia* (Torrey) Soreng ssp. *rigidula* (Bosc ex Nees) Soreng – X < *Sorengia longifolia* (Torrey) Zuloaga & Morrone ssp. *rigidula* (Bosc ex Nees) Zuloaga & Morrone – X; = *Panicum rigidulum* Bosc ex Nees var. *rigidulum* – W; = *P. agrostoides* Sprengel var. *agrostoides* – RAB, G; < *P. rigidulum* Bosc ex Nees ssp. *rigidulum* – FNA; < *P. rigidulum* var. *rigidulum* – K, Z; < *P. rigidulum* – C, GW; > *P. agrostoides* var. *agrostoides* – F, HC; > *P. agrostoides* var. *ramosius* (C. Mohr) Fernald – F, HC; = *P. agrostoides* – S, WV]

Coleataenia tenera (Beyrich ex Trinius) Soreng, Southeastern Panic Grass. Cp (FL, GA, NC, SC): limesink ponds, depression meadows, cypress savannas, wet pinelands, bogs; uncommon (rare north of FL). June-September. Coastal Plain from se. NC to FL, west to e. TX; West Indies. The rhizomes produce lines of closely spaced culms. Though 0.5-1 m tall, the culms are narrow and inconspicuous. [= V; = *Sorengia tenera* (Beyrich ex Trinius) Zuloaga & Morrone – X; = *Panicum tenerum* Beyrich ex Trinius – RAB, FNA, GW, HC, K, S, Z]

Cortaderia Stapf 1897 (Pampasgrass)

A genus of ca. 20 species, native to South America. References: Allred in FNA (2003a).

* ***Cortaderia selloana*** (J.A. & J.H. Schultes) Ascherson & Graebner, Pampasgrass. Cp (GA, SC), Pd (GA): disturbed areas; rare, native of South America. This grass is a popular ornamental, rarely escaping. [= RAB, FNA, HC, K]

Crypsis Aiton (Pricklegrass)

A genus of 8 species, annuals, of Eurasia. References: Hammel & Reeder in FNA (2003b).

Crypsis schoenoides (Linnaeus) Lamarck, Swamp Pricklegrass. Pd (DE): disturbed areas; rare, native of Mediterranean Europe. [= C, FNA; = *Heleochloa schoenoides* (Linnaeus) Host – F, G, HC]

Ctenium Panzer 1813 (Toothache Grass)

A genus of about 20-22 species, of tropical and subtropical Africa and the Americas. References: Barkworth in FNA (2003a); Longhi-Wagner & Renvoize (2004).

1 Spikelets with numerous glands in rows on the back of the second glume; plant short-rhizomatous (nearly cespitose); [widespread in the Coastal Plain]..... ***Ct. aromaticum***

1 Spikelets with very few or no glands on the back of the second glume; plant rhizomatous (the rhizomes slender and scaly); [se. GA and ne. FL] .....***Ct. floridanum***

Ctenium aromaticum (Walter) Wood, Toothache Grass, Orange Grass. Cp (FL, GA, NC, SC, VA): wet savannas, pocosin-savanna ecotones, seepage bogs, sandhill-pocosin ecotones, sandhill seeps; common (rare in VA). June-August (or later in response to late summer fires). Southeastern Coastal Plain endemic: se. VA south to FL and west to LA and e. TX (Singhurst, Keith, & Holmes 2005). The entire plant is aromatic and numbs the mouth, tongue, and lips when chewed, hence the specific epithet and common names. Like many species of the longleaf pine ecosystem, toothache grass generally flowers only following

fire (MacRoberts & MacRoberts 1992). Sterile clumps can be recognized by the rather broad, bicolored leaves (bluish on the upper surface, bright green on the lower surface). [= RAB, C, F, FNA, G, GW, HC, K; = *Campulosus aromaticus* (Walter) Trinius – S]

Ctenium floridanum (A.S. Hitchcock) A.S. Hitchcock, Florida Toothache Grass. Cp (FL, GA): dry pinelands, sandhills, upper ecotones of pineland pools; rare. June-September. Southeastern Coastal Plain endemic: se. GA to ne. FL. Like *Ct. aromaticum*, generally flowering only following fire. [= FNA, GW, HC, K; = *Campulosus floridanus* A.S. Hitchcock – S]

Cynodon L.C. Richard 1805 (Bermuda Grass)

A genus of ca. 9 species, native to the tropical Old World. References: Barkworth in FNA (2003a).

* ***Cynodon dactylon*** (Linnaeus) Persoon *var.* ***dactylon***, Bermuda Grass, Scutch Grass. Cp (DE, FL, GA, NC, SC, VA), Pd (DE, GA, NC, SC, VA), Mt (GA, KY, NC, SC, VA, WV), Ip (KY): lawns, gardens, roadsides, pastures, fields, disturbed areas; common (uncommon in WV), native of Eurasia. May-October. [= FNA; < *C. dactylon* – RAB, C, F, G, HC, K, W, WV; < *Capriola dactylon* (Linnaeus) Kuntze – S]

Cynosurus Linnaeus 1753 (Dogtail)

A genus of 8 species, annuals and perennials, native of the Mediterranean region and w. Asia. References: Long in FNA (2007a); Tucker (1996)=Z.

1 Panicle linear-oblong, 1-10 (-14) cm long, 0.4-1 cm wide; leaves 1-3 (-4) mm wide; perennial; fertile lemma 3-4 mm long, plus a 0-1 mm long mucro; [section *Cynosurus*] ..... ***C. cristatus***
1 Panicle ovoid, 1-4 (-8) cm long, 0.7-2 cm wide; leaves (2-) 3-10 mm wide; annual; fertile lemma 4.5-7 mm long, plus a 6-16 mm long awn; [section *Falona*]..... ***C. echinatus***

* ***Cynosurus cristatus*** Linnaeus, Crested Dogtail. Mt (NC, WV), Pd (DE), {VA?}: lawns, roadsides; rare, native of Eurasia. June-July. [= RAB, C, F, FNA, G, HC, K, WV, Z]

* ***Cynosurus echinatus*** Linnaeus, Rough Dogtail, Bristly Dogtail. Cp (NC, SC, VA), Pd (GA, NC, SC, VA), Mt (GA, WV): lawns, roadsides; rare, native of Eurasia. May-June. [= RAB, C, F, FNA, HC, K, WV, Z]

Dactylis Linnaeus 1753 (Orchard Grass)

A genus of 1 variable species, perennial, native of Eurasia. References: Allred in FNA (2007a); Tucker (1996)=Z.

* ***Dactylis glomerata*** Linnaeus, Orchard Grass, Cock's-foot. Mt (GA, KY, NC, SC, VA, WV), Pd (DE, GA, NC, SC, VA), Ip (KY), Cp (DE, FL, KY, NC, SC, VA): pastures, fields, woodland edges, roadsides; common (rare in FL, uncommon in NC, SC, and GA Coastal Plain), native of Europe. May-October. In Europe there are various chromosome races, often accorded subspecies or species status. Their status in North America has been little investigated. See various references cited in Tucker (1996) for further information about these taxa in Europe. [= RAB, C, FNA, G, HC, S, W, WV; > *D. glomerata* var. *glomerata* – F; > *D. glomerata* var. *detonsa* Fries – F; > *D. glomerata* var. *ciliata* Petermann – F; > *D. glomerata* ssp. *glomerata* – K, Z; > *D. glomerata* ssp. *aschersoniana* (Graebner) Thellung – K; > *D. aschersoniana* Graebner]

Dactyloctenium Willdenow 1809 (Crowfoot Grass)

A genus of 1-13 species, of Africa and Australia. References: Hatch in FNA (2003a).

1 Panicle branches 1.5-6 cm long, well-separated from each other at their tips ..... ***D. aegyptium***
1 Panicle branches 0.4-1.5 cm long, the spikelets of each mostly in contact with the spikelets of adjacent branches ..... ***D. radulans***

* ***Dactyloctenium aegyptium*** (Linnaeus) Willdenow, Crowfoot Grass. Cp (FL, GA, NC, SC, VA), Pd (GA, NC, SC): lawns, roadsides, disturbed areas; common (rare in VA), native of Old World tropics. June-November. [= RAB, C, F, FNA, G, HC, K, S]

* ***Dactyloctenium radulans*** (R. Brown) Palisot de Beauvois, Buttongrass. Cp (SC): waste areas at wool-combing mills; rare, native of Australia. May-July. Collected repeatedly from 1957-1960 at the Santee Wool Combing Mill, Jamestown, Berkeley County, SC. [= FNA, K]

Danthonia A.P. de Candolle 1805 (Oat-grass)

A genus of about 20 species, of North America, Europe, and the Americas, but the generic limits are unclear. References: Darbyshire in FNA (2003a).

1 Lemma teeth (flanking the awn) 0.8-1.8 mm long, triangular, acuminate; glumes 8-13 mm long ..... ***D. spicata***
1 Lemma teeth (flanking the awn) (1.8-) 2.0-4.5 mm long, setaceous; glumes 9-19 mm long.

2 Lemma awn 4-10 mm long; glumes 9-13 mm long ..... ***D. compressa***
2 Lemma awn 11-18 mm long; glumes 11-19 mm long.
3 Sheaths villous; lemmas herbaceous in texture, villous on the back and sides; awn twisted at base several times, forming an awn column 2.5-3 mm long ..... ***D. sericea***
3 Sheaths glabrous; lemmas membranaceous in texture, villous only on the margins and towards the base; awn twisted at base a single time, forming a loose awn column 0.5-1.5 mm long ..... ***D. epilis***

Danthonia compressa Austin ex Peck, Mountain Oat-grass, Allegheny Flyback. Mt (GA, KY, NC, SC, TN, VA, WV), Pd (DE, GA, NC, SC, VA), Cp (VA), Ip (KY, TN): grassy balds, thin soils around rock outcrops, woodlands; common (uncommon in Piedmont, rare in Coastal Plain and Interior Low Plateau, rare in DE). June-August. NS, QC and ON south to SC, GA, and AL. [= RAB, C, F, FNA, G, HC, K, S, W, WV]

Danthonia epilis Scribner, Bog Oat-grass. Cp (NC, SC, VA), Mt (AL, GA, NC, TN, VA?), Pd (NC): peaty bogs in the Coastal Plain and Mountains, seeps around rock outcrops in the Piedmont and Mountains, granitic domes; rare. April-June. The range is apparently bogs in pinelands from NJ to SC, in mountain bogs in NC, VA (?), and GA, in seepage in the Cumberland Plateau and Blue Ridge of TN and AL. This taxon appears to be valid, with a distinct range, habitat, and variety of morphologic characters separating it from *D. sericea*, but further study is needed. Material from the mountains seems to differ from Coastal Plain material. RAB's description of the habitat as "dry woods, rare; pied. of N.C." appears to be in error. Blomquist listed the taxon (as a variety) for bogs in the mountains of sw. NC. It has since been found in bogs in the Sandhills region of NC and in seepage bogs in the adjacent Piedmont. [= F, HC, K, S; = *D. sericea* var. *epilis* (Scribner) Blomquist – RAB, C; < *D. sericea* Nuttall – FNA]

Danthonia sericea Nuttall, Silky Oat-grass. Cp (DE, FL, GA, NC, SC, VA), Pd (GA, NC, SC, VA), Mt (GA, KY, NC, SC, TN, VA), Ip (KY, TN): dry woodlands, especially common in sandy soils in the Coastal Plain, dry oak, oak-pine, and pine forests in the Piedmont and low Mountains; common (uncommon in the Mountains and Interior Low Plateau, rare in DE). April-June. Primarily a Coastal Plain species northwards, ranging from e. MA south to FL and west to LA. [= F, HC, K, S, W; = *D. sericea* var. *sericea* – RAB, C, G; < *D. sericea* – FNA] {AL, LA, MS}

Danthonia spicata (Linnaeus) Palisot de Beauvois ex Roemer & J.A. Schultes, Poverty Oat-grass, Moonshine Grass. Mt (GA, KY, NC, SC, TN, VA, WV), Pd (DE, GA, NC, SC, VA), Cp (DE, FL, KY, NC, SC, TN, VA), Ip (KY, TN): dry woodlands, rock outcrops, shale barrens; common (rare in FL). May-August. NL (Newfoundland) and BC south to FL and NM. [= RAB, C, FNA, G, HC, K, S, W, WV; > *D. spicata* var. *longipila* Lamson-Scribner & Merrill – F; > *D. spicata* var. *spicata* – F; < *D. allenii* Austin – F]

Deschampsia Palisot de Beauvois 1812 (Hairgrass)

A genus of about 20-40 species, perennials and annuals, north and south temperate. References: Barkworth in FNA (2007a); Tucker (1996)=Z. [also see *Avenella*]

1 Awn 4-8 mm long, geniculate, exserted beyond the tips of the glumes; lemmas minutely scabrous, dull; leaf blades involute, appearing filiform (rounded in cross-section); ligule 0.5-3 (-5) mm long; [section *Avenaria*] ..... [see ***Avenella***]
1 Awn 2-3 mm long, straight or nearly so, scarcely (or not at all) exserted beyond the tips of the glumes; lemmas smooth, shiny; leaf blades flat or folded at the midvein (V-shaped in cross-section); ligule 3-10 (-17) mm long ..... ***D. cespitosa*** *ssp.* ***glauca***

Deschampsia cespitosa (Linnaeus) Palisot de Beauvois *ssp.* ***glauca*** (Hartman) Hartman, Tufted Hairgrass. Mt (NC, VA, WV), Ip (KY): thin soil of rock outcrops or barrens over calcareous, mafic, and ultramafic rocks (such as serpentinized olivine, amphibolite, limestone, and dolostone), seepages; rare. June-July. *D. cespitosa* is a complex species, with a complicated polyploid and aneuploid series, variously subdivided (or not) by various taxonomists. As a whole, *D. cespitosa* is circumboreal, ranging south in North America to NJ, sw. NC, WV, c. KY, IL, MN, and AZ. Ssp. *glauca* is the most widespread American subspecies, and extends the farthest south. Other subspecies occur farther north and in Eurasia. In our area, *D. cespitosa* is at its southern limit and is a rare species limited to barrens and outcrops over mafic or ultramafic rocks. Barkworth in FNA (2007a) states that there is no legitimate name available for this taxon. [= K; = *D. caespitosa* var. *glauca* (Hartman) Lindman f. – RAB, F, WV; < *D. cespitosa* ssp. *cespitosa* – FNA; < *D. cespitosa* – C, Z; < *D. cespitosa* var. *cespitosa* – G; < *D. caespitosa* var. *caespitosa* – HC; = *D. cespitosa* ssp. *cespitosa* var. *glauca* (Hartman) Lindman f.; < *Aira caespitosa* Linnaeus – S; < *D. caespitosa* – W]

* *Deschampsia elongata* (Hooker) Munro, Slender Hairgrass. Cp (SC): waste areas near wool-combing mills; rare, perhaps only a waif, native of w. North America. [= FNA, HC, K] {not keyed}

Desmazeria Dumortier 1822

A genus of about 7 species, annuals, native of the Mediterranean region. References: Tucker in FNA (2007a); Soreng et al. (2003)=Z.

* ***Desmazeria rigida*** (Linnaeus) Tutin, Fern Grass. Cp (FL, SC): waste areas around wool-combing mills, other disturbed areas; rare, perhaps only a waif, native of Mediterranean Europe. [= FNA, K; = *Catapodium rigidum* (Linnaeus) Dony – Z; = *Scleropoa rigida* (Linnaeus) Grisebach]

Diarrhena Palisot de Beauvois 1812 (Beakgrain, Twingrass)

Depending on circumscription, a genus of either 2 species of perennial grasses of e. North America, or of ca. 6 species of e. North America and e. Asia. References: Brandenburg in FNA (2007a); Brandenburg, Estes, & Collins (1991)=Z. Key from Z.

1 Callous pubescent on all mature lemmas except the first; lemmas widest below the middle and gradually tapering into a cusp at the apex, those of the first floret 7.1-10.8 mm long; mature fruit 1.3-1.8 mm broad, gradually tapering into a broad, blunt beak ..... ***D. americana***
1 Callous glabrous on all mature lemmas; lemmas widest near or above the middle and more-or-less abruptly contracted into a cusp at the apex, those of the first floret 4.6-7.5 mm long; mature fruit 1.8-2.5 mm broad, abruptly contracted into a bottlenose-shaped beak..... ***D. obovata***

Diarrhena americana Palisot de Beauvois, Eastern Beakgrain. Ip (KY, TN), Mt (GA, NC, TN, VA, WV): rich moist forests, usually over calcareous rocks; uncommon (rare in NC and VA, rare in TN Mountains). July-August; August-October. W. VA and WV west to IN, south to TN, sw. NC, and nw. GA (Jones & Coile 1988); disjunct in MO. This species forms large clonal patches. [= K, Z; = *Diarrhena americana* var. *americana* – C, G, WV; < *Diarrhena americana* – F, HC, W; < *Diarina festucoides* Rafinesque – S]

Diarrhena obovata (Gleason) Brandenburg, Western Beakgrain. Mt (WV), Pd (VA), Ip (KY, TN): alluvial forests, other moist forests; rare. July-August; August-October. Sw. PA and IN west to SD, KA, south to w. VA, c. TN, and ne. TX. First reported for VA by Fleming & Ludwig (1996). The floodplain of the Potomac River (in Fairfax County, VA) has a number of disjuncts of species with more midwestern affinities, including *Diarrhena obovata, Erigenia bulbosa, Valeriana pauciflora,* and *Erythronium albidum* (Fleming & Ludwig 1996). [= K, Z; = *Diarrhena americana* var. *obovata* Gleason – C, G, WV; < *Diarrhena americana* – F, HC, W; < *Diarina festucoides* Rafinesque – S]

Dichanthelium (A.S. Hitchcock & Chase) Gould 1974 (Witch-grass)

(by Richard J. LeBlond)

A genus of 70-100 species, perennials, of temperate and tropical America. References: Gould and Clark (1978)=Z; Freckmann (1981)=Y; Lelong (1984)=X; LeBlond (2001)=Q; Davidse and Polh (1992); Hansen & Wunderlin (1988); Hitchcock & Chase (1910); Freckmann & Lelong (2002). The treatment of *Dichanthelium* sect. *Lanuginosa* (=*D. acuminatum* group) is based closely on Y. The contributor must take responsibility for the treatment of sect. *Angustifolia* (including *D. hirstii*), sections *Dichotoma* and *Ensifolia* (the *D. dichotomum* group), and for sect. *Lancearia*. Other treatments are based largely on Z.

"We admit that our failure to distinguish the several named taxa ... was born of despair!" – Godfrey & Wooten (1979).

"The recognition of only four species and six varieties in this complex [*sabulorum*] to which almost 50 species names have been applied admittedly is somewhat arbitrary and certainly not entirely satisfactory." – Gould & Clark (1978).

Identification notes: *Dichanthelium* has often been treated as subgenus *Dichanthelium* of *Panicum*. It is most readily (though not consistently) separated from *Panicum* by the following combination of features: plants producing over-wintering rosettes of leaves often shorter and broader than the culm leaves; plants producing simple culms with terminal panicles in spring, the culms branching and producing panicles only on branches in the summer and autumn.

Perhaps the most complex and confusing genus in our region, *Dichanthelium* requires careful collection and close observation of several characters to determine to which taxon a specimen belongs, or at least to which taxa it seems most closely aligned. A taxon that is distinct in one part of its range may be indistinguishable from another taxon elsewhere. This is particularly true of Coastal Plain species adapted to natural (and now human) disturbances. Although hybridization is frequently suspected in *Dichanthelium*, documentation of natural hybrids is rare.

When collecting specimens in the field, mature spikelets are essential. This is determined by examining the usually whitish fertile lemma, which is firm and plump at maturity. Immature spikelets often are longer than mature ones (they shorten as they fatten); only mature spikelet length is used in the various manuals and keys. It is also important to note whether a plant is in its "vernal" or "autumnal" fruiting phase before collecting. "Vernal" plants produce panicles only at the summits of the culms (typically April-June). "Autumnal" plants produce panicles from leafy axillary branches below the summit (typically July-September). The autumnal panicles in most species are much smaller than the vernal panicles (and often hidden by fascicled leaves), but the spikelets are the same. When collecting autumnal plants, it is important to select specimens still possessing their vernal leaf blades and panicles, even though these will likely be senescent. It is also important to collect the whole plant, with the basal rosette intact (whether senescent or of current year's growth). When several plants are growing together, compare the culm, leaf, and spikelet features for differences; *Dichanthelium* taxa are gregarious.

When analyzing the character of the culm internodes and nodes, look at the first elongate internode above the base (the lowest internode is often very short and uncharacteristic). Determining whether a node is bearded is often difficult. A bearded node usually is characterized by pubescence that is longer and of a different orientation or structure than that of the internodes and sheaths. Nodes with short pubescence generally are not regarded as bearded. Lower nodes are more likely to be bearded than upper nodes. Some internodes are described as “crisp-puberulent.” This condition is characterized by a dense covering of minute hairs mostly less than 0.1 mm long, and usually crimped or curved. Glandular hairs or protuberences are often intermixed. When analyzing sheaths, look at those on the lower half of the culm. Senescent vernal sheaths often lose their pubescence (though in some species hair papillae are evident). All references in the key to sheath glabrousness or pubescence is without regard to the presence or absence of marginal hairs (cilia). A sheath that is glabrous except for marginal cilia is called glabrous. All culm leaves should be analyzed for blade characters; in general, the key relies on the size and character of the vernal blades. A "cordate" blade is one where the basal lobes of the blade extend outward and partially surround the culm when the culm is enclosed by the sheath. As with sheaths, references in the key to blade glabrousness or pubescence is without regard to marginal cilia. The ligule is an important diagnostic character for many *Dichanthelium* taxa; at least three ligules per specimen should be examined before making conclusions about its structure and length. Ligules form a distinct ring from a cartilaginous base at the inner summit of the sheath; in some species the ligule is membranous, but in most it is pubescent. Care must be taken to distinguish the pubescence of the ligule from any pubescence emanating from the inner surface of the blade base, and from marginal cilia. Ligules of senescent vernal leaves frequently lose their integrity. Spikelet shape as well

as length should be determined only from mature spikelets. Measure the length from the base of the first glume (usually at an articulation) to the apex of the second glume or sterile lemma (whichever is longer). A micrometer is essential for determining the length of spikelets, first glumes, ligules, and various pilosity features. Sometimes one-tenth of a millimeter is all that separates two *Dichanthelium* taxa.

Certain characters, particularly node bearding, cordate/non-cordate blade bases, and ligule length, can be quite variable, and an effort has been made to account for this variability in the key. Nonetheless, some specimens just won't "fit," and the road not taken may have to be reconsidered.

1 Plants densely tufted, often cushion-forming; leaves basally disposed, the blades ascending or spreading-ascending, not forming a distinct rosette of basal leaves shorter than the culm leaves; autumnal culms branching basally or from the lower nodes ..... **Key A**
1 Plants less densely or sparsely tufted, not cushion-forming; leaves well-distributed on the culm, usually much longer than the short, often broad and spreading basal rosette leaves; autumnal culms usually branching from the mid and upper nodes.
2 Spikelets 3.3-5.2 mm long ..... **Key B**
2 Spikelets 0.8-3.2 mm long.
3 Spikelets 0.8-2.0 mm long.
4 Lower culm internodes variously hairy ..... **Key F**
4 Lower culm internodes glabrous ..... **Key G**
3 Spikelets 2.1-3.2 mm long.
5 Larger culm blades 13-25 mm wide ..... **Key C**
5 Larger culm blades < 13 mm wide.
6 Culm nodes (at least the lower) bearded ..... **Key D**
6 Culm nodes not bearded, the lowermost sometimes puberulent or sparsely hairy ..... **Key E**

Key A - Plants densely tufted, often cushion-forming; leaves basally disposed, the blades ascending or spreading-ascending, not forming a distinct rosette of basal leaves shorter than the culm leaves; autumnal culms branching basally or from the lower nodes

1 Spikelets 2.4-4.5 mm long.
2 Nodes, internodes, and sheaths glabrous; blades 4-13 cm, 5-8 mm, the surfaces smooth, glabrous; spikelets 2.4-2.9 mm long, glabrous; not known to produce axillary (autumnal) inflorescences ..... ***[D. nudicaule]***
2 Nodes bearded or otherwise pubescent; internodes and sheaths variously pubescent to glabrate; blades 6-35 cm, 2-5 mm, one or both surfaces scabrous and often pubescent; spikelets 1.7-4.5 mm long, glabrous or pubescent; plants produce axillary (autumnal) inflorescences.
3 Spikelets 2.8-3.8 (-4.5) mm long, the second glume and sterile lemma pointed or beaked and extended beyond the summit of the fertile lemma; first glume 1.2-2 mm long ..... ***D. depauperatum***
3 Spikelets 1.7-2.8 mm long, the second glume and sterile lemma blunt or broadly pointed, not extending beyond the summit of the fertile lemma; first glume 0.7-1.2 mm long ..... ***D. linearifolium***
1 Spikelets 0.9-2.3 mm long.
4 Longer blades > 6 cm; if only 6 cm, then sheaths retrorsely long-pilose (*D. laxiflorum*).
5 Spikelets 1.2-1.5 mm long, glabrous ..... ***[D. dichotomum*** *var.* ***glabrifolium]***
5 Spikelets 1.7-2.3 (-2.8) mm long, pubescent.
6 Longer blades 10-35 cm long, 2-4 mm wide; sheaths glabrous to variously pilose, but not conspicuously retrorsely long-pilose; nodes variously pubescent to glabrate; spikelets 1.7-2.3 (-2.8) mm long ..... ***D. linearifolium***
6 Longer blades 6-18 cm long, 7-12 mm wide; sheaths conspicuously retrorsely long-pilose; nodes bearded with retrorse or spreading hairs; spikelets 1.9-2.3 mm long ..... ***D. laxiflorum***
4 Longer blades 1.5-6 cm; sheaths glabrous or pubescent, but not retrorsely long-pilose.
7 Blades 1-3 mm wide, glabrous, eciliate or basally ciliate; spikelets 0.9-1.4 mm long.
8 Spikelets pubescent, 1.2-1.4 mm long; blades involute, often falcate, 2.5-6 cm long ..... ***[D. chamaelonche*** *ssp.* ***breve]***
8 Spikelets glabrous, 0.9-1.2 mm long; blades flat, not falcate, 1.5-4 (-5) cm long ..... ***D. chamaelonche*** *ssp.* ***chamaelonche***
7 Blades 3-8 mm wide; spikelets 1.1-2.1 mm long (if < 1.5 mm, then blades either pubescent on one or both surfaces or ciliate to the apex).
9 Spikelets pubescent, 1.5-2.1 mm long; blade surfaces glabrous ..... ***D. strigosum*** *var.* ***leucoblepharis***
9 Spikelets glabrous, 1.1-1.8 mm long; blade surfaces pubescent or glabrous.
10 Blades glabrous, or sparsely pilose only near the adaxial base; spikelets 1.4-1.8 mm long ..... ***D. strigosum*** *var.* ***glabrescens***
10 Blades pilose, at least abaxially; spikelets 1.1-1.6 mm long ..... ***D. strigosum*** *var.* ***strigosum***

Key B - Spikelets 3.3-5.2 mm long

1 Nodes (at least lower) densely bearded with retrorse hairs; spikelets 3.7-5.2 mm long.
2 Ligule 2.5-4 mm long; internodes pubescent with long ascending or spreading hairs; blades 8-15 cm long, 10-25 mm wide; first glume 1.8-2.5 mm long ..... ***D. ravenelii***
2 Ligule 0.4-0.9 (-1.3) mm long; internodes glabrous to puberulent; blades 7-12 cm long 12-40 mm wide; first glume 1.5-2.2 mm long ..... ***D. boscii***
1 Nodes glabrous, pubescent, or sparsely pilose; spikelets (2.4-) 3.3-4.2 mm long.
3 Ligule 1.6-3 mm long; blades 4-9 mm wide, > 10× as long as wide ..... ***D. oligosanthes*** *var.* ***oligosanthes***
3 Ligule 0.3-1.5 mm long; if larger blades < 9 mm wide and mostly 15× or more as long, then ligule 0.5-1 mm long (*D. fusiforme*).
4 Larger blades 2-6 (-8) mm wide, mostly 15× or more as long as wide; spikelets fusiform to elliptic, acute, basally constricted ..... ***D. fusiforme***
4 Larger blades 6-35 mm wide, mostly 10× or less as long as wide; spikelets broadly elliptic to obovate, rounded to sub-acute, not basally constricted.
5 Spikelets strongly papillose-hispid with spreading hairs 0.5-1 mm long; blades papillose-hispid ..... ***[D. leibergii]***
5 Spikelets glabrous to pubescent with hairs < 0.5 mm long; blades glabrous, scabrous, or pubsecent.
6 Ligules 1-1.5 mm long; blades 5-10 cm long by 6-15 mm wide, glabrous or pubescent, basally rounded; spikelets glabrous to pubescent ..... ***D. oligosanthes*** *var.* ***scribnerianum***

6 Ligules 0.3-1 mm long; blades 7-35 cm long by 8-35 mm wide, glabrous or scabrous, basally cordate or rounded; spikelets pubescent to glabrate.
7 Sheaths (at least lower) papillose-hispid with spreading hairs; ligule 0.5-1.2 mm long, an eciliate membrane; culm blades 10-28 cm long; spikelets 2.4-3.6 mm long; first glume 1.2-.18 mm long.....***D. clandestinum***
7 Sheaths glabrous or pubescent (the upper papillose-pubescent in *D. xanthophysum*); ligules 0-0.7 mm long, ciliate if more than 0.3 mm long; culm blades 5-18 cm long; spikelets 2.2-4.1 mm long; first glume 0.7-2.6 mm long.
8 Upper sheaths glabrous to softly villous basally; ligules 0.4-0.7 mm long, a short-ciliate membrane; culm blades 15-40 mm wide, the bases cordate-clasping; panicle usually more than half as wide as long.....***D. latifolium***
8 Upper sheaths glabrous, puberulent, or papillose-pubescent; ligules 0-0.5 mm long, eciliate or ciliate; culm blades 5-25 mm wide, the bases cordate-clasping or rounded; panicles less or more than half as wide as long.
9 Upper sheaths glabrous or puberulent; ligules 0.1-0.3 mm long, eciliate; culm blade bases cordate-clasping; panicles usually more than half as wide as long; spikelets 2.2-3.7 mm long, ellipsoid, pointed ...***D. commutatum** var. **commutatum***
9 Upper sheaths papillose-pubescent; ligules 0.3-0.5 mm long, ciliate; culm blade bases rounded; panicles usually less than half as wide as long; spikelets 3.2-4.1 mm long, obovoid, blunt.....***[D. xanthophysum]***

Key C - Spikelets 2.1-3.2 mm long, larger leaves 13-25 mm wide

1 Culm nodes, at least the lower, bearded (often retrorsely).
2 Ligule a stramineous to light brown membrane (with or without ciliate or lacerate extensions); peduncle and often internodes scabrous.....***D. scabriusculum***
2 Ligule entirely of white hairs; peduncle and internodes either smooth or densely hairy (velvety).
3 Lower internodes glabrous, without a viscid band below the nodes; larger blades 7-15 mm wide.....***D. dichotomum*** group
3 Lower internodes densely hairy except for a viscid band below the nodes; larger blades 10-20 mm wide.....***D. scoparium***
1 Culm nodes glabrous or slightly hairy, but not bearded.
4 Second glume and sterile lemma acute to short-acuminate, conspicuously longer than the fertile lemma; spikelets glabrous (occasionally sparsely pubescent in *D. scabriusculum*).
5 Panicle rachis pellucid-punctate; ligule a stramineous to light brown membrane, with or without terminal ciliations; peduncle and often internodes scabrous; first glume 0.3-0.6 (-0.8) mm long, reniform to suborbicular.....***D. scabriusculum***
5 Panicle rachis not pellucid-punctate; ligule entirely of white hairs; peduncle and internodes smooth; first glume 0.7-1.2 mm long, ovate to lanceolate.....***D. yadkinense***
4 Second glume and sterile lemma blunt to subacute, shorter than, equaling, or barely exceeding the fertile lemma; spikelets pubescent (sometimes sparsely so in *D. clandestinum*).
6 Sheaths, at least the lower, papillose-hispid with spreading hairs; blades 10-28 cm long.....***D. clandestinum***
6 Sheaths glabrous, puberulent, finely pubescent, or sparsely pilose; blades 5-18 cm long.
7 Ligule 0-0.3 mm long; spikelets 2.2-3.7 mm long, 1.1-1.3 mm wide; first glume 0.6-2.6 mm long.....***D. commutatum var. commutatum***
7 Ligule 0.4-0.7 mm long; spikelets 2.9-3.9 mm long, 1.6-2.0 mm wide; first glume 1.5-2.2 mm long.....***D. latifolium***

Key D - Spikelets 2.1-3.2 mm long, larger culm blades < 13 mm wide, at least the lower culm nodes bearded with a usually spreading-ascending collar of dense and/or longish hairs

1 Ligule with a dense ring of short hairs 0.5-1 mm long in front of a usually less dense ring of longer hairs (pseudoligule) 1-5 mm long.
2 Nodes retrorsely bearded; internode and sheath hairs spreading to restrorse; blade surfaces velvety-pubescent or long-pilose.
3 Spikelets 2.5-3.2 mm long; longer hairs of pseudoligule 1-3 mm long; blade surfaces velvety-pubescent; panicle rachis densely pubescent; [of cedar glades and dry limestone soils].....***[D. malacophyllum]***
3 Spikelets 1.8-2.5 mm long; longer hairs of pseudoligule 3-5 mm long; blade surfaces long-pilose; panicle rachis sparsely pilose; [of dry sandy soil of pine and oak woodlands].....***D. villosissimum** var. **villosissimum***
2 Node beard hairs spreading to ascending; internode and sheath hairs ascending to appressed; blade surfaces glabrate to appressed-pubescent.
4 Spikelets 2.5-3.1 mm long; lower culm blades usually glabrous adaxially except for long hairs at or near the margin (appearing ciliate), appressed-pubescent abaxially.....***D. ovale** var. **ovale***
4 Spikelets 2.1-2.6 mm long; lower culm blades usually sparsely appressed-pubescent on both surfaces, eciliate or ciliate at the base only.....***D. ovale** var. **addisonii***
1 Ligule a single structure, without a pseudoligule.
5 Ligule 2-5 mm long, ciliate.....***D. acuminatum* group**
5 Ligule < 2 mm long, ciliate or membranous.
6 Ligule a stramineous to light brown membrane, with or without terminal ciliations; peduncle antrorsely scabrous but not hairy.
7 Panicle rachis smooth, pellucid-punctate; first glume 0.3-0.6 (-0.8) mm long, as broad as or broader than long, truncate to obtuse; larger leaves 10-25 cm long, 8-15 mm wide; ligule 0.5-1.3 mm long; lowest elongate culm internode > 2 mm in diameter; lowest nodes usually glabrous or pubescent.....***D. scabriusculum***
7 Panicle rachis scabrous or smooth, not pellucid-punctate; first glume 0.5-1.1 mm long, longer than wide, rounded to acute; larger leaves 3.5-12 cm long, 3-9 mm wide; ligule 0.1-0.6 mm long; lowest elongate culm internode < 2 mm in diameter; lowest nodes retrorsely bearded or glabrous.
8 Lowest nodes usually retrorsely bearded; ligules (0.1-) 0.3-0.6 mm long; largest vernal blades 7-12 cm long, (4.5-) 6-9 mm wide; panicle peduncle scabrous; spikelets ovate-lanceolate, acute, 2.0-2.4 mm long; first glume lanceolate, blunt to acute; fertile lemma smooth.....***D. species 9 (=cryptanthum)***
8 Lowest nodes usually glabrous; ligules 0.1-0.2 (-0.3) mm long; largest vernal blades 3.5-7 cm long, 3-6 mm wide; panicle peduncle smooth; spikelets elliptic, blunt to acute, 1.6-2.2 mm long; first glume ovate to rotund, rounded to acute; fertile lemma papillose.....***D. lucidum***
6 Ligule entirely of white hairs; peduncle variously hairy or glabrous, but not antrorsely scabrous.
9 Culms to 1.5 m tall, with a broad, glabrous, viscid band below the nodes; blades of the lower leaves typically villous or velvety-pubescent.....***D. scoparium***

9 Culms rarely exceeding 1 m, without a viscid band below the nodes; blades various.
10 Sheaths retrorsely pilose with hairs 2-3 mm long; basal leaves usually numerous, ascending, similar in size and shape to the culm leaves; culms branching only at the base ..... ***D. laxiflorum***
10 Sheaths glabrous or pilose (if pilose, then hairs not both retrorse and 2-3 mm long); basal leaves rosette-forming, usually much smaller than the culm leaves; culms branching at the nodes in age.
11 Culm internodes glabrous to sparsely pilose; culm nodes bearded with long retrorse hairs; blade surfaces glabrous to velvety-pubescent ..... ***D. dichotomum* group**
11 Culm internodes, at least the lower, strigose, pilose, or villous; culm nodes bearded with ascending or spreading hairs; blade surfaces glabrous or variously hairy.
12 Lower and often mid-culm nodes bearded with spreading, stiffish, and short-to-long hairs; mid-culm blades usually 15× or less as long as wide.
13 Blades stiff, often longitudinally ribbed, at least the lower villous or strongly pilose on the abaxial surface, and usually strongly pilose at least basally on the adaxial surface ..... ***D. consanguineum***
13 Blades not noticeably stiff nor longitudinally ribbed, pubescent or strigose underneath, glabrous above or with a few long hairs near the base.
14 Spikelets 2.5-3.1 mm long; lower culm blades usually glabrous adaxially except for long hairs at or near the margin (appearing ciliate), appressed-pubescent abaxially ..... ***D. ovale*** *var.* ***ovale***
14 Spikelets 2.1-2.6 mm long; lower culm blades usually sparsely appressed-pubescent on both surfaces, eciliate or ciliate at the base only ..... ***D. ovale*** *var.* ***addisonii***
12 Lower nodes bearded with erect-ascending, soft, and long hairs; mid-culm blades usually 20× or more as long as wide.
15 Spikelets 2.9-4.0 mm long, fusiform to elliptic, acute, basally constricted; first glume 1.4-2.6 mm long ..... ***D. fusiforme***
15 Spikelets 1.5-3.1 mm long, obovate to elliptic-obovate, obtuse to sub-acute, not basally constricted; first glume 0.6-1.5 mm long.
16 Spikelets 1.5-2.2 mm long; first glume 0.6-0.8 mm long; longer cauline blades 4-8 cm, 2-5 mm wide, <20× as long as wide; lower cauline leaves glabrous to sparsely pilose abaxially; autumnal leaves involute... ***D. aciculare*** *ssp.* ***aciculare***
16 Spikelets 2.1-3.1 mm long; first glume 0.7-1.5 mm long; longer cauline blades 7-12 (-15) cm, 3-8 mm wide, <20×->20× as long as wide; lower cauline leaves often villous abaxially (especially in *D. species 1=arenicoloides*); autumnal leaves involute or flat.
17 Cauline blades 4-8 mm wide, averaging 15-20 × as long as wide; autumnal blades flat; spikelets 2.3-3.1 mm long; first glume 0.8-1.5 mm long ..... ***D. angustifolium***
17 Cauline blades 3-4 (-5) mm wide, averaging >20 × as long as wide; autumnal blades usually involute; spikelets 2.1-2.5 (-2.8) mm long ..... ***D. species 1=arenicoloides***
15 Spikelets (3.0-) 3.2-3.8 mm long, fusiform, pointed at summit, attenuate at base, with both glumes attached 0.3-0.5 mm below sterile lemma, the autumnal spikelets 3.5-3.8 mm long; larger vernal blades 3-6 mm wide, the lower and mid-culm blades of similar width; autumnal blades involute ..... ***D. fusiforme***
15 Spikelets 1.8-3.1 mm long, obovate, blunt, and the base not attenuate except in *D. species 1=arenicoloides* with autumnal spikelets 2.3-3.1 mm long; larger vernal blades 2-8 mm wide, the lower usually wider and often shorter than mid-culm blades; autumnal blades involute or flat.
16 Longest vernal blades to 16 cm, widest vernal blades 4-8 mm, usually longitudinally wrinkled; vernal and autumnal spikelets 2.3-3.1 mm long; autumnal blades flat, the larger to 9 cm × 2-4 mm ..... ***D. angustifolium***
16 Longest vernal blades to 6 (*D. aciculare*) or 12 (*D. species 1=arenicoloides*) cm long, 2-5 mm wide, not noticeably wrinkled; vernal spikelets 1.5-2.8 mm long, autumnal spikelets either 1.5-2.3 (*D. aciculare*) or 2.3-3.1 (*D. species 1=arenicoloides*); autumnal blades involute, the larger to 6 cm × 1.5 mm.
17 Longest vernal blades to 6 (-8) cm, widest vernal blades 2-5 mm; vernal and autumnal spikelets 1.7-2.3 mm long, blunt, not attenuate, the glumes attached <0.2 mm below sterile lemma; first glumes 0.6-0.9 mm long; larger autumnal blades to 3 cm by 1 mm ..... ***D. aciculare***
17 Longest vernal blades to 12 cm, widest vernal blades 3-4 (-5) mm; vernal spikelets 2.1-2.8 mm long; autumnal spikelets 2.3-3.1 mm long, pointed, attenuate, the glumes attached 0.3-0.5 mm below sterile lemma; first glumes 0.7-1.5 mm long; larger autumnal blades to 6 cm by 1.5 mm ..... ***D. species 1=arenicoloides***

Key E - Spikelets 2.1-3.2 mm long, larger culm blades < 13 mm wide, culm nodes not bearded, the lowermost sometimes puberulent or sparsely pilose

1 Ligule 1.6-4 mm long ..... ***D. oligosanthes*** *var.* ***oligosanthes***
1 Ligule < 1.5 mm long.
2 Blades, at least the lower, cordate or subcordate at the base, mostly 6-12 mm wide.
3 Spikelets obpyriform when viewed dorsally, strongly plano-convex when viewed laterally, usually markedly reddish-purple basally; fertile lemma papillose ..... ***D. species 2 (=webberianum)***
3 Spikelets elliptic to elliptic-obovoid when viewed dorsally or laterally, greenish to faintly purple-tinged basally; fertile lemma not papillose.
4 Internodes crisp-puberulent; ligules 0-0.3 mm long, eciliate; larger culm blades 4-8 (-11) cm long, 5-10 (-12) mm wide, broadest near the base; spikelets 2.1-2.7 mm long; first glumes 0.7-0.9 mm long ..... ***D. commutatum*** *var.* ***ashei***
4 Internodes glabrous to sparsely pubescent; ligules either 0-0.3 mm long and eciliate, or about 0.5 mm long and ciliate; larger culm blades 5-16 mm long, 6-25 mm wide, broadest above the base or broadly linear; spikelets 2-3.7 mm long; first glumes 0.5-2.6 mm long.
5 Ligule 0-0.3 mm long, eciliate; larger culm blades 5-25 mm wide; spikelets 2.2-3.7 mm long; first glumes 0.6-2.6 mm long ..... ***D. commutatum*** *var.* ***commutatum***
5 Ligule about 0.5 mm long, ciliate; larger culm blades 6-13 mm wide; spikelets 2-3 mm long; first glumes 0.5-1 mm long ..... ***D. boreale***
2 Blades tapering to the base, 2-12 mm wide.
6 Ligule a stramineous to light brown membrane, with or without terminal ciliations; peduncle antrorsely scabrous but not hairy.

7 Panicle rachis smooth, pellucid-punctate; first glume 0.3-0.6 (-0.8) mm long, as broad as or broader than long, truncate to obtuse; larger leaves 10-25 cm long, 8-15 mm wide; ligule 0.5-1.3 mm long; lowest elongate culm internode > 2 mm in diameter; lowest nodes usually glabrous or pubescent ..... ***D. scabriusculum***

7 Panicle rachis scabrous or smooth, not pellucid-punctate; first glume 0.5-1.1 mm long, longer than wide, rounded to acute; larger leaves 3.5-12 cm long, 3-9 mm wide; ligule 0.1-0.6 mm long; lowest elongate culm internode < 2 mm in diameter; lowest nodes retrorsely bearded or glabrous.

8 Lowest nodes usually retrorsely bearded; ligules (0.1-) 0.3-0.6 mm long; largest vernal blades 7-12 cm long, (4.5-) 6-9 mm wide; panicle peduncle scabrous; spikelets ovate-lanceolate, acute, 2.0-2.4 mm long; first glume lanceolate, blunt to acute; fertile lemma smooth ..... ***D. species 9 (=cryptanthum)***

8 Lowest nodes usually glabrous; ligules 0.1-0.2 (-0.3) mm long; largest vernal blades 3.5-7 cm long, 3-6 mm wide; panicle peduncle smooth; spikelets elliptic, blunt to acute, 1.6-2.2 mm long; first glume ovate to rotund, rounded to acute; fertile lemma papillose..... ***D. lucidum***

6 Ligule of short white hairs or absent; peduncle variously hairy or glabrous, but not antrorsely scabrous.

9 Leaves basally disposed, usually matted or cushion-forming, larger than the mid and upper culm leaves; blade margins uniformly papillose-ciliate; culms branching only at the base, 0.5-3.5 dm tall; internodes glabrous or sparsely pubescent ..... ***D. strigosum*** *var.* ***leucoblepharis***

9 Basal leaves rosette-forming, usually much smaller than culm leaves; blade margins glabrous, or ciliate only below the middle (or papillose-ciliate throughout in =*lancearium*, which has densely puberulent internodes); culms branching at the nodes in age, 1.5-7.5 mm tall.

10 Blades of mid-culm leaves typically long and stiff, acuminate, linear or narrowly lanceolate, usually > 10× as long as wide, only 2-5 mm wide when < 8 cm long.

11 Vegetative parts glabrous (spikelets pubescent, lowest internodes and sheaths sometimes sparsely pubescent, blades and sheaths sometimes ciliate); mature panicles less than ¼ as wide as long, the branches erect-ascending, the spikelets often subsecond; autumnal blades 4-10 cm long, involute, <2 mm wide; spikelets 1.8-2.2 mm long..... ***D. aciculare*** *ssp.* ***neuranthum***

11 Vegetative parts pubescent, at least in the lower portion of plant; mature panicles usually more than half as wide as long, the branches spreading-ascending, the spikelets not noticeably subsecond; autumnal blades 1-6 cm long, involute and <2 mm wide in *D. aciculare* ssp. *aciculare* and *D. species 1=arenicoloides*, or to 9 cm long, flat and 2-4 mm wide in *D. angustifolium*; spikelets 1.5-3.1 mm long.

12 Spikelets (3.0-) 3.2-3.8 mm long, fusiform, pointed at summit, attenuate at base, with both glumes attached 0.3-0.5 mm below sterile lemma, the autumnal spikelets 3.5-3.8 mm long; larger vernal blades 3-6 mm wide, the lower and mid-culm blades of similar width; autumnal blades involute ..... ***D. species 8 (=fusiforme)***

12 Spikelets 1.8-3.1 mm long, obovate, blunt, and the base not attenuate (except in *D. species 1=arenicoloides* with autumnal spikelets 2.3-3.1 mm long); larger vernal blades 2-8 mm wide, the lower usually wider and often shorter than mid-culm blades; autumnal blades involute or flat.

13 Longest vernal blades to 16 cm, widest vernal blades 4-8 mm, usually longitudinally wrinkled; vernal and autumnal spikelets 2.3-3.1 mm long; autumnal blades flat, the larger to 9 cm by 2-4 mm ..... ***D. angustifolium***

13 Longest vernal blades to 6 (*D. aciculare* ssp. *aciculare*) or 12 (*D. species 1=arenicoloides*) cm long, 2-5 mm wide, not noticeably wrinkled; vernal spikelets 1.5-2.8 mm long, autumnal spikelets either 1.5-2.3 (*D. aciculare* ssp. *aciculare*) or 2.3-3.1 (*D. species 1=arenicoloides*); autumnal blades involute, the larger to 6 cm by 1.5 mm.

14 Longest vernal blades to 12 cm, widest vernal blades 3-4 (-5) mm; vernal spikelets 2.1-2.8 mm long; autumnal spikelets 2.3-3.1 mm long, pointed, attenuate, the glumes attached 0.3-0.5 mm below sterile lemma; first glumes 0.7-1.5 mm long; larger autumnal blades to 6 cm by 1.5 mm ..... ***D. species 1=arenicoloides***

14 Longest vernal blades to 6 (-8) cm, widest vernal blades 2-5 mm; vernal and autumnal spikelets 1.7-2.3 mm long, blunt, not attenuate, the glumes attached <0.2 mm below sterile lemma; first glumes 0.6-0.9 mm long; larger autumnal blades to 3 cm by 1 mm ..... ***D. aciculare*** *ssp.* ***aciculare***

10 Blades of mid-culm leaves lanceolate, thin or firm but not stiff, usually < 10× as long as wide, usually 7 mm or more wide when as much as 8 cm long.

15 Spikelets 2.9-3.8 mm long, broadly elliptic, rounded at the summit, with broad and thick nerves ..... ***D. oligosanthes*** *var.* ***scribnerianum***

15 Spikelets 2.1-2.9 mm long, elliptic or obovate, rounded or pointed at the summit, the nerves often raised, but not broad and thick.

16 Culm internodes and sheaths glabrous or sparsely pilose.

17 Spikelets strongly plano-convex when viewed laterally, obpyriform when viewed dorsally, 2.2-2.6 mm long; fertile lemma and palea papillose; first glume and base of second glume usually strongly reddish-purple..... ***D. species 2 (=webberianum)***

17 Spikelets biconvex to elliptic when viewed laterally, variously shaped but not obpyriform when viewed dorsally; fertile lemma and palea smooth or reticulate (or papillose in *D. lucidum* with weak and sprawling culms and spikelets 1.7-2.3 mm long); first and second glume various.

18 Culms tending to be stiffly erect; blades erect or erect-spreading, broad, usually but not always tapering from just below the middle to both ends, often yellowish green; plants not or only sparingly branched in age, not developing leafy fascicles of reduced leaves and inflorescences..... ***D. boreale***

18 Culms not stiffly erect; leaves usually spreading, broad or narrow, dark to bright green; plants often freely branched in age, becoming top-heavy with a mass of fascicled, reduced leaves and inflorescences..... ***D. dichotomum*** group

16 Culm internodes crisp-puberulent (sparsely so in *D. species 2 (=webberianum)*; sheaths puberulent or glabrous.

19 Spikelets elliptic, sub-acute to pointed, greenish or faintly purple-tinged basally..... ***D. commutatum var. ashei***

19 Spikelets strongly plano-convex when viewed laterally, obpyriform when viewed dorsally, broadly rounded, usually markedly reddish-purple basally.

20 Fertile lemma and palea papillose; spikelets 2.2-2.6 mm long; lower culm blades 6-12 mm wide, glabrous..... ***D. species 2 (=webberianum)***

20 Fertile lemma and palea smooth (minutely reticulate but not papillose); spikelets (1.8) 1.9-2.2 (-2.3) mm long; lower culm blades 4-8 mm wide, glabrous, glabrate, or puberulent (especially abaxially)..... ***D. species 3 (=lancearium)***

Key F - Spikelets 0.8-2.0 mm long, lower culm internodes variously hairy

1 Longer hairs of ligule 2-5 mm long.
2 Ligule without a distinct ring of short hairs in front of the long hairs.
3 Blades of mid-culm leaves linear or narrowly lanceolate, stiff, acuminate, often involute, 4-10 cm long, 2-5 mm wide, about 15-20× as long as wide ... ***D. aciculare*** *ssp.* ***aciculare***
3 Blades of mid-culm leaves lanceolate, thin or firm but not stiff, length and width various, less than 15× as long as wide ... ***D. acuminatum*** **group**
2 Ligule with a distinct ring of short hairs in front of the long hairs.
4 Peduncle, panicle axis, and sheaths puberulent with hairs 0.1 mm long; larger blades 3-6 cm long, 3-5 mm wide; spikelets 1.3-1.7 mm long ... ***D. meridionale***
4 Peduncle panicle axis hairs > 0.1 mm long; sheaths and internodes densely clothed with straight retrorse (occasionally spreading to spreading-ascending) hairs often > 4 mm long ... ***D. villosissimum*** *var.* ***villosissimum***
1 Longer hairs of ligule < 2 mm long.
5 Culm leaves basally crowded, ascending, usually matted or cushion-forming, larger than the mid and upper culm blades.
6 Sheaths conspicuously retrorsely long-pilose; longer blades 6-18 cm long and 7-12 mm wide; spikelets 1.9-2.3 mm long ... ***D. laxiflorum***
6 Sheaths variously pubescent or glabrous, but not conspicuously retrorsely long-pilose; longer blades 2-6 cm long and 1-8 mm wide; spikelets 0.9-2.1 mm long.
7 Blades 1-4 mm wide, glabrous, the margins eciliate or basally ciliate; spikelets 0.9-1.5 mm long, glabrous; autumnal form branched from lower and mid nodes as well as from basal nodes.
8 Blades 1.5-4 (-5) cm long; spikelets 0.9-1.2 mm long ... ***D. chamaelonche***
8 Blades 4-12 (-20) cm long, some at least 7 cm long; spikelets 1.2-1.5 mm long ... ***[D. dichotomum*** *var.* ***glabrifolium]***
7 Blades 2-10 mm wide, pubescent or glabrous, the margins coarsely papillose-ciliate throughout; spikelets 1.1-2.1 mm long, glabrous or pubescent; autumnal form branched from basal nodes only.
9 Spikelets pubescent, 1.5-2.1 mm long; blade surfaces glabrous ... ***D. strigosum*** *var.* ***leucoblepharis***
9 Spikelets glabrous, 1.1-1.8 mm long; blade surfaces pubescent or glabrous.
10 Blades glabrous, or sparsely pilose only near the adaxial base; spikelets 1.4-2.1 mm long ... ***D. strigosum*** *var.* ***glabrescens***
10 Blades pilose, at least abaxially; spikelets 1.1-1.6 mm long ... ***D. strigosum*** *var.* ***strigosum***
5 Culm leaves not basally crowded, the lowest leaves spreading and rosette-forming, usually smaller than the culm leaves.
11 Blades of mid-culm leaves linear or narrowly lanceolate, stiff, acuminate, often involute, 4-10 cm long, 2-5 mm wide, about 15-20× as long as wide ... ***D. aciculare*** *ssp.* ***aciculare***
11 Blades of mid-culm leaves lanceolate, thin or firm but not stiff, length and width various, less than 15× as long as wide.
12 Internodes crisp-puberulent.
13 Ligule 0.7-1.5 mm long; first glume acute; spikelets elliptic when viewed dorsally, biconvex or elliptic when viewed laterally, not strongly nerved ... ***D. columbianum***
13 Ligule < 0.5 mm long; first glume obtuse to truncate; spikelets obovate when viewed dorsally, plano-convex when viewed laterally, strongly nerved.
14 Spikelets 1.5-1.8 mm long; first glume 0.5-0.8 mm long; lower culm blades 2-5 mm wide ... ***D. portoricense***
14 Spikelets (1.8-) 1.9-2.2 (-2.3) mm long; first glume 0.8-1.2 mm long; lower culm blades 4-8 mm wide ... ***D. species 3 (=lancearium)***
12 Internodes variously hairy but not crisp-puberulent.
15 Internodes (sparsely-) moderately to densely pubescent to pilose; ligule 1-5 mm long; blade margins either weakly ciliate, papillose-ciliate basally only, or eciliate, lacking a white-beige cartilagionous edge 0.2 mm wide.
16 Larger mid-culm blades 4-7 cm long, 4-7 mm wide, glabrous to sparsely pubescent adaxially; ligule 1-5 mm long; spikelets 1.1-1.5 mm long ... ***D. leucothrix***
16 Larger mid-culm blades 3-6 cm long, 3-5 mm wide, long-pilose adaxially; ligule often with a ring of hairs < 1 mm and scattered longer hairs to 4 mm; spikelets 1.3-1.7 mm long ... ***D. meridionale***
15 Internodes sparsely pilose; ligule < 1 mm long; blade margins **either** coarsely papillose-ciliate throughout **or** glabrous with a white-beige cartilaginous edge about 0.2 mm wide.
17 Blades with white-beige cartilaginous margins 0.2 mm wide; spikelets 1.4-1.7 mm long; autumnal form branching from middle and upper nodes ... ***D. tenue***
17 Blade margins coarsely papillose-ciliate throughout; spikelets 1.1-2.1 mm long; autumnal form branching from the base.
18 Spikelets pubescent, 1.5-2.1 mm long; blade surfaces glabrous ... ***D. strigosum*** *var.* ***leucoblepharis***
18 Spikelets glabrous, 1.1-1.8 mm long; blade surfaces pubescent or glabrous.
19 Blades glabrous, or sparsely pilose only near the adaxial base; spikelets 1.4-1.8 mm long ... ***D. strigosum*** *var.* ***glabrescens***
19 Blades pilose; spikelets 1.1-1.6 mm long ... ***D. strigosum*** *var.* ***strigosum***

Key G - Spikelets 0.8-2.0 mm long, lower culm internodes glabrous

1 Ligule 1-5 mm long.
2 Ligule 1-2 mm long; sheaths sparsely to moderately spreading short-pilose; internodes glabrous; nodes retrorsely bearded; leaves 1-4 cm long, 2-5 mm wide; spikelets 1.2-1.4 mm long ... ***D. species 10 (=curtifolium)***
2 Ligule (1.5-) 2-5 mm long; sheaths glabrous to variously pubescent; internodes glabrous or pubescent; nodes glabrous, or bearded with ascending, spreading, or tangled hairs; leaves 3-10 cm long, 3-10 mm wide; spikelets 0.8-1.9 mm long ... ***D. acuminatum*** **group**
1 Ligule < 1 mm long.
3 Basal leaves rosette-forming, usually much smaller than the culm leaves, not matted or cushion-forming; culms branching at the mid and upper nodes in age.
4 Blades of mid-culm leaves typically long and acuminate, linear or narrowly lanceolate, usually 10-20× as long as wide, only 2-5 mm wide when < 8 cm long.
5 Spikelets (glandular-) papillose-pubescent; blades 1-3 (-5) mm wide; first glume 0.8-1.0 mm long; culms to 4 dm tall ... ***D. aciculare*** *ssp.* ***neuranthum***
5 Spikelets glabrous; blades 3-8 mm wide; first glume 0.3-1.1 mm long; culms to 10 dm tall.
6 Leaves 3-8 mm wide; panicle (8-) 20-40 mm wide; first glume 0.6-1.1 mm long, blunt to acute ... ***D. dichotomum*** **group**
6 Leaves 3-5.5 mm wide; panicle 2-5 mm wide; first glume 0.3-0.4 mm long, truncate to obtuse ... ***D. hirstii***

4 Blades of mid-culm leaves lanceolate, mostly 10× or less as long as wide, usually 7 mm or more wide when as much as 8 cm long.
7 Spikelets elliptic, oblong, or obovate; lower culm blades 3-12 (-15) mm wide, thin, tapered to the base; plants often freely branching in age, becoming top-heavy with a mass of fascicled, reduced leafy branches and inflorescences..... ***D. dichotomum* group**
7 Spikelets broadly elliptic to suborbicular; lower culm blades 6-30 mm wide, thickish, broad, and cordate to subcordate at the base; plants sparingly branched in age, not becoming top-heavy with fascicled, reduced leafy branches and inflorescences.
8 Spikelets 0.9-1.2 mm long; longer blades 6-8 cm long, erect to erect-ascending..... ***D. erectifolium***
8 Spikelets 1.2-1.9 mm long; longer blades 8-20 cm long, ascending or the uppermost erect.
9 Mid-culm blades 6-11 (-14) mm wide, the uppermost 3-9 cm long..... ***D. sphaerocarpon* *var.* *sphaerocarpon***
9 Mid-culm blades, at least some, 15-30 mm wide, the uppermost 10-15 cm or more long ..... ***D. polyanthes***
3 Basal leaves similar to or larger than the mid and upper culm leaves, often matted or cushion-forming; culms branching at the base (also at mid and upper nodes in *D. chamaelonche* vars. and *D. dichotomum* var. *glabrifolium*).
10 Longer blades > 6 cm; if only 6 cm, then sheaths retrorsely long-pilose (*D. laxiflorum*).
11 Spikelets 1.2-1.5 mm long, glabrous..... ***[D. dichotomum* *var.* *glabrifolium]***
11 Spikelets 1.7-2.3 (-2.8) mm long, pubescent.
12 Longer blades 6-18 cm long by 7-12 mm wide; sheaths conspicuously retrorsely long-pilose; nodes bearded with retrorse or spreading hairs; spikelets 1.9-2.3 mm long ..... ***D. laxiflorum***
12 Longer blades 10-35 cm long by 2-4 mm wide; sheaths glabrous to variously pilose, but not conspicuously retrorsely long-pilose; nodes variously pubescent to glabrate; spikelets 1.7-2.3 (-2.8) mm long..... ***D. linearifolium***
10 Longer blades 1.5-6 cm; sheaths glabrous or pubescent, but not retrorsely long-pilose.
13 Blades 1-3 mm wide, glabrous, eciliate or basally ciliate; spikelets 0.9-1.4 mm long.
14 Spikelets pubescent, 1.2-1.4 mm long; blades involute, often falcate, 2.5-6 cm long..... ***[D. chamaelonche* *ssp.* *breve]***
14 Spikelets glabrous, 0.9-1.2 mm long; blades flat, not falcate, 1.5-4 (-5) cm long..... ***D. chamaelonche* *ssp.* *chamaelonche***
13 Blades 3-8 mm wide; spikelets 1.1-2.1 mm long (if < 1.5 mm, then blades either pubescent on one or both surfaces or ciliate to the apex).
15 Spikelets pubescent, 1.5-2.1 mm long; blade surfaces glabrous..... ***D. strigosum* *var.* *leucoblepharis***
15 Spikelets glabrous, 1.1-1.8 mm long; blade surfaces pubescent or glabrous.
16 Blades glabrous, or sparsely pilose only near the adaxial base; spikelets 1.4-2.1 mm long..... ***D. strigosum* *var.* *glabrescens***
16 Blades pilose, at least abaxially; spikelets 1.1-1.6 mm long..... ***D. strigosum* *var.* *strigosum***

Key to the *Dichanthelium acuminatum* group

1 Internodes glabrous.
2 Ligule 1-2 mm long; sheaths sparsely to moderately spreading short-pilose; nodes retrorsely bearded; leaves 1-4 cm long, 2-5 mm wide; spikelets 1.2-1.4 mm long..... ***D. species 10 (=curtifolium)***
2 Ligule (1.5-) 2-5 mm long; sheaths glabrous to variously pubescent, but not spreading short-pilose; nodes glabrous or pubescent, but not bearded; leaves 4-11 cm long, 4-8 mm wide.
3 Panicles 8-12 cm long, ¼-⅓ as wide, bearing 250 or more spikelets; spikelets 1.4-1.6 mm long; ligule (1.5-) 2-3 mm long; larger blades 7-11 cm long, often tinged with purple..... ***D. spretum***
3 Panicles 3-8 cm long, > ½ as wide, bearing < 200 spikelets; spikelets 1.1-1.6 mm long; ligule 2-5 mm long; larger blades 4-10 cm long.
4 Internodes glabrous to pubescent (especially lower); larger vernal blades usually longer than 6 cm, the basal margin prominently long-ciliate; spikelets (1.3-) 1.4-1.7 mm long; longer hairs of ligule usually more than 3 mm; plants often yellowish-green..... ***D. acuminatum* *var.* *lindheimeri***
4 Internodes glabrous (the lowest rarely slightly pubescent); larger vernal blades usually shorter than 7 cm, the basal margin cilia inconspicuous or absent; spikelets 1.1-1.5 mm long; longer hairs of ligule often less than 3 mm long; plants often purplish-green..... ***D. longiligulatum***
1 Internodes variously pubescent.
5 Peduncle, panicle axis, and/or sheaths of vernal culms puberulent with hairs 0.1 mm long, sometimes also pubescent with longer hairs, but never grayish-villous; larger blades 2-7 cm long, 2-7 mm wide.
6 Spikelets 0.8-1.1 mm long; blades 2-4.5 cm long, 2-5 mm wide; sheaths sparsely puberulent, lacking papillose-based longer hairs..... ***D. wrightianum***
6 Spikelets 1.1-1.7 mm long; mid-culm blades generally 3-7 cm long and 3-7 mm wide; sheaths with some papillose-based hairs 2 mm or more long.
7 Larger mid-culm blades 4-7 cm long, 4-7 mm wide, glabrous to sparsely pubescent adaxially; ligule 1-5 mm long; spikelets 1.1-1.5 mm long..... ***D. leucothrix***
7 Larger mid-culm blades 3-6 cm long, 3-5 mm wide, long-pilose adaxially; ligule often with a ring of hairs < 1 mm and scattered longer hairs to 4 mm; spikelets 1.3-1.7 mm long..... ***D. meridionale***
5 Peduncle, panicle axis, and sheaths of vernal culms glabrous, or pilose, or grayish-villous with some shorter hairs 0.2-0.5 mm long, but not puberulent with hairs 0.1 mm long; larger blades 4-12 cm long, 4-12 mm wide.
8 Sheaths and internodes of vernal culms gray-villous with a dense, tangled, or matted mixture of slender hairs 2-4 mm long, variously ascending, spreading, and retrorse, papillose or non-papillose, often with shorter hairs beneath; blades velvety-pubescent on abaxial surface, the margins ciliate for half or more their length ..... ***D. acuminatum* *var.* *acuminatum***
8 Sheaths and internodes of vernal culms puberulent, pubescent or papillose-pilose to hispid with ascending straight hairs, but never grayish-villous; blades glabrous to variously pilose abaxially, but not velvety-pubescent, the margins eciliate or ciliate only below the middle.
9 Spikelets 0.8-1.1 mm long; blades 2-4.5 cm long, 2-5 mm wide ..... ***D. wrightianum***
9 Spikelets 1.1-2.0 mm long; blades 3-12 mm long, 3-12 mm wide.
10 Peduncle, panicle axis, and often middle and upper internodes glabrous; sheaths lacking hairs or papillae, at least near mid-length..... ***D. acuminatum* *var.* *lindheimeri***
10 Peduncle, panicle axis, and internodes puberulent, pubescent, or pilose; sheaths papillose-pilose to hispid.
11 Blades 5-12 cm long, 6-12 mm wide; spikelets 1.5-2.0 mm long; peduncle, panicle axis, and sheaths variously pilose, but lacking puberulent hairs 0.1 mm long..... ***D. acuminatum* *var.* *fasciculatum***
11 Blades 3-7 cm long, 3-7 mm wide; spikelets 1.1-1.7 mm long; puberulent hairs 0.1 mm long often present on peduncle, panicle axis, or sheaths.

12 Larger mid-culm blades 4-7 cm long, 4-7 mm wide, glabrous to sparsely pubescent adaxially; ligule 1-5 mm long, the hairs of one series; spikelets 1.1-1.5 mm long ..... ***D. leucothrix***
12 Larger mid-culm blades 3-6 cm long, 3-5 mm wide, long-pilose adaxially; ligule often with a short series of hairs <1 mm long in front of a series with hairs to 4 mm long; spikelets 1.3-1.7 mm long ..... ***D. meridionale***

Key to the *Dichanthelium dichotomum* Group

1 Lower cauline nodes bearded, the hairs usually retrorse.
2 Spikelets glabrous.
3 Ligule an eciliate membrane; leaves 3.5-7 cm long by 3-6 mm wide..... ***D. species 11***
3 Ligule ciliate; leaves either 1.5-4 (-5) cm long by 1-5 mm wide, or 5-12 cm long by 3-15 mm wide.
4 Spikelets 0.9-1.4 mm long; vernal cauline blades 1.5-4 (-5) cm long and 1-5 mm wide; internodes or sheaths glabrous or pubescent.
5 Spikelets 1.2-1.4 mm long; sheaths spreading-pilose; vernal cauline blades 2-5 mm wide; ligule 1-2 mm long; node beard hairs usually spreading or reflexed; internodes glabrous ..... ***D. species 10 (=curtifolium)***
5 Spikelets 0.9-1.2 mm long; sheaths glabrous; vernal cauline blades 1-2 (-3) mm wide; ligule < 1 mm long; node beard hairs erect and often only partially encircling the node; internodes glabrous or puberulent..... ***D. chamaelonche***
4 Spikelets 1.4-2.3 mm long; vernal cauline blades 5-12 cm long and 3-15 mm wide; internodes and sheaths glabrous.
6 Spikelets 1.8-2.3 mm long; first glume 0.6-1.1 mm long; fertile lemma 0.8–1.0 mm wide; widest vernal blades 3-8 (-10) mm wide; nodes, often only the lower, usually sparsely to moderately bearded with retrorse hairs..... ***D. dichotomum*** *var.* ***dichotomum***
6 Spikelets 1.4-1.9 mm long; first glume 0.3-0.6 (-0.7) mm long; fertile lemma 0.6-0.8 mm wide; widest vernal blades 7-15 mm wide; usually all nodes densely bearded with retrorse hairs ..... ***D. dichotomum*** *var*. ***ramulosum***
2 Spikelets pubescent.
7 Spikelets 1.2-1.4 mm long; sheaths spreading-pilose; vernal cauline blades 1-4 cm long and 2-5 mm wide; ligule 1-2 mm long ..... ***D. species 10 (=curtifolium)***
7 Spikelets 1.4-2.8 mm long; sheaths glabrous to appressed-pilose; vernal cauline blades 5-12 cm long and 5-15 mm wide; ligule < 1 mm long.
8 Usually all culm nodes bearded; internodes glabrous, or middle and upper internodes and peduncle sparsely to moderately spreading short-hairy, sometimes also glandular; upper as well as lower vernal sheaths and both surfaces of cauline blades pubescent, often densely so; spikelets (1.5-) 1.8-2.2 mm long; [of dry rocky or sandy basic soil and barrens]..... ***D. annulum***
8 Often only lower culm nodes bearded; internodes glabrous; at least middle and upper cauline blades glabrous; spikelets 1.4-2.8 mm long; [mostly of wet acid soils and mesic to dry woodlands].
9 Spikelets (2.0-) 2.2-2.8 mm long; first glume 0.5-1.3 mm long; fertile lemma 1.8-2.3 mm long; lowest vernal cauline blades pubescent at least abaxially..... ***D. mattamuskeetense***
9 Spikelets 1.4-2.2 mm long; first glume 0.3-0.9 mm long; fertile lemma 1.4-1.7 mm long; lowest vernal cauline blades glabrous.
10 Spikelets 1.7-2.2 mm long; first glume 0.6-0.9 mm long; fertile lemma 0.7-1.0 mm wide..... ***D. dichotomum*** *var.* ***nitidum***
10 Spikelets 1.4-1.9 mm long; first glume 0.3-0.6 (-0.8) mm long; fertile lemma 0.6-0.8 mm wide..... ***D. dichotomum*** *var.* ***ramulosum***
1 Lower cauline nodes glabrous or puberulent, but not bearded.
11 Spikelets pubescent.
12 Spikelets (1.5-) 1.7-2.7 mm long, if shorter than 1.8 mm then fertile lemma and palea densely papillose; culms soon sprawling.
13 Spikelets (1.5-) 1.7-2.3 mm long, glabrous (rarely pubescent); first glume 0.7-1.1 mm long; fertile lemma and palea densely papillose at 20× ..... ***D. lucidum***
13 Spikelets 2.2-2.7 mm long, pubescent; first glume 1.0–1.4 mm long; fertile lemma and palea smooth or with a few weak papillae at 20× ..... ***D. sphagnicola***
12 Spikelets 1.2-1.7 mm long; fertile lemma and palea smooth; culms erect.
14 Blades involute and often falcate, 3-6 cm long, about 1.5 mm wide when flattened, 20-50× as long as wide; lower internodes often strigose; spikelets 1.2-1.4 mm long; culms 5-20 cm long..... ***[D. chamaelonche*** *ssp.* ***breve]***
14 Blades neither involute (except apically) nor falcate, 1-7 cm long, 1.5-7 mm wide, about 10× as long as wide; lower internodes glabrous or sparsely pilose, but not strigose; spikelets 1.1-1.7 mm long; culms 15-60 cm long.
15 Blades 1-3 (-5) cm long, 1.5-3 (-4) mm wide, the cartilaginous margins typically gray-green to white-beige and about 0.1 mm wide; spikelets 1.2-1.5 mm long; culms to 40 cm long..... ***D. ensifolium***
15 Blades 2-7 cm long, 3-6 mm wide, the cartilaginous margins typically white-beige and about 0.2 mm wide; spikelets (1.2-) 1.4-1.7 mm long; culms to 60 cm long..... ***D. tenue***
11 Spikelets glabrous.
16 Cauline leaves mostly basally disposed, strongly ascending, much larger than the 2-3 remote middle and upper cauline leaves of fertile culms; spikelets 2.4-2.9 mm long; culms branch from basal and lower nodes, but are not known to produce autumnal inflorescences ..... ***[D. nudicaule]***
16 Cauline leaves well-distributed along the culm, > 3, gradually reduced upwards and often spreading; spikelets 0.9-2.6 mm long; culms produce autumnal inflorescences from lower, middle, and/or upper nodes, if from lower only, then spikelets only 0.9-1.2 mm long.
17 Fertile lemma and palea densely papillose; culms weak, soon sprawling over other vegetation..... ***D. lucidum***
17 Fertile lemma and palea smooth, with few or no papillae; culms stiffer, erect to ascending.
18 Spikelets 0.9-1.5 mm long; vernal blades 1-4 mm wide.
19 Spikelets 0.9-1.2 mm long; blades 1.5-4 (-5) cm long, 1-2.5 (-3) mm wide, mostly 15-20 times as long as wide; autumnal plants cushion-forming..... ***D. chamaelonche ssp. chamaelonche***
19 Spikelets 1.2-1.5 mm long; blades 1-12 (-20) cm long; autumnal plants not cushion-forming.
20 Blades 1-3 (-5) cm long, 1.5-3 (-4) mm wide, about 10 times as long as wide; autumnal plants sparsely tufted..... ***D. ensifolium***
20 Blades 4-12 (-20) cm long (the longer at least 7 cm), 2-4 mm wide, 20-30 (-50) times as long as wide ..... ***[D. dichotomum*** *var.* ***glabrifolium]***
18 Spikelets 1.4-2.6 mm long; vernal blades 3-15 mm wide (if spikelets < 1.6 mm long and vernal blades < 5 mm wide, then larger blades > 5 cm long in *D. caerulescens*).
21 Widest vernal cauline blades 7-15 mm wide; upper sheaths often glutinous-warty; spikelets 2.1-2.6 mm long, some or most acute to beaked, second glume and sterile lemma extending 0.3-0.5 mm beyond fertile lemma in at least some spikelets.....

.....***D. yadkinense***

21 Widest vernal cauline blades 3-10 mm wide; upper sheaths not glutinous-warty; spikelets 1.4–2.3 mm long, blunt to subacute, second glume and sterile lemma often equal to or shorter than fertile lemma, or extending < 0.3 mm beyond it.

22 Ligule an eciliate membrane; largest vernal blades 3-6 cm long, usually 10-15 × as long as wide.....***D. species 11***

22 Ligule ciliate; largest vernal blades 5-12 cm long, usually 15-20 × as long as wide.

23 Spikelets 1.4-1.8 mm long; first glume 0.3–0.8 mm long; fertile lemma 1.3-1.5 mm long; mature vernal panicles usually short-exserted with ascending branches; fresh foliage bluish-glaucous.....***D. caerulescens***

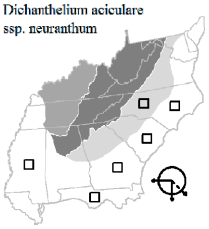
23 Spikelets 1.7-2.3 mm long; first glume 0.6-1.1 mm long; fertile lemma 1.6-1.9 mm long; mature vernal panicles exserted with spreading branches; fresh foliage not bluish-glaucous.

24 Vernal cauline blades spreading to deflexed, flexuous; [of wet-mesic to dry woods and thickets].....
.....***D. dichotomum*** *var.* ***dichotomum***

24 Vernal cauline blades stiffly erect; [of wet pine savannas and open swamps].....***D. dichotomum*** *var.* ***roanokense***

Dichanthelium aciculare (Desvaux ex Poiret) Gould & Clark *ssp.* ***aciculare***, Needle Witch Grass. Cp (DE, GA, NC, SC, VA), Pd (GA, NC, SC, VA): sandy woods and fields; common (uncommon in GA, NC, and SC Piedmont, rare in VA Piedmont, rare in DE Coastal Plain). May-October. NJ south to n. FL, west to TX and OK, also in West Indies and n. South America. Blades typically are strongly involute. Can be confused with autumnal forms of *D. ovale* var. *addisonii*, which has vernal blades 5-10 mm wide. Plants referable to *Panicum chrysopsidifolium* by HC have ligules <1 mm long; blades 5-10 cm long and 3-5 mm wide; densely villous nodes, internodes, sheaths, and blades; and villous, obovate spikelets 1.9-2.2 mm long. This entity needs further study. [= *Panicum aciculare* Desvaux ex Poiret – RAB, F; < *P. aciculare* – C; = *D. aciculare ssp. aciculare* – FNA; > *P. aciculare* – G, HC, S; > *P. chrysopsidifolium* Nash – G, HC, S; > *P. bennettense* M.V. Brown – HC, S; < *D. aciculare* – K, Z]

Dichanthelium aciculare (Desvaux ex Poiret) Gould & Clark *ssp.* ***neuranthum*** (Grisebach) Freckmann & Lelong, Nerved Witch Grass. Maritime wet grasslands, Piedmont prairie-like barrens. May-November. Disjunct in se. and central NC, se. SC, GA, FL, MS, e. TX, AR, Bahamas, Cuba, and Belize. Can occur with the similar-appearing *D. caerulescens*, from which it differs by having spikelets that are longer (1.8-2.2 mm vs. 1.4-1.8), rounded summits vs. obtuse to sub-acute, and pubescent vs. glabrous; longer first glumes (0.8-1.0 mm vs. 0.3-0.8); leaves 15× or more as long as wide vs. 10-15×; and a nearly strict panicle. FNA gives a spikelet length of 2-2.8 mm, well beyond the length of spikelets on specimens we have seen. Although FNA provides no synonymy, it appears that its concept of ssp. *neuranthum* includes *Panicum pinetorum* of s. FL, with spikelets 2.3-3 mm long according to Silveus (1942). The plants from the Piedmont of NC match descriptions of *Panicum ovinum*, known from dry to moist open ground and prairies in e. TX, MS, and AR when last recognized (HC). Both of these taxa are treated here as synonyms of ssp. *neuranthum*. [= FNA; > *Panicum neuranthum* Grisebach – RAB, HC, S; > *P. ovinum* Scribner & J.G. Smith – HC, S; > *P. pinetorum* Swallen – HC, S; < *D. aciculare* – K, Z]



Dichanthelium acuminatum (Swartz) Gould & Clark. *var.* ***acuminatum***, Woolly Witch Grass. Cp (DE, GA, NC, SC, VA), Pd (DE, GA, NC, SC, VA): on dryish sandy or clayey soils of open woods and disturbed areas; common. May-October. MA south to FL, west to TX, also in West Indies, Mexico, Central America, and n. South America. Internodes and sheaths gray-villous with usually non-papillate hairs. Plants tend to be low and "bushy" with several spreading-ascending culms and dense autumnal branching. See note at end of descriptions regarding *Panicum chrysopsidifolium*. [= Y; < *Panicum lanuginosum* Elliott – RAB; > *P. lanuginosum* var. *lanuginosum* – C, F, G; < *P. leucothrix* Nash – C; > *P. auburne* Ashe – F, G, HC, S, WV; < *D. acuminatum* ssp. *acuminatum* – FNA; > *P. lanuginosum* – HC, S, WV; >< *D. acuminatum* var. *acuminatum* – K, Z; >< *D. acuminatum* var. *implicatum* (Scribner) Gould & Clark – K, Z; < *P. acuminatum* Swartz var. *acuminatum* – X; < *P. thurowii* Scribner & J.G. Smith – HC, S; < *D. acuminatum* var. *thurowii* (Scribner & J.G. Smith) Gould & C.A. Clark – K, Y, Z]

Dichanthelium acuminatum (Swartz) Gould & Clark *var.* ***fasciculatum*** (Torrey) Freckmann, Slender-stemmed Witch Grass. Mt (GA, NC, SC, VA), Pd (DE, GA, NC, SC, VA), Cp (DE, GA, NC, SC, VA): open or cut-over woods, thickets, fields, meadows, and shores, frequently on disturbed soils; common (uncommon in GA, NC, SC, and VA Coastal Plain). May-August. NL (Newfoundland) south to FL, west to CA, north to s. BC. Typically much less pilose than var. *acuminatum*, the hairs usually papillate. Plants referable to *Panicum glutinoscabrum* Fernald may be a hybrid of var. *fasciculatum* with *D. scoparium*. Known only from se. VA, they are described as having culms 7-9 dm high; elongate internodes with cinereous puberulence and black, warty, viscid glands; villous nodes; glutinous-warty and scabrous sheaths and blades; ligule 4-5 mm long; minutely puberulent panicle axis; spikelets ellipsoid, subacute, 1.7-1.8 mm long, pubescent; first glume subacute, 0.6-0.7 mm long. [= Y; < *Panicum lanuginosum* Elliott – RAB; > *P. lanuginosum* var. *fasciculatum* (Torrey) Fernald – C, F, G; > *P. lanuginosum* var. *tennesseense* (Ashe) Gleason – C, G; > *P. lanuginosum* var. *implicatum* (Scribner) Fernald – C, F, G; = *D. acuminatum* ssp. *fasciculatum* (Torrey) Freckmann & Lelong – FNA; > *P. implicatum* Scribner – HC, WV; > *P. huachucae* Ashe var. *huachucae* – HC, S; > *P. huachucae* var. *fasciculatum* (Torrey) Hubb. – HC; > *P. tennesseense* Ashe – HC, S; > *P. huachucae* var. *silvicola* Hitchcock & Chase – S; >< *D. acuminatum* var. *acuminatum* – K, Z; >< *D. acuminatum* var. *implicatum* (Scribner) Gould & Clark – K, Z; > *P. huachucae* Ashe – WV; > *P. acuminatum* Swartz var. *fasciculatum* (Torrey) Lelong – X; > *P. acuminatum* var. *unciphyllum* (Trinius) Lelong – X]

Dichanthelium acuminatum (Swartz) Gould & Clark *var.* ***lindheimeri*** (Nash) Gould & Clark, Lindheimer's Witch Grass. Pd (GA, NC, SC, VA), Cp (DE, GA, NC, SC, VA), Mt (GA, NC, SC, VA): open or cut-over woods, thickets, fields, meadows, and shores, often on wet soils; uncommon (common in DE Coastal Plain, rare in Coastal Plain and Mountains). May-September. NS west to MB, south to FL and MO, west to s. CA. Internodes as well as sheaths often nearly glabrous. Panicle axis sometimes

sparsely pilose at branch nodes, but otherwise glabrous. [= Y; < *Panicum lanuginosum* Elliott – RAB; >< *P. lanuginosum* var. *lindheimeri* (Nash) Fernald – C, G; > *P. lanuginosum* var. *septentrionale* Fernald – C, F, G; > *P. lanuginosum* var. *lindheimeri* – F; = *D. acuminatum ssp. lindheimeri* (Nash) Freckmann & Lelong – FNA; < *P. spretum* Schultes – GW; > *P. lindheimeri* Nash – HC, S, WV; < *D. acuminatum* var. *acuminatum* – K, Z; > *D. acuminatum* var. *lindheimeri* – K, Z; > *P. acuminatum* Swartz var. *lindheimeri* (Nash) Lelong – X; *?* *D. lanuginosum* (Elliott) Gould var. *lindheimeri* (Nash) Harvill]

Dichanthelium angustifolium (Elliott) Gould, Narrow-leaved Witch Grass. Cp (DE, GA, NC, SC, VA), Pd (GA, NC, SC, VA), Mt (GA, NC, SC, VA): sandy pinelands and fields; common (rare in Mountains, rare in DE and VA). May-October. NJ south to FL, west to AR and e. TX. Vernal blades typically are flat (often involute distally). Can be confused with *D. consanguineum*, which has spreading-pilose nodes and blades 10-15× as long as wide; *D. angustifolium* blades typically are 20× or more as long as wide. Plants with involute blades to 8 cm long, spikelets 2.1-2.5 mm long, and first glumes 0.7-1.1 mm long are referable to *Panicum species 1=arenicoloides*. They are transitional to *D. aciculare*. [= *Panicum angustifolium* Elliott – RAB, F, G; < *P. aciculare* Desvaux ex Poiret – C; = *D. aciculare* ssp. *angustifolium* (Elliott) Freckmann & Lelong – FNA; > *P. angustifolium* – HC, S; > *P. arenicoloides* Ashe – HC, S; < *D. aciculare* – K, Z]

Dichanthelium annulum (Ashe) LeBlond, Ringed Witch Grass. Pd (DC, MD, NC, SC, VA), Cp (DC, NC), Mt (VA): dry sandy or rocky soil of open woods, dry grasslands, and barrens, and glades over serpentine, limestone, calcareous shales, and other high pH dry soils; rare. May-October. NJ, IN, and MO south to AL and MS, primarily in the Appalachian Province with very few occurrences in the Coastal Plain. One of the more distinctive taxa within the *D. dichotomum* group by morphology, habitat, and range. Plants from se. MA with all leaves pubescent, glabrous internodes, and spikelets 2.2-2.5 mm long were described as *Panicum annulum* var. *glabrescens*, but belong to *D. mattamuskeetense*. [= Q; < *P. dichotomum* Linnaeus – RAB, C, GW; = *Panicum annulum* Ashe – F, HC, S; = *P. annulum* var. *annulum* – G; < *D. dichotomum* ssp. *mattamuskeetense* (Ashe) Freckmann & Lelong – FNA; < *D. dichotomum* (Linnaeus) Gould – K, Z; < *P. dichotomum* var. *mattamuskeetense* (Ashe) Lelong - X]

Dichanthelium boreale (Nash) Freckmann, Northern Witch Grass. Pd (GA, NC, VA), Mt (GA, NC, VA): open woods and grassy slopes, usually in moist soil; rare. April-September. NL (Newfoundland) and ON south to NC, GA, and AR. Our plants are =*Panicum bicknellii*, regarded as a "putative hybrid" (along with =*P. calliphyllum*) by FNA, which cites WV as the southern limit of *D. boreale*. [= K, Z; > *Panicum bicknellii* Nash – RAB, F, HC, S; > *P. boreale* Nash – C, F, G, HC; > *P. calliphyllum* Ashe – F, HC; > *D. boreale* – FNA; > *P. bicknellii* var. *bicknellii* – G; > *P. bicknellii* var. *calliphyllum* (Ashe) Gleason – G]

Dichanthelium boscii (Poiret) Gould & Clark, Bosc's Witch Grass. Pd (DE, GA, NC, SC, VA), Mt (GA, NC, SC, VA), Cp (DE, GA, NC, SC, VA): shaded mesic to dry woodlands; common. April-September. MA and IL south to n. FL and e. TX. [= FNA, K, Z; = *Panicum boscii* Poiret – RAB, C, G; > *P. boscii* var. *boscii* – F, HC, S, WV; > *P. boscii* var. *molle* (Vasey) Hitchcock & Chase – F, HC, S, WV]

Dichanthelium caerulescens (Hackel ex Hitchcock) Correll, Blue Witch Grass. Cp (NC, VA): marshes, swamps, wet pinelands, maritime grasslands, damp sandy soil; rare. June-October. NJ to NC, and from FL to LA, also in the Bahamas and West Indies. Not treated by FNA, where it presumably would have been placed in synonymy with *D. dichotomum* ssp. *roanokense*. [= Q; < *Panicum dichotomum* Linnaeus – RAB, GW; = *P. caerulescens* Hackel ex Hitchcock – F, HC, S; < *D. dichotomum* ssp. *roanokense* – FNA; < *P. roanokense* Ashe – G; < *D. dichotomum* var. *dichotomum* – K, Z; < *P. dichotomum* var. *roanokense* (Ashe) Lelong – X]

Dichanthelium chamaelonche (Trinius) Freckmann & Lelong *ssp.* ***chamaelonche***, Carpet Witch Grass. Cp (GA, NC, SC, VA): moist pine savannas and flatwoods, pineland pondshores; uncommon (rare in VA). April-September. Se. VA south to FL, west to LA, also in Cuba and Belize. Internodes can be glabrous or puberulent, and nodes glabrous, pubescent, or bearded, but the glabrous spikelets 0.9-1.2 mm long are diagnostic. The concept of this taxon in FNA (as ssp. *chamaelonche*) appears to include *D. dichotomum* var. *glabrifolium* (see descriptions of Floridian *D. chamaelonche* ssp. *breve* and *D. dichotomum* var. *glabrifolium* at end of this treatment). [= *Panicum chamaelonche* Trinius – RAB, G, GW, HC, S; < *P. ensifolium* Baldwin – C; < *D. chamaelonche* ssp. *chamaelonche* – FNA; < *D. dichotomum* (Linnaeus) Gould var. *ensifolium* (Baldwin) Gould & Clark – K, Z; = *P. chamaelonche* var. *chamaelonche* – X]

Dichanthelium clandestinum (Linnaeus) Gould, Deer-tongue Witch Grass. Mt (GA, NC, SC, VA), Pd (DE, GA, NC, SC, VA), Cp (DE, GA, NC, SC, VA): shaded to filtered woodlands, ditches and low areas, and often in moist sandy soil; common (uncommon in GA, NC, and SC Coastal Plain). May-October. NS and QC south to n. FL, west to IA, KA, and TX. [= FNA, K, Z; = *Panicum clandestinum* Linnaeus – RAB, C, F, G, HC, S, WV, X]

Dichanthelium columbianum (Scribner) Freckmann, American Witch Grass. Pd (DE, GA, NC, SC, VA), Cp (DE, GA, NC, SC, VA), Mt (NC, VA): dry to moist thin woods and open ground, usually in sandy soil; uncommon (rare in VA). June-October. S. ME, s. ON, and WI south to GA, TN, and IL. [= *Panicum columbianum* Scribner – RAB, C, G, WV; > *P. columbianum* var. *columbianum* – F, HC; > *P. columbianum* var. *oricola* (Hitchcock & Chase) Fernald – F; = *D. acuminatum* ssp. *columbianum* (Scribner) Freckmann & Lelong – FNA; > *P. columbianum* var. *thinium* Hitchcock & Chase – HC; > *P. oricola* Hitchcock & Chase – HC; > *P. tsugetorum* Nash – HC, S; < *D. sabulorum* (Lamarck) Gould & Clark var. *thinium* (Hitchcock & Chase) Gould & Clark – K, Z; > *P. columbianum* – S; < *P. acuminatum* Swartz var. *unciphyllum* (Trinius) Lelong – X]

Dichanthelium commutatum (Schultes) Gould *var.* ***ashei*** (Pearson ex Ashe) Mohlenbrock, Ashe's Witch Grass. Cp (DE, GA, NC, SC, VA), Pd (GA, NC, SC, VA), Mt (GA, NC, SC, VA): dry rocky or sandy woods and openings; common. May-October. MA south to FL and MS, west to MI, MO, and OK. [< *Panicum commutatum* – RAB, C; = *P. commutatum* Schultes var. *ashei* (Pearson ex Ashe) Fernald – F, G; = *D. commutatum ssp. ashei* (Pearson ex Ashe) Freckman & Lelong – FNA; = *P. ashei* Pearson ex Ashe – HC, S, WV; < *D. commutatum* – K]

Dichanthelium commutatum (Schultes) Gould *var.* ***commutatum***, Variable Witch Grass. Cp (FL, GA, NC, SC, VA), Mt (GA, NC, SC, VA), Pd (GA, NC, SC, VA): low, shaded, moist woodlands and woodland edges, and dry, thin, often rocky woods and thickets; common. May-October. ME south to FL, west to MI, MO, OK, and TX, also in Mexico. Plants with spikelets 3.0-3.7 mm long, first glumes half or more as long, and with broadly linear leaves about 10× as long as wide have been recognized as ssp. *equilaterale* by FNA, and *Panicum equilaterale* by HC and S, but intermediates occur throughout the NC to FL portion of the range of specimens bearing the *equilaterale* name. [< *Panicum commutatum* Schultes – RAB, C; > *P. commutatum* var. *commutatum* – F, G; > *P. commutatum* – HC, S, WV; > *P. mutabile* Scribner & Smith ex Nash – F, G, HC, S; > *D. commutatum* ssp. *commutatum* Freckmann & Lelong – FNA; > *D. commutatum ssp. equilaterale* (Scribner) Freckmann & Lelong – FNA; > *D. commutatum ssp. joori* (Vasey) Freckmann & Lelong – FNA; < *D. commutatum* – K; > *P. joorii* Vasey – HC, S; > *P. equilaterale* Scribner – HC, S]

Dichanthelium consanguineum (Kunth) Gould & Clark, Kunth's Witch Grass. Cp (GA, NC, SC, VA), Pd (GA, NC, SC): moist or dry sandy soils of pinelands; common in the Coastal Plain, uncommon in the Piedmont (rare in VA). April-September. Occasional from se. VA south to FL, west to TX and IN. Often not easily separated from *D. angustifolium* and *D. ovale*. It is distinguished from *D. angustifolium* by spreading-hirsute nodes and leaves 10-15× as long as wide (*D. angustifolium* has beardless nodes, or nodes bearded with erect-ascending soft hairs, and longer leaves 20× or more as long as wide). *D. consanguineum* is distinguished from *D. ovale* by having strongly pilose upper blade surfaces (*D. ovale* upper blade surfaces are glabrous or with a few long hairs basally). The hairs of *D. consanguineum* frequently are strongly papillate. [= FNA, K, Z; = *Panicum consanguineum* Kunth – RAB, C, F, G, HC, S]

Dichanthelium depauperatum (Muhlenberg) Gould, Starved Witch Grass. Pd (DE, GA, NC, SC, VA), Mt (GA, NC, SC, VA), Cp (DE, GA, NC, SC, VA): dry soils of grasslands and open woods, often on disturbed soils of roadsides and ditches; common (rare in GA, NC, and SC Coastal Plain). May-September. NL (Newfoundland) and MN south to GA and TX. [= FNA, K, Z; = *Panicum depauperatum* Muhlenberg – RAB, C, HC, S, WV; > *P. depauperatum* var. *depauperatum* – F, G; > *P. depauperatum* var. *psilophyllum* Fernald – F, G]

Dichanthelium dichotomum (Linnaeus) Gould *var.* ***dichotomum***, Forked Witch Grass. Cp (DE, GA, NC, SC, VA), Pd (DE, GA, NC, SC, VA), Mt (GA, NC, SC, VA): wet-mesic to dry woods, thickets, and woodland openings; common (rare in VA Coastal Plain). May-October. S. Canada and MI south to FL and TX. Plants with bearded nodes and larger leaves are referable to *Panicum dichotomum* var. *barbulatum* (here included) but intermediates abound. [= Q; < *Panicum dichotomum* Linnaeus – RAB, C, GW; > *P. dichotomum* var. *dichotomum* – F, WV; > *P. dichotomum* var. *barbulatum* (Michaux) Wood – F, WV; = *D. dichotomum* ssp. *dichotomum* – FNA; = *P. dichotomum* – G; > *P. dichotomum* – HC, S; > P. *barbulatum* Michaux – HC, S; < *D. dichotomum* var. *dichotomum* – K, Z; = *P. dichotomum* var. *dichotomum* – X]

Dichanthelium dichotomum (Linnaeus) Gould *var.* ***nitidum*** (Lamarck) LeBlond, Shining Witch Grass. Cp (GA, NC, SC, VA), Pd (NC), Mt (SC, VA): moist sandy or peaty soil of wet pine savannas and pocosin ecotones, wet meadows near the coast, swamps, and marshes; uncommon (rare in Piedmont and Mountains, rare in VA). PA and NJ south to FL, west to MO and TX; also the Bahamas (Sorrie & LeBlond 1997) and West Indies, and Mexico to Venezuela. [= Q; < *Panicum dichotomum* Linnaeus – RAB, C, GW; = *P. nitidum* Lamarck – F, HC, S; = *D. dichotomum* ssp. *nitidum* (Lamarck) Freckmann & Lelong – FNA; = *P. nitidum* var. *nitidum* – G; < *D. dichotomum* var. *dichotomum* – K, Z; = *P. dichotomum* var. *nitidum* (Lamarck) Wood – X]

Dichanthelium dichotomum (Linnaeus) Gould *var.* ***ramulosum*** (Torrey) LeBlond, Branched Witch Grass. Cp (DE, GA, NC, SC, VA), Pd (DE, GA, NC, SC, VA), Mt (GA, NC, SC, VA): floodplain forests, swamps, openings, and borders of streams and ponds, and occasionally in dry upland woods; common. May-October. MA and MI south to FL and TX. All nodes usually densely retrorsely bearded. [= Q; < *Panicum dichotomum* Linnaeus – RAB, C, GW; = *P. microcarpon* Muhlenberg ex Elliott – F, HC, S, WV; = *D. dichotomum* ssp. *microcarpon* (Muhlenberg ex Elliott) Freckmann & Lelong – FNA; = *P. nitidum* Lamarck var. *ramulosum* Torrey – G; < *D. dichotomum* var. *dichotomum* – K, Z; = *P. dichotomum* var. *ramulosum* (Torrey) Lelong – X]

Dichanthelium dichotomum (Linnaeus) Gould *var.* ***roanokense*** (Ashe) LeBlond, Roanoke Witch Grass. Cp (DE, GA, NC, SC, VA): wet pine savannas, swamp openings, and wet peaty meadows; uncommon (rare in VA). May-September. DE south to FL, west to e. TX; also in Jamaica. See note under *D. caerulescens* regarding FNA treatment. [= Q; < *Panicum dichotomum* Linnaeus – RAB, C, GW; = *P. roanokense* Ashe – F, HC, S; < *D. dichotomum* ssp. *roanokense* (Ashe) Freckmann & Lelong – FNA; < *P. roanokense* – G; < *D. dichotomum* var. *dichotomum* – K, Z; < *P. dichotomum* var. *roanokense* (Ashe) Lelong – X]

Dichanthelium ensifolium (Baldwin ex Elliott) Gould, Small-leaved Witch Grass. Cp (DE, GA, NC, SC, VA), Pd (GA, NC, SC, VA): wet to mesic peaty, sandy, or mucky soils, often in open pinelands or with sphagnum; common (rare in Piedmont). May-October. NJ south to FL, west to e. TX and AR. Plants with pubescent spikelets are frequent. [= *D. ensifolium* ssp. *ensifolium* – FNA; < *Panicum ensifolium* Baldwin ex Elliott – RAB, C, G, GW; = *P. ensifolium* – F; > *P. ensifolium* – HC, S; > *P. flavovirens* Nash – HC, S; > *P. vernale* Hitchcock & Chase – HC, S; < *D. dichotomum* (Linnaeus) Gould var. *ensifolium* (Baldwin ex Elliott) Gould & Clark – K, Z; < *P. ensifolium* var. *ensifolium* – X]

Dichanthelium erectifolium (Nash) Gould & Clark, Erect-leaved Witch Grass. Cp (GA, NC, SC): limesink ponds, depression meadows, cypress savannas, pine savannas; rare. May-August. Se. NC to FL, west to LA; Cuba. [= FNA, K, Z; = *Panicum erectifolium* Nash – RAB, GW, HC, S]

Dichanthelium fusiforme (Hitchcock) Harvill, Spindle-fruited Witch Grass. Cp (GA, NC, SC, VA): dry to moist sand of open pine and pine/oak woods and clearings; rare. May-November. Se. VA south to FL, west to MS, also in West Indies, Mexico, Central America, and Venezuela; perhaps most abundant in FL. Autumnal blades often flat. The autumnal form of *D. oligosanthes* var. *oligosanthes* can be very similar to *D. fusiforme* if the vernal blades of the former are missing. They are best separated by ligule length (0.5-1 mm in *fusiforme*, 1.5-3 mm in *oligosanthes*) and the more attenuated ends of the *fusiforme* spikelet. [= *Panicum fusiforme* Hitchcock – RAB, F, G, HC, S; < *P. aciculare* Desvaux ex Poiret – C; = *D. aciculare* ssp. *fusiforme* (Hitchcock) Freckmann & Lelong – FNA; < *D. aciculare* – K, Z]

Dichanthelium hirstii (Swallen) Kartesz, Hirsts' Witch Grass. Cp (DE, GA, NC): pond-cypress savannas and limesink depressions; rare. June-September. This distinctive species is known from only seven sites: two in NC, one in DE, two in NJ (one not seen since 1992), and two historical populations in GA. Described in 1961 (Swallen 1961), it is treated by some taxonomists as part of the *D. aciculare* group and by others as part of the *D. dichotomum* group; its affinities appear to lie with the former. See Schuyler (1996) for a discussion of the taxonomic distinctiveness of this species. The occurrence of this species in NC is documented in LeBlond & Sorrie (2001). [= K; < *Panicum aciculare* Desvaux ex Poiret – C; < *D. dichotomum* ssp. *roanokense* (Ashe) Freckmann & Lelong – FNA]

Dichanthelium latifolium (Linnaeus) Harvill, Broad-leaved Witch Grass. Mt (GA, NC, SC, VA), Pd (DE, VA), Cp (VA): open or shady well-drained forests; common (rare in GA, NC, and SC). Late May-September. ME south to n. GA, west to WI and MS. [= FNA; = *Panicum latifolium* Linnaeus – RAB, C, F, G, HC, S, WV; = *D. latifolium* (Linnaeus) Gould & Clark – K, Z, a later combination]

Dichanthelium laxiflorum (Lamarck) Gould, Open-flower Witch Grass. Cp (GA, NC, SC, VA), Pd (GA, NC, SC, VA), Mt (GA, NC, SC, VA): open or shaded woodlands, often in moist soil; common. April-September. MD south to FL, west to TX, north to IN, also in Mexico, Central America, and West Indies. [= FNA, K, Z; = *Panicum laxiflorum* Lamarck – RAB, C, F, G; > *P.*

laxiflorum – HC, S; > *P. xalapense* Humboldt, Bonpland, & Kunth var. *xalapense* – HC, S; > *P. xalapense* var. *strictirameum* Hitchcock & Chase – HC, S; > *P. xalapense* – WV]

Dichanthelium leucothrix (Nash) Freckmann, Roughish Witch Grass. Cp (GA, NC, SC), Pd (GA, NC, SC, VA): wet sandy, peaty, or mucky soil of pinelands; uncommon (rare in Piedmont). May-October. S. NJ south to FL, west to TX, also in TN, West Indies and n. South America. A micrometer is needed to measure the very short puberulence (0.1 mm) that distinguishes this taxon, *D. meridionale*, and *D. wrightianum* from other members of the *D. acuminatum* group. [= K, Y; = *Panicum leucothrix* Nash – RAB, F, G, HC, S; < *P. leucothrix* – C; = *D. acuminatum ssp. leucothrix* (Nash) Freckmann & Lelong – FNA; < *P. spretum* Schultes – GW; = *P. acuminatum* Swartz var. *leucothrix* (Nash) Lelong – X; < *D. acuminatum* (Swartz) Gould & Clark var. *implicatum* (Scribner) Gould & Clark – Z]

Dichanthelium linearifolium (Scribner) Gould, Low White-haired Witch Grass. Pd (DE, GA, NC, SC?, VA), Mt (GA, NC, SC?, VA), Cp (VA): dry open woods; common (rare south of VA, rare in DE). May-October. Se. Canada and MN south to GA and TX. [= FNA, K, Z; = *Panicum linearifolium* Scribner – RAB, C, S; > *P. linearifolium* var. *linearifolium* – F, G, WV; > *P. linearifolium* var. *werneri* (Scribner) Fernald – F, G, WV; > *P. linearifolium* – HC; > *P. werneri* Scribner – HC]

Dichanthelium longiligulatum (Nash) Freckmann, Long-ligule Witch Grass. Cp (DE, GA, NC, SC, VA), Pd (GA, NC, SC, VA): limesink ponds, depression meadows, cypress savannas, pine savannas, bogs, swamps; common (rare in Piedmont, rare in DE and VA). May-September. NJ and PA south to FL, also in TN, e. TX, and Central America. Intermediate forms between this taxon and *D. spretum* occur. [= K, Y; = *Panicum longiligulatum* Nash – RAB, HC, S; < *P. lanuginosum* Elliott var. *lindheimeri* (Nash) Fernald – C, G; = *D. acuminatum* ssp. *longiligulatum* (Nash) Freckmann & Lelong – FNA; < *P. spretum* Schultes – GW; = *P. acuminatum* Swartz var. *longiligulatum* (Nash) Lelong – X; = *D. acuminatum* (Swartz) Gould & Clark var. *longiligulatum* (Nash) Gould & Clark – Z]

Dichanthelium lucidum (Ashe) LeBlond, Bog Witch Grass. Cp (DE, GA, NC, SC, VA), Pd (GA, NC, SC, VA), Mt (GA, NC, SC, VA): wet meadows, sphagnous swamps, bogs, wet woods, sphagnous streamhead pocosins, baygalls; common (uncommon in Mountains). May-October. MA and MI south to FL and TX. Vernal culms soon recline, producing a tangled mass. The papillose fertile lemma is diagnostic. Rarely, entire populations of *D. lucidum* can have eciliate ligules composed of a membrane 0.1-0.3 mm long. Even rarer are plants within these populations with retrorsely bearded nodes. Both conditions may reflect intergradation with another taxon, possibly within the *dichotomum* complex, or with =*cryptanthum* in section *Clandestina*. [= Q; < *Panicum dichotomum* Linnaeus – RAB, C, GW; = *P. lucidum* Ashe – G, S; > *P. lucidum* var. *lucidum* – F, HC; > *P. lucidum* var. *opacum* Fernald – F, HC; < *D. dichotomum* ssp. *lucidum* (Ashe) Freckmann & Lelong – FNA; < *D. dichotomum* var. *dichotomum* – K, Z; < *P. dichotomum* var. *lucidum* (Ashe) Lelong – X]

Dichanthelium mattamuskeetense (Ashe) Mohlenbrock, Mattamuskeet Witch Grass. Cp (DE, NC, SC, VA): wet savannas, meadows, borders of pocosin shrub swamps, thickets; uncommon (rare in DE and VA). May-October. Se. MA south to ne. SC. Typically a robust plant, often richly tinged with dark purple-maroon. [= Q; < *Panicum dichotomum* Linnaeus – RAB, C, GW; > *P. mattamuskeetense* var. *mattamuskeetense* – F; > *P. mattamuskeetense* var. *clutei* (Nash) Fernald – F; < *D. dichotomum* (Linnaeus) Gould ssp. *mattamuskeetense* (Ashe) Freckmann & Lelong – FNA; > *P. mattamuskeetense* Ashe – G, HC, S; > *P. annulum* Ashe var. *glabrescens* Gleason – G; > *P. clutei* Nash – HC, S, WV; < *D. dichotomum* var. *dichotomum* – K, Z; < *P. dichotomum* var. *mattamuskeetense* (Ashe) Lelong – X]

Dichanthelium meridionale (Ashe) Freckmann, Matting Witch Grass. Pd (DE, GA, NC, SC, VA), Cp (DE, GA, NC, SC, VA), Mt (GA, NC, SC, VA): dry to damp sand of shores and woods; common (uncommon in GA, NC, SC, and VA). May-October. Sw. NS and MA to MN, south to e. NC, n. GA, and n. AL. A micrometer is needed to measure the very short puberulence (0.1 mm) that distinguishes this taxon, *D. leucothrix*, and *D. wrightianum* from other members of the *D. acuminatum* group. [= K, Y; < *Panicum lanuginosum* Elliott – RAB; < *P. leucothrix* Nash – C; > *P. meridionale* var. *meridionale* – F; > *P. meridionale* var. *albemarlense* (Ashe) Fernald – F; = *D. acuminatum* (Swartz) Gould & Clark ssp. *implicatum* (Scribner ex Nash) Freckmann & Lelong – FNA; = *P. meridionale* Ashe – G; > *P. meridionale* – HC, S, WV; > *P. albemarlense* Ashe – HC, S, WV; < *P. acuminatum* Swartz var. *unciphyllum* (Trinius) Lelong – X; < *D. acuminatum* var. *implicatum* (Scribner) Gould & Clark – Z]

Dichanthelium oligosanthes (Schultes) Gould *var.* ***oligosanthes***, Few-flowered Witch Grass. Cp (DE, GA, NC, SC, VA), Pd (GA, NC, SC, VA): sandy fields and open woods; uncommon (rare in Piedmont, rare in DE and VA Coastal Plain). April-October. MA and MN south to FL and TX. See note under *D. fusiforme*. [= K, Z; = *Panicum oligosanthes* Schultes – RAB, HC, S; < *P. oligosanthes* – C, G; = *P oligosanthes* var. *oligosanthes* – F; = *D. oligosanthes* ssp. *oligosanthes* – FNA]

Dichanthelium oligosanthes (Schultes) Gould *var.* ***scribnerianum*** (Nash) Gould, Scribner's Witch Grass. Mt (GA, VA), Pd (DE, GA, VA), Cp (NC, VA): calcareous maritime forests, dry thin woods and openings, dry prairies, usually in basic soil; uncommon in Mountains (rare in Piedmont and Coastal Plain). April-November. Sw. ME to s. BC, south to se. NC, n. GA, and CA, also in n. Mexico. Throughout the U.S., but infrequent in the southeastern and western states. [= K, Z; < *Panicum oligosanthes* Schultes – RAB, C, G; = *P. oligosanthes* var. *scribnerianum* (Nash) Fernald – F; = *D. oligosanthes* ssp. *scribnerianum* (Nash) Freckmann & Lelong – FNA; = *P. scribnerianum* Nash – HC, S]

Dichanthelium ovale (Elliott) Gould & Clark *var.* ***addisonii*** (Nash) Gould & Clark, Low Stiff Witch Grass. Cp (DE, GA, NC, SC, VA), Mt (VA): dry to damp sandy woods and fields; common (uncommon in GA, NC, and SC, rare in VA). May-October. MA and MN south to FL and TX, also in n. Mexico. See note under *D. ovale* var. *ovale* and *D. aciculare* ssp. *aciculare*. [= K, Z; = *Panicum commonsianum* Ashe – RAB, C; > *P. commonsianum* var. *commonsianum* – F, G; > *P. commonsianum* var. *addisonii* (Nash) Fernald – F, G; > *P. mundum* Fernald – F, G, HC; > *P. villosissimum* var. *pseudopubescens* (Nash) Fernald – F, G; = *D. ovale* ssp. *pseudopubescens* (Nash) Freckmann & Lelong – FNA; > *P. commonsianum* – HC, S; > *P. pseudopubescens* Nash – HC, S; > *P. addisonii* Nash – HC, S; > *P. wilmingtonense* Ashe – HC, S; = *P. ovale* Elliott var. *pseudopubescens* (Nash) Lelong – X]

Dichanthelium ovale (Elliott) Gould & Clark *var.* ***ovale***, Oval-flowered Witch Grass. Cp (GA, NC, SC, VA): dry to damp sandy pinelands; common (rare in GA, NC, SC, VA). May-October. NY to WI, south to FL and e. TX. Infrequent over most of its range except FL. In our region, the *D. ovale* double ligule character is more evident in var. *ovale*, with var. *addisonii* often having only a single ligule about 1 mm long. Plants referable to *Panicum malacon* have spikelets 3-3.2 mm long with a first glume attached conspicuously below the second glume and sterile lemma, and half or more as long as the spikelet; leaves 3-5 mm wide, puberulent beneath, and puberulent to glabrous above. It needs further study. Also see note under *D. consanguineum* regarding *D. ovale*. [= K, Z; = *Panicum ovale* Elliott – RAB, X; = *D. ovale* ssp. *ovale* – FNA; > *P. ovale* – HC, S; > *P. malacon* Nash – HC, S; = *P. ovale* var. *ovale* – X]

Dichanthelium polyanthes (Schultes) Mohlenbrock, Small-fruited Witch Grass. Pd (DE, GA, NC, SC, VA), Mt (GA, NC, SC, VA), Cp (DE, GA, NC, SC, VA): damp to dry soil of open woods and ditches; common (absent from the outer Coastal Plain south of the Neuse River, NC). June-October. VA to s. IL, south to GA and e. TX. [= FNA; = *Panicum polyanthes* Schultes – RAB, C, F, G, GW, HC, S, WV; = ***D. sphaerocarpon*** (Elliott) Gould var. ***isophyllum*** (Scribner) Gould & Clark – K, Z]

Dichanthelium portoricense (Desvaux ex Hamilton) B.F. Hansen & Wunderlin, Puerto Rican Witch Grass. Cp (GA, NC, SC): moist pine savannas and flatwoods; common (uncommon in SC). May-September. NC south to FL, west to TX, also in West Indies. [= *Panicum portoricense* Desvaux ex Hamilton – RAB, HC, S; = *D. portoricense* ssp. *portoricense* – FNA; < *D. sabulorum* (Lamarck) Gould & Clark var. *thinium* (Hitchcock & Chase) Gould & Clark – K, Z; = *P. portoricense* var. *portoricense* – X]

Dichanthelium ravenelii (Scribner & Merrill) Gould, Ravenel's Witch Grass. Cp (DE, GA, NC, SC, VA), Pd (GA, NC, SC, VA): dry sandy or rocky thin woods and openings, sometimes in moist soils; common (rare in DE and VA). May-October. NJ south to FL, west to e. TX, north to IA. [= FNA, K, Z; = *Panicum ravenelii* Scribner & Merrill – RAB, C, F, G, HC, S]

Dichanthelium scabriusculum (Elliott) Gould & Clark, Tall Swamp Witch Grass. Cp (DE, GA, NC, SC, VA), Pd (GA, NC, SC): moist, low, open or shaded woodlands, often along streams or ditches; common (uncommon in Piedmont, rare in DE and VA Coastal Plain). May-October. Se. MA south to FL, west to e. TX and AR. [< *Panicum scabriusculum* – RAB, C, GW; > *P. scabriusculum* – F, HC, S; > *P. aculeatum* Hitchcock & Chase – F, G, HC, S; < *D. scabriusculum* – FNA, K, Z; > *P. scabriusculum* var. *scabriusculum* – G]

Dichanthelium scoparium (Lamarck) Gould, Velvet Witch Grass. Cp (DE, GA, NC, SC, VA), Pd (DE, GA, NC, SC, VA), Mt (GA, NC, SC, VA): moist sandy soil of woodland openings and ditches; common (uncommon in Mountains). May-October. MA and MI south to FL and TX, also in Mexico and West Indies. The dense, velvety pubescence of the internodes, sheaths, and blades of this taxon, combined with the viscid band below the nodes, are diagnostic. See note under *D. acuminatum* var. *fasciculatum* regarding *Panicum glutinoscabrum*. [= FNA, K, Z; = *Panicum scoparium* Lamarck – RAB, C, F, G, GW, HC, S]

Dichanthelium species 1 (=arenicoloides), Sandy Woods Witch Grass. Cp (GA, NC, SC), Pd (NC): in open sandy soil of pinelands and dunes, primarily near the coast; possibly uncommon, but long overlooked. May-November. NC south to FL and west to TX and AR; also in West Indies, Central America, and n. South America. Should be sought in VA. Autumnal form strongly resembling *D. aciculare* but with larger spikelets and longer first glumes. Vernal cauline leaves are longer than those of *D. aciculare* but of similar width. Panicle branches often ascending. [= *Panicum arenicoloides* Ashe – HC, S; < *D. aciculare* (Desvaux ex Poiret) Gould & C.A. Clark ssp. *angustifolium* (Elliott) Freckmann & Lelong – FNA; < *D. aciculare* – K, Z]

Dichanthelium species 2 (=webberianum), Webber's Witch Grass. Cp (GA, NC, SC): moist pine savannas and flatwoods; uncommon. May-August. Disjunct in se. NC and SC from GA and FL. [= *Panicum webberianum* Nash – RAB, HC, S; < *D. portoricense* (Desvaux ex Hamilton) B.F. Hansen & Wunderlin ssp. *patulum* (Scribner & Merrill) Freckmann & Lelong – FNA; < *D. sabulorum* (Lamarck) Gould & Clark var. *patulum* (Scribner & Merrill) Gould & Clark – K, Z; < *P. portoricense* Desvaux ex Hamilton var. *nashianum* (Scribner) Lelong – X]

Dichanthelium species 3 (=lancearium), Nash's Witch Grass. Cp, Pd (GA, NC, SC, VA): moist pine savannas and flatwoods, moist to dry openings in maritime forests, dry pine and oak sandhills; common (uncommon in Piedmont, rare in VA Piedmont and Coastal Plain). May-September. Se. VA to FL, west to e. TX, also in West Indies and Central America. This and *D. portoricense* appear to intergrade in our region, and =*lancearium* is treated as part of *D. portoricense* ssp. *patulum* in FNA, whose concept of ssp. *patulum* includes *Panicum webberianum* (*D. species 2* here) and *P. patentifolium*, both of which appear to merit recognition (=*webberianum* as a species and =*patentifolium* as at least a variety). [= *Panicum lancearium* Trinius – RAB, C, G; > *P. lancearium* var. *lancearium* – F; > *P. lancearium* var. *patulum* (Scribner & Merrill) Fernald – F; < *D. portoricense* (Desvaux ex Hamilton) B.F. Hansen & Wunderlin ssp. *patulum* (Scribner & Merrill) Freckmann & Lelong – FNA; > *P. lancearium* – HC, S; > *P. patulum* (Scribner & Merrill) Hitchcock – HC, S; < *D. sabulorum* (Lamarck) Gould & Clark var. *patulum* (Scribner & Merrill) Gould & Clark – K, Z; < *P. portoricense* Desvaux ex Hamilton var. *nashianum* (Scribner) Lelong – X]

Dichanthelium species 9 (=cryptanthum), Hidden-flowered Witch Grass. Cp (NC, SC): wet meadows and ditches, streamside openings; rare. May-September. NC (or NJ?) to MS (or TX?) (previous concepts of this taxon and its range are unclear). In the field, this taxon can be mistaken for *D. yadkinense*; it is readily distinguished by its scabrous peduncle and membranous ligules. [= *Panicum cryptanthum* Ashe – F, HC, S; < *P. scabriusculum* Elliott – RAB, C, GW; < *D. scabriusculum* (Elliott) Gould & Clark – FNA, K, Z; = *P. scabriusculum* var. *cryptanthum* (Ashe) Gleason – G]

Dichanthelium species 10 (=curtifolium), Short-leaved Witch Grass. Cp (SC), Mt (NC): bogs, sphagnous streamhead swamps, mountain streams; uncommon (rare in Piedmont and Mountains). April-September. Ranging disjunctly in w. NC and e. TN, e. SC, FL, and MS. The combination of characters is quite distinctive for the genus in our region. [= *Panicum curtifolium* Nash – RAB, HC, S; = *D. ensifolium* (Baldwin ex Elliott) Gould ssp. *curtifolium* (Nash) Freckmann & Lelong – FNA; < *D. acuminatum* (Swartz) Gould & C.A. Clark var. *implicatum* (Scribn.) Gould & C.A. Clark – K, Z; = *Panicum ensifolium* Baldwin ex Elliott var. *curtifolium* (Nash) Lelong – X]

Dichanthelium sphaerocarpon (Elliott) Gould, Round-fruited Witch Grass. Cp (DE, GA, NC, SC, VA), Pd (DE, GA, NC, SC, VA), Mt (GA, NC, SC, VA): moist or dry thin woods, meadows, and ditches, often in dry sandy soil; common (uncommon in DE). May-October. MA, VT, OH, and KA south to FL and TX, also in Mexico. [= FNA, K, Z; = *Panicum sphaerocarpon* Elliott – RAB, C, WV; > *P. sphaerocarpon* var. *sphaerocarpon* – F, G, HC, S; > *P. sphaerocarpon* var. *inflatum* (Scribner & J.G. Smith) Hitchcock & Chase – F, G, HC, S]

Dichanthelium sphagnicola (Nash) LeBlond, Peaty Witchgrass. Cp (FL, GA): edges of cypress swamps, in sphagnous bogs, moist shady places; rare (but poorly known). May-October. GA (Chatham, Camden, Lanier counties) (Carter, Baker, & Morris 2009) to FL; should be sought in se. SC. Treated in synonymy with *Panicum dichotomum* by RAB, but no specimen is known from the Carolinas. This species is similar to *D. lucidum* in appearance, and differs most readily by its larger pubescent spikelets with smooth fertile lemma and palea. [= Q; < *Panicum dichotomum* Linnaeus – RAB; < *D. dichotomum* (Linnaeus) Gould ssp. *lucidum* (Ashe) Freckmann & Lelong – FNA; = *P. sphagnicola* Nash – HC, S; < *D. dichotomum* var. *dichotomum* – K, Z; < *P. dichotomum* var. *lucidum* (Ashe) Lelong – X]

Dichanthelium spretum (Schultes) Freckmann, Eaton's Witch Grass. Pd (GA, NC, SC, VA), Cp (DE, GA, NC, SC, VA), Mt (GA, NC, SC, VA): wet sands and peats of bogs, savannas, meadows, and shores; rare (rare in NC and VA, common in DE Coastal Plain). May-September. ME south to n. FL, LA and e. TX. Intermediate forms between this taxon and *D.*

longiligulatum occur. [= K, Y; = *Panicum spretum* Schultes – RAB, C, F, G, HC, S; = *D. acuminatum* (Swartz) Gould & Clark ssp. *spretum* (Schultes) Freckmann & Lelong – FNA; < *P. spretum* – GW; = *P. acuminatum* Swartz var. *densiflorum* (Rand & Redfield) Lelong – X; = *D. acuminatum* var. *densiflorum* (Rand & Redfield) Gould & Clark – Z]

Dichanthelium strigosum (Muhlenberg) Freckmann *var.* ***glabrescens*** (Grisebach) Freckmann, Hairless Witch Grass. Cp (GA, NC): low, open sandy pinelands and hammocks; rare. May-October. S. GA and FL west to LA; disjunct in se. NC; also in West Indies, Belize. Included in synonymy with *Panicum strigosum* by RAB, but no specimen from the Carolinas had been found prior to discovery of a population in Onslow County in 2009. [= K; = *D. strigosum* ssp. *glabrescens* (Grisebach) Freckmann & Lelong – FNA; < *Panicum strigosum* Muhlenberg – GW, RAB; = *P. polycaulon* Nash – HC, S; = *D. leucoblepharis* (Trinius) Gould & Clark var. *glabrescens* (Grisebach) Gould & Clark – Z]

Dichanthelium strigosum (Muhlenberg) Freckmann *var.* ***leucoblepharis*** (Trinius) Freckmann, Dwarf Witch Grass. Cp (GA, NC, SC), Mt (GA, NC, SC): sandy, acidic soils of pinelands; uncommon (rare in Mountains). May-October. NC south to FL, west to TX, also in Mexico. [= K; = *Panicum ciliatum* Elliott – RAB, HC, S; = *D. strigosum* ssp. *leucoblepharis* (Trinius) Freckmann & Lelong – FNA; = *P. strigosum* Muhlenberg var. *leucoblepharis* (Trinius) Lelong – X; = *D. leucoblepharis* (Trinius) Gould & Clark var. *leucoblepharis* – Z]

Dichanthelium strigosum (Muhlenberg) Freckmann *var.* ***strigosum***, Rough-hairy Witch Grass. Cp (GA, NC, SC, VA): moist soils of pine flatwoods, savannas, and pocosins, also in boggy situations; uncommon (rare in VA). May-September. Se. VA south to FL, west to TX, also in TN, e. Mexico, Mesoamerica, n. South America, and West Indies. [= K; = *Panicum strigosum* Muhlenberg – C, F, G, HC, S; = *D. strigosum* ssp. *strigosum* – FNA; < *P. strigosum* – GW, RAB; = *P. strigosum* var. *strigosum* – X; = *D. leucoblepharis* (Trinius) Gould & Clark var. *pubescens* (Vasey) Gould & Clark – Z]

Dichanthelium tenue (Muhlenberg) Freckmann & Lelong, White-edged Witch Grass. Cp (GA, NC, SC, VA), Pd (GA, NC, SC), Mt (GA, NC, SC): wet peaty or sandy soil pineland savannas, flatwoods, bogs, and meadows; common (uncommon in Piedmont, rare in Mountains). May-October. NJ south to FL, west to TX; also in Mesoamerica and Cuba. This treatment of *D. tenue* includes plants from northern Alabama formerly recognized as *Panicum concinnius*, with spikelets 1.2-1.4 mm long but otherwise possessing the characters of *D. tenue*. [= FNA; = *Panicum tenue* Muhlenberg – RAB, C; > *P. tenue* – F, HC, S; > *P. albomarginatum* Nash – F, HC, S; > *P. trifolium* Nash – F, G, HC, S; < *P. ensifolium* Baldwin – G; > *P. concinnius* Hitchcock & Chase – HC, S; < *D. dichotomum* (Linnaeus) Gould var. *tenue* (Muhlenberg) Gould & Clark – K, Z]

Dichanthelium villosissimum (Nash) Freckmann *var.* ***villosissimum***, White-haired Witch Grass. Cp (DE, GA, NC, SC, VA), Pd (DE, GA, NC, SC, VA), Mt (GA, NC, SC, VA): dry sandy soil of open woods and prairies; common (uncommon in VA). April-September. MA south to FL, west to TX, also in Mexico and Mesoamerica. Appearing to be related to *D. ovale* based on such characters as the double ligule. [= K, Y; = *Panicum villosissimum* Nash – RAB, C, HC, S, WV; = *P. villosissimum* var. *villosissimum* – F, G; = *D. ovale* (Elliott) Gould & Clark ssp. *villosissimum* (Nash) Freckmann & Lelong – FNA; = *P. ovale* Elliott var. *villosum* (A. Gray) Lelong – X; < *D. acuminatum* (Swartz) Gould & Clark var. *villosum* (A. Gray) Gould & Clark – Z]

Dichanthelium wrightianum (Scribner) Freckmann, Wright's Witch Grass. Cp (DE, GA, NC, SC, VA): limesink ponds and meadows, cypress savannas, pine savannas, bogs; uncommon (rare in DE and VA). May-September. MA south to FL, west to TX, also in Cuba and Mesoamerica. A micrometer is needed to measure the very short puberulence (0.1 mm) that distinguishes this taxon, D. *meridionale*, and *D. leucothrix* from other members of the *D. acuminatum* group. [= FNA, K, Y; = *Panicum wrightianum* Scribner – RAB, C, F, G, HC, S; < *P. spretum* Schultes – GW; = *D. acuminatum* (Swartz) Gould & Clark var. *wrightianum* (Scribner) Gould & Clark – Z]

Dichanthelium yadkinense (Ashe) Mohlenbrock, Spotted-sheath Witch Grass. Pd (DE, GA, NC, SC, VA), Cp (GA, NC, SC, VA), Mt (GA, NC, SC, VA): floodplain forests, thickets, bottomlands, and swamps, often on alluvial deposits; common (uncommon in Coastal Plain, uncommon in Mountains, uncommon in VA, rare in DE). May-October. NJ and MI south to GA and TX, also in Mexico. Sheaths often with wart-like glands. This taxon resembles *D. species 9 (=cryptanthum)*, from which it differs most readily by its hairy ligule (vs. membranous) and smooth peduncle (vs. antrorsely scabrous). [= Q; < *Panicum dichotomum* Linnaeus – RAB, GW; = *P. yadkinense* Ashe – C, F, G, HC, S, WV; = *D. dichotomum* ssp. *yadkinense* (Ashe) Freckmann & Lelong – FNA; < *D. dichotomum* var. *dichotomum* – K, Z; = *P. dichotomum* var. *yadkinense* (Ashe) Lelong – X]

Dichanthelium chamaelonche (Trinius) Freckmann & Lelong *ssp. breve* (Hitchcock & Chase) Freckmann & Lelong, Short Witch Grass, endemic to c. and s. FL, primarily near the east coast. [= FNA; = *Panicum breve* Hitchcock & Chase – HC, S; = *D. dichotomum* (Linnaeus) Gould var. *breve* (Hitchcock & Chase) Gould & Clark – K, Z; = *P. chamaelonche* Trinius var. *breve* (Hitchcock & Chase) Lelong – X]

Dichanthelium dichotomum (Linnaeus) Gould *var. glabrifolium* (Nash) Gould & Clark, Smooth-leaved Witch Grass, endemic to peninsular FL, mostly near the west coast. Like *D. chamaelonche* ssp. *breve*, this taxon appears to be more closely related to *D. chamaelonche* than to *D. dichotomum* or *D. ensifolium*. [= K, Z; = *Panicum glabrifolium* Nash – HC, S; < *P. chamaelonche* Trinius var. *chamaelonche* – X]

Dichanthelium leibergii (Vasey) Freckmann, Leiberg's Witch Grass. NY and PA west to AB, ND, and KS. [= FNA, K, Z; = *Panicum leibergii* (Vasey) Scribner – C, F, G, HC]

Dichanthelium malacophyllum (Nash) Gould, Soft-leaf Witch Grass. KY and TN west to KS and TX. Primarily a plant of cedar glades and dry calcareous soils. Reported from SC by FNA, but source of record has not been identified. [= FNA, K, Z; = *Panicum malacophyllum* – F, G, HC, S]

Dichanthelium nudicaule (Vasey) B.F. Hansen & Wunderlin. Cp (AL, FL, MS): bogs, wet pine savannas; rare. W. FL Panhandle and s. AL west to MS. [= Q; = *Panicum nudicaule* Vasey] {add synonymy}

Dichanthelium wilcoxianum (Vasey) Freckmann is shown as occurring in SC and MS on the range map in FNA, but the source of these records is not known for this plant primarily of dry prairies in the Upper Midwest. It is not treated here.

Dichanthelium xanthophysum (A. Gray) Freckmann, Slender Witch Grass. Mt (WV): {habitats}; rare. NS and ME west to SK, south to PA, ne. WV, and SD. [= FNA, K, Z; = *Panicum xanthophysum* A. Gray – C, F, G, HC, WV]

Digitaria Haller 1768 (Crab Grass)

A genus of about 200 species, primarily in the tropics and subtropics. Most of our species occur primarily in disturbed situations; their original distributions and habitats are now obscure. References: Wipff in FNA (2003a); Webster (1987)=Z; Wipff & Hatch (1994)=Y; Wipff (1996b)=X; Webster (1980).

1 Inflorescence an open panicle; spikelets long-pedicellate, borne singly at the ends of long panicle branches; [section *Pennatae*] ..... ***D. cognata*** *var.* ***cognata***
1 Inflorescence of 2-several spikelike racemes borne digitately or in close proximity near the summit of the culm; spikelets sessile or short-pedicellate, borne more-or-less closely spaced along the racemes.
2 Rachis of each raceme narrow, trigonous, only slightly (if at all) winged.
3 Spikelets 4.2-5.9 mm long ..... ***D. insularis***
3 Spikelets 1.3-3.6 mm long.
4 Spikelets in 2s on the middle portions of the primary branches, the pedicels not adnate; upper lemmas gray, yellow, and/or purple-tinged when immature, purple at maturity ..... ***D. texana***
4 Spikelets in groups of 2-5 on the middle portions of the primary branches, the longer pedicels often adnate to the primary branch for a portion of their lengths; upper lemmas brown when immature, dark brown at maturity.
5 Spikelets 1.7-2.2 mm long; plants 3-10 dm tall; racemes to 10 cm long; upper sheaths glabrous, lower sheaths glabrous to sparsely pilose..... ***D. filiformis*** *var.* ***filiformis***
5 Spikelets 2.0-2.8 mm long; plants 8-15 dm tall; racemes to 25 cm long; upper sheaths glabrous or pilose, lower sheaths densely pilose..... ***D. villosa***
2 Rachis of each raceme broad (0.5-1 mm wide), winged, the wings as wide as or wider than the rachis proper.
6 Lower sheaths glabrous; second glume 0.75-1× as long as the first glume (which may be ; fertile lemma dark brown or black at maturity (or pale brown or gray in *D. longiflora*).
7 Hairs of the spikelet minutely capitate; second glume ca. 1× as long as the first glume; spikelets 1.7-2.3 mm long ..... ***D. ischaemum***
7 Hairs of the spikelet not minutely capitate; second glume ca. 0.75× as long as the first glume; spikelets 1.2-1.7 mm long ..... ***D. violascens***
6 Lower sheaths pilose; second glume 0.3-0.6× as long (to 0.8× as long in *D. ciliaris*) as the first glume; fertile lemma white, tan, or grayish-brown at maturity.
8 Spikelets 1.5-1.8 mm long, villous with crinkled hairs; pedicels glabrous, terete in cross-section ..... ***D. serotina***
8 Spikelets (1.7-) 2.4-4.1 mm long, glabrous, scabrous, or pubescent with straight hairs; pedicels scabrous, 3-angled in cross-section; [section *Digitaria*].
9 Spikelets (1.7-) 2.5-3.4 mm long, averaging 3.0 mm long or shorter; leaf blades pilose over the upper surface ..... ***D. sanguinalis***
9 Spikelets 2.6-4.1 mm long, averaging 3.1 mm long or longer; leaf blades glabrous except for a few hairs on the upper surface at the base.
10 Lower lemma of the sessile spikelet with 5 equidistant nerves; lowermost inflorescence node glabrous or pubescent with hairs < 0.4 mm long; apex of the first glume rounded to truncate..... ***D. bicornis***
10 Lower lemma of sessile spikelet with the lateral nerves crowded to the margins; lowermost inflorescence node pubescent with hairs > 0.4 mm long; apex of the first glume acute..... ***D. ciliaris***

Digitaria bicornis (Lamarck) Roemer & J.A. Schultes. Cp (FL, GA, NC, SC): sandy fields, lawns, roadsides, disturbed places; common. Webster (1980) believed that this species is likely to occur in VA and MD, as well. Whether or not it is introduced is unclear; it is now widely distributed in the tropics and subtropics worldwide. [= FNA, K, Z]

Digitaria ciliaris (Retzius) Köler, Southern Crab Grass. Cp (FL, GA, NC, SC, VA), Pd (GA, NC, SC), Mt (GA, NC, SC): sandy fields, roadsides, and disturbed areas; common? August-October. [= C, FNA, K, Z; = *D. sanguinalis* var. *ciliaris* (Retzius) Parlatore – F, HC]

Digitaria cognata (J.A. Schultes) Pilger, Fall Witch Grass. Cp (DE, FL, GA, NC, SC, VA), Pd (GA, NC, SC, VA), Mt (VA): sandy fields and roadsides; common (rare in VA). July-October. Wipff & Hatch (1994) discuss the reasons for including *Leptoloma* in *Digitaria*. [= FNA; = *Digitaria cognata* var. *cognata* – K; = *Leptoloma cognatum* (J.A. Schultes) Chase – RAB, C, F, G, HC, S; = *D. cognatum* ssp. *cognatum* – Y]

Digitaria filiformis (Linnaeus) Köler *var.* ***filiformis***. Cp (DE, FL, GA, NC, SC, VA), Pd (GA, NC, SC, VA), Mt (GA, NC, SC, VA, WV): fields, roadsides, disturbed areas; common (uncommon in Mountains, rare in WV). September-October. Var. *filiformis*, with pubescent spikelets, is widespread in e. North America. Var. *laeviglumis* (Fernald) J. Wipff, with glabrous spikelets, occurs in New England. Var. *dolichophylla* (Henrard) J. Wipff occurs in s. FL, Cuba, and PR. See Wipff (1996) for additional discusion. [= RAB, C, F, FNA, G, X; = *D. filiformis* – HC, K; = *Syntherisma filiformis* (Linnaeus) Nash – S; < *D. filiformis* – W, WV]

Digitaria insularis (Linnaeus) Mez ex Ekman, Sourgrass. Cp (AL, FL, MS): moist areas; rare. FL, AL, and MS west to TX; West Indies; Mexico, Central America, South America. [= FNA, K; = *Trichachne insularis* (Linnaeus) Nees – HC; = *Valota insularis* (Linnaeus) Chase – S]

* ***Digitaria ischaemum*** (Schreber) Muhlenberg, Smooth Crab Grass. Cp (DE, FL, GA, NC, SC, VA), Pd (DE, GA, NC, SC, VA), Mt (GA, NC, SC, VA, WV): fields, lawns, disturbed areas; common, native of Eurasia. July-October. Two varieties have sometimes been recognized. Var. *ischaemum* has racemes (1-) 2-6, 1-9 (-10) cm long, mostly curved and plants mostly to 4 dm tall. Var. *mississippiensis* (Gattinger) Fernald has racemes 5-7, 6-15 cm long, mostly stiff and straight and plants to 10 dm tall. [= C, FNA, K, W, WV; > *D. ischaemum* var. *ischaemum* – F, G, HC; > *D. ischaemum* (Schreber) Muhlenberg var. *mississippiensis* (Gattinger) Fernald – F, G, HC; = *D. ischaemum* var. *ischaemum* – RAB; = *Syntherisma ischaemum* (Schreber) Nash – S]

* ***Digitaria sanguinalis*** (Linnaeus) Scopoli, Northern Crab Grass. Cp (DE, GA, NC, SC, VA), Pd (DE, GA, NC, SC, VA), Mt (GA, NC, SC, VA, WV): fields, roadsides, disturbed areas; common. July-October. [= RAB, FNA, C, G, K, W, WV, Z; = *D. sanguinalis* var. *sanguinalis* – F, HC; = *Syntherisma sanguinalis* (Linnaeus) Dulac – S]

Digitaria serotina (Walter) Michaux, Dwarf Crab Grass. Cp (FL, GA, SC, VA): sandy woodlands; rare (rare in VA). October. [= RAB, C, F, FNA, G, GW, HC, K; = *Syntherisma serotina* Walter – S]

* ***Digitaria texana*** A.S. Hitchcock, Texas Crabgrass. Cp (VA): disturbed areas; rare, native of coastal Texas. Established in City of Virginia Beach, VA (VBA 2007). Also reported for St. Johns County, FL, adjacent to our area. [= FNA, HC, K] {add to synonymy}

Digitaria villosa (Walter) Persoon. Cp (GA, NC, SC, VA), Pd (GA, NC, SC, VA), Mt (GA, NC, SC): sandy fields, roadsides; common (rare in VA). September-October. [= HC, K; = *D. filiformis* var. *villosa* (Walter) Fernald – RAB, C, F, FNA, G, X; = *Syntherisma villosa* Walter – S]

* ***Digitaria violascens*** Link. Cp (FL, GA, NC, SC), Pd (GA, SC), Mt (GA): sandy fields, roadsides, and woodland borders; common. September-October. [= C, FNA, G, HC, K; = *D. ischaemum* var. *violascens* (Link) Radford – RAB; *? Syntherisma floridana* (A.S. Hitchcock) A.S. Hitchcock – S]

* ***Digitaria eriantha*** Steudel *ssp.* ***pentzii*** (Stent) Kok, Pangola Grass. Cp (FL): pastures; rare, native of Africa. Introduced in n. FL (Wunderlin & Hansen 2003, 2006). [= FNA; < *D. eriantha* – K; = *D. pentzii* Stent] {not yet keyed; add to synonymy}

* ***Digitaria horizontalis*** Willdenow, Jamaican Crabgrass. Reported for SC on the basis of a specimen at NCU (Kartesz 1999). {check specimen} [= FNA, K] {not yet keyed; add to synonymy

* ***Digitaria longiflora*** (Retzius) Persoon, Indian Crabgrass. Cp (FL): lawns, roadsides, pastures; uncommon, native of Asia and Africa. Alachua, Dixie Duval, and Holmes counties southward to s. FL. [= FNA, K] {not yet keyed}

* ***Digitaria nuda*** Schumacher. Cp (FL): disturbed areas; rare, native of Africa. In our area, known only from Columbia County, FL. [= FNA, K; *Syntherisma nuda* (Schumacher) A.S. Hitchcock] {not yet keyed; add to synonymy}

Dinebra Jacquin 1809 (Viper Grass)

A genus of 3 species, annuals, of Africa and India. References: Barkworth in FNA (2003a).

* *Dinebra retroflexa* (Vahl) Panzer, Viper Grass, native of Africa and s. Asia, has been collected as a waif in Mecklenburg County, NC (Mellichamp, Matthews, & Smithka 1987). [= FNA, K] {not keyed}

Distichlis Rafinesque 1819 (Saltgrass)

A genus of about 10 species, of North, Central, and South America, and Australia. Bell & Columbus (2008) recircumscribe *Distichlis* to include *Monanthochloe* Engelmann and *Reederochloa* Soderstrom & H.F. Decker. References: Bell & Columbus (2008)=Z; Thieret in FNA (2003a); Barkworth in FNA (2003a). [including *Monanthochloe*]

Identification notes: When sterile, *Distichlis spicata* is easily confused with *Sporobolus virginicus*, with which it sometimes occurs. *Distichlis spicata* is generally a coarser plant, and lacks long hairs around the collar of the sheath; *Sporobolus virginicus* is more delicate, and typically has long hairs on either side of the collar.

1 Leaf blades < 1.5 cm long, subulate; plant colonial by surficial stolons (rarely rhizomatous); pistillate and staminate inflorescence with 1 spikelet; [FL and other subtropical shores] ..... ***D. littoralis***
1 Leaf blades 2.5-14 cm long, flat (though often involute when dry); plants colonial by subterranean rhizomes; pistillate and staminate inflorescences with > 1 spikelet; [widespread] ..... ***D. spicata***

Distichlis littoralis (Engelmann) H.L. Bell & Columbus, Shoregrass, Key Grass. Cp (FL): brackish shores; rare. From n. peninsular FL (Taylor and Dixie cos. on the west coast and Volusia County on the east coast) southward. Also known from coastal sw. LA (Cameron Parish) and TX southward. [= *Monanthochloe littoralis* Engelmann – FNA, K, S, WH]

Distichlis spicata (Linnaeus) Greene, Saltgrass, Spike Grass. Cp (DE, FL, GA, NC, SC, VA): coastal marshes and shores, especially common in hypersaline flats (where infrequent tidal inundation is followed by evaporation); common. June-October. Two varieties (or subspecies or species) have often been recognized: var. *spicata* ranging along the Atlantic coast from NS and PE south to tropical America, and on the Pacific coast of North America, and var. *stricta* (Torrey) Scribner widespread in saline situations in western North America. These do not appear to warrant taxonomic recognition (Barkworth in FNA 2003a). [= RAB, FNA, GW, K, S; > *D. spicata* var. *spicata* – C; > *D. spicata* – F, G, HC; > *D. spicata* ssp. *spicata*]

Echinochloa Palisot de Beauvois 1812 (Barnyard-grass, Jungle-rice)

A genus of 4-5- species of the tropics and warm temperate regions. References: Michael in FNA (2003a). Key based in part on C.

1 Panicle elongate, the branches few, distant, unbranched, and short, to 2 (-3) cm long; spikelets awnless; leaves 3-6 (-9) mm wide ..... ***E. colonum***
1 Panicle broader, the branches numerous, approximate, often further branched, short to long, some (at least) exceeding 2 cm long; spikelets awnless or awned; leaves 5-30 mm wide.
  2 Lower sheaths usually papillate-pubescent; fertile lemma 2.5-4× as long as wide ..... ***E. walteri***
  2 Lower sheaths glabrous; fertile lemma 1.5-2.5× as long as wide.
    3 Inflorescence nodding; awns 4-29 mm long ..... ***E. cruspavonis*** *var.* ***cruspavonis***
    3 Inflorescence erect, stiff; awns 0-25 mm long.
      4 Second glume and sterile lemma hairy or scabrous to nearly glabrous, the hairs usually not papillose-based; fertile lemma obtuse or broadly acute, with a thin, membranous (later withering) tip set off from the body by a line of minute hairs.

5 Panicle fairly open, the branches erect, appressed, or spreading; spikelets green or purple-tinged, awnless or with a well-developed awn (to 25 mm long); leaves 5-15 mm wide; plants mostly 3-7 dm tall.....***E. crusgalli** var. **crusgalli***
5 Panicle very crowded, the branches appressed to slightly spreading, the tips often incurved; spikelets purplish-brown, awnless (or with awn to 2 mm long); leaves mostly 15-30 mm wide; plants mostly 7-15 dm tall..... ***E. frumentacea***
4 Second glume and sterile lemma usually with stout, papillose-based hairs on the veins; fertile lemma acuminate, abruptly narrowed to a firm, persistent tip.
6 Spikelets < 3.5 mm long, not including the awn (if present); sterile lemma awnless or with an awn to 6 (-10) mm long..... .....***E. muricata** var. **microstachya***
6 Spikelets > 3.5 mm long, not including the awn (if present); sterile lemma usually awned (rarely awnless), the awn 6-25 mm long. .....***E. muricata** var. **muricata***

* ***Echinochloa colonum*** (Linnaeus) Link, Jungle-rice. Cp (FL, GA, NC, SC, VA), Pd (GA, NC, SC, VA), Mt (GA, SC, NC): fields, ditches, disturbed wet areas; uncommon (rare in VA), native of the Old World tropics. July-October. The debate over the appropriate grammatical treatment and therefore spelling of the epithet is discussed in detail in Ward (2005b). [= *E. colonum* – RAB, C, F, G, GW, HC; = *E. colona* – FNA, K, S, orthographic variant]

* ***Echinochloa crusgalli*** (Linnaeus) Palisot de Beauvois *var.* ***crusgalli***, Barnyard-grass. Cp (DE, FL, VA), Pd (DE, VA), Mt (VA, WV), {GA, NC, SC}: disturbed areas; common. July-October. [= C, G; < *E. crusgalli* – RAB, GW, WV (also see *E. muricatum*); = *E. crus-galli* – K, orthographic variant; < *E. crusgalli* – F, FNA; < *E. crus-galli* ssp. *crus-galli* – S (also see *E. muricata*)]

Echinochloa cruspavonis (Kunth) J.A. Schultes *var.* ***cruspavonis***. Cp (FL, VA), {AL, MS} July-October. [< *E. crus-pavonis* – HC; = *E. crus-pavonis* var. *crus-pavonis* – FNA, K, orthographic variant]

* ***Echinochloa frumentacea*** Link, Japanese Millet, Billion-dollar Grass, White Panic, Siberian Millet. Cp (NC), Pd (VA), Mt (WV): disturbed areas; rare, native of Asia. July-October. [= F, FNA, K, WV; < *E. crusgalli* – RAB, GW; = *E. crusgalli* (Linnaeus) Palisot de Beauvois var. *frumentacea* (Link) W. Wight – C, G; = *E. crus-galli* ssp. *edulis* A.S. Hitchcock – S]

Echinochloa muricata (Palisot de Beauvois) Fernald *var.* ***microstachya*** Wiegand, Barnyard-grass. Mt (VA, WV), {GA, NC, SC, VA}: {habitat}; uncommon in WV {rarity}. July-October. [= C, FNA, K; < *E. crusgalli* – RAB, GW, WV; = *E. pungens* (Poiret) Rydberg var. *microstachya* (Wiegand) Fernald & Griscom – F; = *E. microstachya* (Wiegand) Rydberg – G; < *E. crus-galli* ssp. *crus-galli* – S]

Echinochloa muricata (Palisot de Beauvois) Fernald *var.* ***muricata***, Barnyard-grass. Cp (DE, FL, NC, VA), Pd (DE, VA), Mt (VA, WV): interdune wetlands, {other habitats}; common. July-October. [= C, FNA, K; < *E. crusgalli* – RAB, GW, WV; > *E. pungens* (Poiret) Rydberg var. *pungens* – F; > *E. pungens* var. *ludoviciana* (Wiegand) Fernald & Griscom – F; = *E. muricata* – G; < *E. crus-galli* ssp. *crus-galli* – S]

Echinochloa walteri (Pursh) Heller. Cp (DE, FL, GA, NC, SC, VA), Pd (GA), Mt (WV): marshes; common (rare in WV). July-October. MA south to FL, west to TX on the outer Coastal Plain; also inland from OH west to WI, south to w. WV, MO, and AR. [= RAB, C, F, FNA, GW, HC, K, S, W]

Eleusine Gaertner 1788 (Yard Grass)

A genus of about 9 species, native to Africa and South America. References: Hilu in FNA (2003a). Key based on FNA.

1 Panicles with 1-3 branches, attached in a single digitate cluster.....***E. tristachya***
1 Panicles with 4-20 branches, 1-2 of these attached below the terminal digitate cluster.
2 Lower glumes 2-3-veined; panicle branches 5-7 mm wide; ligule 1-2 mm long, ciliate with hairs 1-2 mm long ....***E. coracana** ssp. **africana***
2 Lower glumes 1-veined; panicle branches 3-5.5 mm wide; ligule 0.2-1 mm long, erose.....***E. indica***

* ***Eleusine coracana*** (Linnaeus) Gaertner *ssp.* ***africana*** (Kennedy & O'Byrne) Hilu & de Wet, Finger Millet. Cp (SC): disturbed areas; rare, native of Africa. There remains some doubt about the identity of the population discovered. Reported by Werth, Zeng, & Baird (1997). [= FNA, K; = *E. africana* Kennedy & O'Byrne]

* ***Eleusine indica*** (Linnaeus) Gaertner, Yard Grass, Goose Grass. Cp (DE, FL, GA, NC, SC, VA), Pd (DE, GA, NC, SC, VA), Mt (GA, NC, SC, VA, WV): lawns, roadsides, gardens, disturbed areas; common, native of Old World. [= RAB, C, F, FNA, G, HC, K, S, W, WV]

* ***Eleusine tristachya*** (Lamarck) Lamarck. Cp (SC): in waste areas of wool-combing wills; rare, native of South America, perhaps only a waif in our area. Reported as introduced in additional, scattered states in e. United States, including VA (Kartesz 1999, but apparently in error), NJ (Hilu 1980) and AL (Small 1933). [= FNA, K, S]

Elionurus Humboldt & Bonpland ex Willdenow 1805 (Balsamscale)

A genus of about 15 species, native to tropical and subtropical parts of Africa and the Americas. References: Barkworth in FNA (2003a).

Elionurus tripsacoides Humboldt & Bonpland ex Willdenow, Pan-American Balsamscale. Cp (FL, GA, MS): wet savannas; rare. S. GA south to s. FL, west to s. and w. TX, and south through Central America to s. South America. Reported for sw. GA by Jones & Coile (1988), for s. MS and FL (Sorrie & Leonard 1999). [= FNA, K; = *Elyonurus tripsacoides* – GW, HC, S, orthographic variant]

Elymus Linnaeus 1753 (Wild-rye, Rye Grass)

(also see *Thinopyrum*)

A genus of about 150 species, semicosmopolitan in temperate regions. The genus, as now circumscribed, includes all allopolyploid taxa with at least one chromosome complement contributed from *Pseudoroegneria*. North American *Elymus* are allopolyploids of *Pseudoroegneria* and *Hordeum* (Helfgott & Mason-Gamer 2004). Reference: Barkworth, Campbell, & Salomon in FNA (2007a); Campbell (2000); Church (1967); Tucker (1996)=Z; Barkworth (1997)=X. This treatment largely follows Barkworth, Campbell, & Salomon in FNA (2007a).

Identification notes: Measurements of the spike include the awns, but measurements of spikelets and its components do not. Rachis internodes should be measured near the middle of the spike. Glume widths are measured at the widest point, or if the widest point is not apparent, at about 5 mm above the glume base.

1 Spikelets solitary at each node (occasionally paired at the lowest nodes); glumes and lemmas awned or unawned; plants cespitose to strongly rhizomatous.
- 2 Plants strongly rhizomatous; [common and weedy introduced species]; [section *Elytrigia*] ..... ***E. repens***
- 2 Plants cespitose; [rare natives and introductions]; [section *Goulardia*].
  - 3 Spikelets 20-30 mm long; anthers 3-6 mm long; rachis internodes hirtellous below the spikelets; [very rare introduction, reported for c. GA] ..... ***E. semicostatus***
  - 3 Spikelets 8-25 mm long; anthers 0.8-3 mm long; rachis internodes glabrous below the spikelets; [rare natives of glades and barrens].
    - 4 Lemma awns 15-40 mm long, longer than the body of the lemma ..... ***E. trachycaulus*** *ssp.* ***subsecundus***
    - 4 Lemma awns 1-13 mm long, shorter than the body of the lemma..... ***E. trachycaulus*** *ssp.* ***trachycaulus***

1 Spikelets 2-3 (-5) at each node; glumes and lemmas usually awned; plants usually cespitose, occasionally short-rhizomatous.
- 5 Both glumes (including their awn) either 0-3 mm long and subulate or 1-20 mm long and differing in length by > 5 mm, 0.1-0.6 mm wide, tapering from the base, with 0-1 distinct veins, persistent; rachis internodes 4-12 mm long, ca. 0.5 mm thick at the narrowest section.
  - 6 Spikelets appressed; lemma awns straight or curving; glumes sometimes absent, but usually 1-20 mm long, 0.1-0.6 mm wide, with a distinct vein; spikes erect or nodding..... ***E. svensonii***
  - 6 Spikelets widely spreading to horizontal; lemma awns straight (rarely slightly curving); glumes 0-3 mm long, with no distinct veins (rarely 1 glume to 20 mm long, 0.2 mm wide); spikes usually erect.
    - 7 Lemmas pubescent..... ***E. hystrix*** *var.* ***bigelovianus***
    - 7 Lemmas glabrous to scabrous..... ***E. hystrix*** *var.* ***hystrix***
- 5 Both glumes (including the awns) 10-40 mm long, usually differing in length by < 5 mm, 0.2-2.3 mm wide, lanceolate to setaceous, usually widest above the base, with 2-8 veins, persistent or disarticulating; rachis internodes slender (as above) or stout (2-5 mm long and ca. 1 mm thick at the narrowest section).
  - 8 Glume bases flat, thin, and evidently veined, or indurate for < 1 mm, the bodies not exceeding the adjacent (usually 8-15 mm long) lemmas; lemma awns usually curving outward; spikes usually nodding to pendent; internodes (2-) 4-12 mm long.
    - 9 Glumes 0.5-1.6 mm wide; lemma awns 15-40 (-50) mm long; paleas acute; rachis internodes 2-5 (-7) mm long; blades (3-) 4-15 (-20) mm wide, pale green, usually glabrous or scabridulous above ..... ***E. canadensis*** *var.* ***canadensis***
    - 9 Glumes 0.3-0.8 mm wide; lemma awns 15-25 (-35) mm long; paleas narrowly truncate; rachis internodes 5-8 (-12) mm long; blades 8-24 mm wide, dark green, usually thinly pilose above ..... ***E. wiegandii***
  - 8 Glume bases terete, indurate, and lacking evident veins for 0.5-4 mm, the bodies (unless indistinct from the awns) exceeding the adjacent (usually 6-12 mm long) lemmas; lemma awns straight; spikes erect or nodding; internodes 2-5 mm long (to 7 mm in *E. sp. 1*).
    - 10 Glumes persistent, 0.2-1 mm wide, with 2-4 veins, the basal 0.5-2 mm essentially straight; lemmas rarely glabrous; spikelets with 1-3 (-4) florets; spikes nodding, exserted.
      - 11 Blades glabrous to scabrous, pale dull green; spikes 7-25 cm long; internodes usually 3-5 mm long; spikelets with 2-3 (-4) florets; lemmas usually scabrous, 7-14 mm long, 1-5 mm longer than the acute paleas; flowering usually late June to late July..... ***E. riparius***
      - 11 Blades villous to pilose, dark glossy green; spikes 4-12 cm long; internodes usually 2-3 mm long; spikelets with 1-2 (-3) florets; lemmas usually villous, 5.5-9 mm long, 0-1.5 mm longer than the obtuse paleas; flowering usually early June to early July ..... ***E. villosus***
    - 10 Glumes disarticulating with the lowest floret, 0.7-2.3 mm wide, with (2-) 3-5 (-8) veins, the basal 1-4 mm clearly bowed-out; lemmas often glabrous; spikelets with (2-) 3-5 (-6) florets; [*Elymus virginicus* complex].
      - 12 Spikes 2.5-6 cm wide, exserted; lemma awns 15-40 mm long; blades glabrous or villous.
        - 13 Spikes with 9-18 nodes; internodes 4-7 mm long; blades usually lax, dark glossy green under the glaucous bloom; auricles 2-3 mm long, blackish at maturity; flowering usually in mid-May to mid-June ..... ***E. macgregorii***
        - 13 Spikes with 15-30 nodes; internodes 3-5 mm long; blades lax, or often ascending and involute, pale dull green; auricles 0-2 mm long, brownish at maturity; flowering usually in mid-June to late July.
          - 14 Spikelets (and usually also the foliage) pubescent; spikes usually 6-12 cm long; lemmas 6-10 mm long..... ***E. glabriflorus*** *var.* ***australis***
          - 14 Spikelets (and usually also the foliage) glabrous to scabrous); spikes usually 9-16 cm long; lemmas 7-13 mm long..... ***E. glabriflorus*** *var.* ***glabriflorus***
      - 12 Spikes 0.7-2 cm wide (including the awns), exserted or sheathed; lemma awns 1-15(20) mm long; spikelets appressed to slightly spreading; blades usually glabrous to scabridulous.
        - 15 Lemma awns 1-3(5) mm long; blades often ascending, somewhat involute, those higher on the stiffly erect culms broader and more persistent; flowering usually in early July to mid-August..... ***E. curvatus***
        - 15 Lemma awns 5-15(20) mm long; blades usually spreading or lax, not markedly broader or more persistent towards the culm summit; flowering usually in mid-June to late July.
          - 16 Spikes glaucous, hispidulous to villous-hirsute, often intermediate in exsertion; glumes indurate in the lowest 1-2 mm; ligules and auricles usually absent; flowering usually early July to mid-August..... ***E. virginicus*** *var.* ***intermedius***
          - 16 Spikes green to glaucous, usually glabrous to scabrous, partly included in the sheath to fully exserted; ligules and auricles often present; flowering usually mid-June to mid-July.
            - 17 Spikes partly sheathed; glumes 1-2.3 mm wide, strongly indurate and bowed-out in the lowest 2-4 mm; plants usually green to yellowish-brown; nodes mostly covered..... ***E. virginicus*** *var.* ***virginicus***

17 Spikes usually exserted; glumes (0.5-) 0.7-1.5 (-1.8) mm wide, moderately indurate and bowed out in the lowest 1-2 mm; plants usually glaucous, sometimes reddish-brown at maturity; nodes often exposed.
18 Culms usually 3-8 dm tall, with 4-6 nodes; blades 2-9 mm wide, becoming involute; spikes 3.5-11 cm long, strongly glaucous; glumes usually indurate in the lowest 1-2 mm.....***E. virginicus** var. **halophilus***
18 Culms usually 7-10 dm tall, with 6-8 nodes; blades 3-15 mm wide, flat; spikes 4-20 cm long, pale green or glaucous; glumes indurate only in the lowest 1 mm.....***E. virginicus** var. **jejunus***

Elymus canadensis Linnaeus *var.* ***canadensis***, Great Plains Wild-rye, Nodding Wild-rye. Mt (NC, VA), Pd (NC, VA), Cp? (SC?): moist forests; uncommon (rare in NC, VA, and SC?). July-August. NS, QC, and YT south to NC, SC (?), OK, NM, and AZ. [= FNA; < *E. canadensis* – RAB, C, F, G, GW, K, W, WV]

Elymus curvatus Piper, Awnless Wild-rye. Ip (KY, TN): moist bottomlands and slopes; rare. NY and QC west to BC and WA, south to s. OH, KY, c. TN, OK, and n. TX. [= FNA; < *E. virginicus* Linnaeus – C; = *E. submuticus* (Hooker) Smyth & Smyth – K; = *E. virginicus* Linnaeus var. *submuticus* Hooker – F, G; < *E. virginicus* var. *virginicus* – S]

* *Elymus elymoides* (Rafinesque) Swezey ssp. *brevifolius* (J.G. Smith) Barkworth. Mt (KY): {habitat}; rare. [= FNA] {synonymy incomplete}

Elymus glabriflorus (Vasey) Scribner & Ball *var.* ***australis*** (Scribner & C.R. Ball) J.J.N. Campbell, Southeastern Wild-rye. Pd (DE), {Cp (FL, GA, NC, SC, VA), Pd, Mt (GA, NC, SC, VA): } {*glabriflorus* as a whole: ME, WV, IN, IL, and IA, south to n. FL, and c. TX} [< *E. glabriflorus* – FNA; < *E. virginicus* – RAB, C, GW, W, WV; < *E. virginicus* var. *glabriflorus* (Vasey) Bush – F, "forma *australis*"; < *E. virginicus* var. *virginicus* – G, K; = *E. virginicus* var. *australis* – S]

Elymus glabriflorus (Vasey) Scribner & Ball *var.* ***glabriflorus***, Southeastern Wild-rye. Cp (DE), Pd (DE), {Cp (FL, GA, NC, SC, VA), Pd (GA, NC, SC, VA), Mt (GA, NC, SC, VA): } {*glabriflorus* as a whole: ME, WV, IN, IL, and IA, south to n. FL, and c. TX} [< *E. glabriflorus* – FNA; < *E. virginicus* – RAB, C, GW, W, WV; < *E. virginicus* var. *glabriflorus* (Vasey) Bush – F, "forma *glabriflorus*"; < *E. virginicus* var. *virginicus* – G, K; = *E. virginicus* var. *glabriflorus* – S]

Elymus hystrix Linnaeus *var.* ***bigelovianus*** (Fernald) Bowden, Northern Bottlebrush Grass. Mt (NC): high elevation forests; rare. [< *Hystrix patula* Moench – RAB, G, WV; < *Elymus hystrix* – C, FNA; = *Hystrix patula* var. *bigeloviana* (Fernald) Deam – F; = *E. hystrix* var. *bigeloviana* – K, orthographic variant; < *Hystrix hystrix* (Linnaeus) Millspaugh – S]

Elymus hystrix Linnaeus *var.* ***hystrix***, Common Bottlebrush Grass. Mt (GA, NC, SC, VA, WV), Pd (DE, GA, NC, SC, VA), Cp (VA): moist forests, dry forests especially over more fertile soils; common (rare in DE). [= K; < *Hystrix patula* Moench – RAB, G, WV; < *Elymus hystrix* – C, FNA; = *Hystrix patula* var. *patula* – F; < *Hystrix hystrix* (Linnaeus) Millspaugh – S]

Elymus macgregorii R. Brooks & J.J.N. Campbell, Early Wild-rye. Pd (DE, GA, NC, VA), Mt (FL, NC, VA), Cp (FL, NC, VA): rich mesic forests, especially bottomlands; uncommon. ME west to SD, south to Panhandle FL and s. TX. See Campbell (2000). [= FNA; < *E. virginicus* – RAB, C, GW, W, WV; < *E. virginicus* var. *virginicus* – F, G, K, S]

* ***Elymus repens*** (Linnaeus) Gould, Quackgrass, Dog-grass, Witchgrass. Mt (NC, VA, WV), Pd (DE, NC, VA), Cp (DE, NC, VA): roadsides, disturbed areas, pastures; uncommon, probably introduced from Europe (sometimes considered to be partially native along the coast). June-August. [= FNA, K, X; = *Elytrigia repens* (Linnaeus) Nevski – C, Z; = *Agropyron repens* (Linnaeus) Palisot de Beauvois – RAB, G, HC, S, W, WV; > *Agropyron repens* var. *repens* – F; > *Agropyron repens* var. *subulatum* (Schreber) Roemer & J.A. Schultes – F]

Elymus riparius Wiegand, Eastern Riverbank Wild-rye. Mt (GA, NC,SC, VA, WV), Pd (DE, GA, NC, SC, VA), Cp (DE, SC?, VA): moist forests; common (uncommon in GA, SC, VA, rare in NC). ME, QC, ON, and MN south to GA and AR. [= RAB, C, F, FNA, G, GW, K, S, W, WV]

* *Elymus semicostatus* (Nees ex Steudel) Melderis. Reported for c. GA by Jones & Coile (1988), as *Agropyron semicostatum* Nees ex Steudel, but FNA states that known reports from North America are based on misidentifications. [= FNA, K; = *Agropyrum semicostatum* Nees ex Steudel]

Elymus svensonii G.L. Church, Svenson's Wild-rye. Ip (AL, KY, TN): limestone river bluffs; rare. Nc. KY south to c. TN and n. AL. [= FNA, K]

Elymus trachycaulus (Link) Gould ex Shinners *ssp.* ***subsecundus*** (Link) A. & D. Löve, Bearded Wheatgrass. Mt (WV): glades, barrens, open woodlands; rare. June-August. NL (Newfoundland) west to AK, south to MD, WV, KY, MO, NM, AZ, and CA. [= FNA, K; *?* *Agropyron trachycaulum* (Link) Malte ex H.F. Lewis var. *glaucum* (Pease & Moore) Malte – F, G; = *Agropyron subsecundum* (Link) A.S. Hitchcock var. *subsecundum* – HC; < *Agropyrum subsecundum* (Link) A.S. Hitchcock – WV]

Elymus trachycaulus (Link) Gould ex Shinners *ssp.* ***trachycaulus***, Slender Wheatgrass. Mt (NC, VA, WV): glades and barrens, over serpentine, etc.; rare. August. Greenland, NL (Labrador), Keewatin, NU, YT, and AK, south to w. NC, OH, IN, IL, MO, TX, Mexico and CA. [= FNA, K; < *Agropyron trachycaulum* (Link) Malte ex H.F. Lewis – RAB, W, WV; < *Elymus trachycaulus* – C; > *Agropyron trachycaulum* var. *novae-angliae* (Scribner) Fernald – F; > *Agropyron trachycaulum* var. *ciliatum* (Scribner & J.G. Smith) Gleason – G; = *Agropyron trachycaulum* – HC]

Elymus wiegandii Fernald, Northern Riverbank Wild-rye. South to sc. PA and NJ; reported for nc. KY (Kartesz 2010). [= C, F, FNA, K; < *E. canadensis* – G]

Elymus villosus Muhlenberg ex Willdenow, Downy Wild-rye. Mt (NC, SC, VA, WV), Pd (DE, NC, SC, VA), Cp (DE, NC, SC, VA), {GA}: moist forests; uncommon. QC, ON, MN, ND, and WY south to GA, AL, MS, and TX. [= RAB, C, F, FNA, G, GW, K, W, WV; = *E. striatus* Willdenow – S]

Elymus virginicus Linnaeus *var.* ***halophilus*** (Bicknell) Wiegand, Salt-marsh Wild-rye. Cp (DE, NC, VA): brackish marshes, maritime forests and hammocks; uncommon (rare in DE). Along the Atlantic Coast, from NS to NC. [= F, FNA, G, K; < *E. virginicus* – RAB, C, GW; < *E. virginicus* var. *virginicus* – S]

Elymus virginicus Linnaeus *var.* ***intermedius*** (Vasey) Bush. [= FNA, G; < *E. virginicus* – RAB, C, GW, W, WV; < *E. virginicus* var. *virginicus* – F, K; < *E. virginicus* var. *hirsutiglumis* (Scribner) A.S. Hitchcock – S]

Elymus virginicus Linnaeus *var.* ***jejunus*** (Ramaley) Bush. [= F, FNA, G; < *E. virginicus* – RAB, C, GW, W, WV; < *E. virginicus* var. *virginicus* – K; < *E. virginicus* var. *virginicus* – S]

Elymus virginicus Linnaeus *var.* ***virginicus***, Common Eastern Wild-rye, Terrell Grass. Cp (DE, FL, GA, NC, SC, VA), Mt (DE, NC, SC, VA, WV), Pd, Cp (NC, SC, VA): moist forests; common. [= FNA; < *E. virginicus* – RAB, C, GW, W, WV; < *E. virginicus* var. *virginicus* – F, G, K; < *E. virginicus* var. *virginicus* – S; *? E. striatus* Willdenow – S]

Enteropogon Nees 1836

* ***Enteropogon prieurii*** (Kunth) W.D. Clayton. Cp (NC): on ballast at Wilmington, New Hanover County, NC; rare, native of Africa, probably only a waif. Also reported from Mobile, Baldwin County, AL (Hitchock & Chase 1950). [= K; = *Chloris prieurii* Kunth – S]

Eragrostis Wolf 1776 (Lovegrass)

A genus of about 350 species of temperate and tropical areas. References: Peterson in FNA (2003a); Koch (1978); Peterson & Harvey (in prep.)=Z. Key adapted from Peterson & Harvey (in prep.).

1 Plants cespitose or rhizomatous perennials, with innovations near the base, and with or without buds in the basal sheaths.
2 Plants with short, knotty, thick rhizomes; florets articulating whole ..... ***E. spectabilis***
2 Plants without short or thick rhizomes; florets usually disarticulating.
3 Caryopsis with a deep to shallow groove along the adaxial surface.
4 Caryopsis dorso-ventrally compressed, flattened parallel to the side of the embryo, translucent, light brownish ..... ***E. curvula***
4 Caryopsis laterally compressed, flattened on the side perpendicular to the embryo, or cylindric, opaque (rarely translucent), usually reddish brown.
5 Lateral veins of the lemmas conspicuous, often greenish, the lemmas strongly keeled ..... ***E. trichodes***
5 Lateral veins of the lemmas inconspicuous and hardly evident, the lemmas sometimes weakly keeled.
6 Lemmas 1.2-1.8 mm long; culms 30-70 cm tall ..... ***E. lugens***
6 Lemmas 1.6-3.0 mm long; culms (30-) 40-110 (-120) cm tall.
7 Spikelets 2-6-flowered, greenish with purple tinges; leaf blades 3-8 (-11) mm wide, 25-60 cm long; sheaths often densely papillose-hirsute ..... ***E. hirsuta***
7 Spikelets (3-) 5-12-flowered, olive green to lead gray; leaf blades 1-3.8 mm wide, (4-) 10-35 cm long; sheaths never papillose-hirsute ..... ***E. intermedia***
3 Caryopsis not grooved on the adaxial surface.
8 Stamens 3.
9 Spikelets 4-8.2 (-10) mm long ..... ***E. curvula***
9 Spikelets 2-4.5 (-5) mm long.
10 Leaf blades 25-60 cm long, 3-8 (-11) mm wide; lemmas 1.6-2.4 mm long; spikelets 1.0-1.7 mm wide ..... ***E. hirsuta***
10 Leaf blades (4-) 8-22 cm long, 1-3.5 mm wide; lemmas 1.2-1.8 mm long; spikelets 0.5-1.0 (-1.3) mm wide ..... ***E. lugens***
8 Stamens 2.
11 Panicle 15-45 cm wide, open, diffuse, broadly ovate to obovate in outline, the panicle branches capillary; pedicels 0.5-35 (-50) mm long, longer than or shorter than the spikelets.
12 Spikelets with widely spreading pedicels, the lower pedicels all generally longer than the spikelets; disarticulation of the lemmas only, the paleas persistent ..... ***E. elliottii***
12 Spikelets with appressed pedicels, lower pedicels of each branch shorter than the spikelets; disarticulation usually of the whole floret ..... ***E. refracta***
11 Panicle (1-) 2-17 (-20) cm wide, contracted to open, narrowly ovate to oblong in outline;, the panicle branches stiffly spreading; pedicels (0-) 0.3-6 mm long, always shorter than the spikelets.
13 Spikelets 0.7-2.4 mm wide; glumes 0.3-2.2 mm long; lemma 1.5-2.5 mm long, the apex acute (sometimes acuminate) ..... ***E. bahiensis***
13 Spikelets 2.4-5 mm wide; glumes 1.4-4 mm long; lemma 2-6 mm long, the apex acuminate to attenuate ..... ***E. secundiflora*** *var.* ***oxylepis***

1 Plants cespitose, geniculate or mat-forming annuals, lacking innovations or buds in the lower sheaths.
14 Paleas prominently ciliate-pectinate on the keels, the hairs 0.1-0.8 mm long.
15 Panicles contracted, narrow, spike-like, usually <1.5 cm wide ..... ***E. ciliaris*** *var.* ***ciliaris***
15 Panicles open, cylindrical to narrowly ovate, usually 1-8 cm wide.
16 Spikelets (1.0-) 1.5-3.5 mm long, 0.9-1.4 mm wide, 4-12-flowered; lemmas 0.7-1.1 mm long, membranous, the apex truncate to obtuse ..... ***E. amabilis***
16 Spikelets 5-12 (-18) mm long, 1.4-2.4 mm wide, 12-42-flowered; lemmas (1.3-) 1.5-2.0 mm long, chartaceous, the apex acute ..... ***E. cumingii***
14 Paleas smooth to scaberulous on the keels, the hairs (if present) <0.1 mm long.
17 Plants extensively stoloniferous, creeping and forming flat mats; inflorescences 1-3.5 cm long; culms (2-) 5-12 (-20) cm tall on the erect portions ..... ***E. hypnoides***
17 Plants not stoloniferous (sometimes creeping and forming flat mats); inflorescences 3-55 cm long; culms (2-) 6-130 cm tall.
18 Ligules membranous, glabrous ..... ***E. japonica***
18 Ligules ciliate, with a row of tiny white hairs.
19 Caryopsis with a deep to shallow groove along the adaxial surface.
20 Spikelets (4-) 5-10 (-11) mm long, 5-11 (-15)-flowered; pedicels ascending, somewhat appressed along the branches.
21 Spikelets ovate to oblong in outline, >1.4 mm wide; lower glume 1.2-2.3 mm long ..... ***E. mexicana*** *ssp.* ***mexicana***
21 Spikelets linear to linear-lanceolate, <1.5 mm wide; lower glume 0.7-1.7 mm long ..... ***E. mexicana*** *ssp.* ***virescens***
20 Spikelets (1.4-) 2-5 mm long, 2-6 (-7)-flowered; pedicels erect, spreading along the branches.
22 Panicle 10-45 (-55) cm long, 2/3 or more the height of the plant; pedicels (4-) 5-25 mm long; glandular pits absent below the nodes, branches, and rachis ..... ***E. capillaris***
22 Panicle 4-20 cm long, < ½ the height of the plant; pedicels 1.5-5 mm long; glandular pits often present below the nodes, branches, and rachis ..... ***E. frankii***
19 Caryopsis not grooved on the adaxial surface.

23 Plants with glandular pits or bands on the culm below the nodes, on the veins of the sheath, on the margins and veins of the blade, on the rachis, on the inflorescence branches and pedicels, and/or on the midveins of the lemma and palea.
24 Spikelets (1.7-) 2-4 mm long, 3-6-flowered ..... ***E. frankii***
24 Spikelets (2-) 3.5-20 mm long, (3-) 5-40-flowered.
25 Spikelets 0.6-1.3 mm wide; pedicels 1-10 mm long, flexuous and delicate, appressed or spreading ..... ***E. pilosa***
25 Spikelets 1.1-4 mm wide; pedicels 0.2-4 mm long, straight and rigid, mostly spreading.
26 Spikelets 6-20 mm long, 2-4 mm wide, 10-40-flowered; lemmas 2-2.8 mm long, with 1-3 crateriform glands along the keel; disarticulation of the entire florets from the persistent rachilla; anthers yellow ..... ***E. cilianensis***
26 Spikelets 4-7 (-11) mm long, 1.1-2.2 mm wide, 7-12 (-20)-flowered; lemmas 1.4-1.8 mm long, rarely with 1-2 crateriform glands along the keel; disarticulation of the lemmas only, the palea and rachilla usually persistent; anthers reddish-brown.
27 Inflorescence with glandular areas of spots or rings on the rachis below the panicle branch bases, the glands often shiny or yellowish; stamens 3; blade margins lacking crateriform glands ..... ***E. barrelieri***
27 Inflorescence sometimes with glandular areas of spots or crateriform pits on the rachis below the panicle branch bases, the glands usually dull and greenish-gray to straw-colored; stamens 2; blade margins sometimes with crateriform glands ..... ***E. minor***
23 Plants lacking glandular pits or bands on the culm below the nodes, on the veins of the sheath, on the margins and veins of the blade, on the rachis, on the inflorescence branches and pedicels, and/or on the midveins of the lemma and palea.
28 Spikelets (1.6-) 2-4 mm wide, 12-42-flowered; disarticulation of entire florets from a persistent rachilla ..... ***[E. unioloides]***
28 Spikelets 0.6-2.5 mm wide, 3-22-flowered; disarticulation of the lemmas only, the paleas usually persistent (or deciduous), the rachilla persistent.
29 Spikelets 3-6-flowered ..... ***E. frankii***
29 Spikelets (3-) 5-22-flowered.
30 First glume 0.3-0.6 (-0.8) mm long, <0.5× as long as the lowest lemma; spikelets 0.6-1.3 mm wide; panicle branches usually whorled at the lowest 2 nodes ..... ***E. pilosa***
30 First glume 0.5-1.5 mm long, >0.5× as long as the lowest lemma; spikelets 1.2-2.5 mm wide; panicle branches solitary or paired at the 2 lowest nodes.
31 Pedicels widely spreading ..... ***E. pectinacea*** *var.* ***miserrima***
31 Pedicels appressed or rarely diverging up to 20 degrees from the branches ..... ***E. pectinacea*** *var.* ***pectinacea***

* ***Eragrostis amabilis*** (Linnaeus) Wright & Arnott ex Nees, Japanese Lovegrass, Feather Lovegrass. Cp (FL, GA, SC), Pd? (GA?): disturbed areas; rare, native of Old World. June. [= RAB, FNA, HC, S, Z; *? E. tenella* (Linnaeus) Palisot de Beauvois ex Roemer & J.A. Schultes – K]

* ***Eragrostis bahiensis*** (Schrader ex J.A. Schultes) J.A. Schultes, Bahia Lovegrass. Cp (FL, GA, SC): disturbed areas; rare, native of {}. Reported for SC (Kartesz 1999) and sw. GA (Jones & Coile 1988, GW, Kartesz 1999). [= FNA, GW, HC, K, S, Z]

* ***Eragrostis barrelieri*** Daveau, Mediterranean Lovegrass. Cp (FL, SC): waste areas near wool-combing mills, other disturbed areas; rare, native of Mediterranean Europe. Also reported for e. TN (Chester et al. 1993). [= FNA, HC, K, Z]

Eragrostis capillaris (Linnaeus) Nees, Lacegrass. Mt (GA, NC, SC, VA, WV), Pd (DE, GA, NC, SC, VA), Cp (DE, GA, NC, SC, VA): fields, roadsides, disturbed areas; common (uncommon in GA, NC, SC, and VA Piedmont, uncommon in GA, NC, SC, and VA Coastal Plain). July-October. ME and WI south to GA and TX. [= RAB, C, F, FNA, G, HC, K, S, W, WV, Z]

* ***Eragrostis cilianensis*** (Allioni) Vignolo ex Janchen, Stinkgrass. Mt (GA, NC, SC, VA, WV), Pd (GA, NC, SC, VA), Cp (DE, FL, NC, SC, VA): fields, disturbed areas; common (rare in DE), native of Europe. July-October. [= RAB, C, FNA, G, HC, K, S, W, Z; *? E. megastachya* (Koeler) Link – F, WV]

Eragrostis ciliaris (Linnaeus) R. Brown *var.* ***ciliaris***. Cp (FL, GA, SC): sandy shores; rare. S. SC south to TX, Central America, West Indies, South America, Africa, and Asia. [= FNA, HC; < *E. ciliaris* – RAB, G, K, S, Z]

* ***Eragrostis cumingii*** Steudel, Fortyflower Lovegrass, Cuming's Lovegrass. Cp (FL, GA), {NC}. Reported for NC (Kartesz 1999) and sw. GA (Jones & Coile 1988, HC). [= FNA, K, Z; *? E. simplex* Scribner – HC]

* ***Eragrostis curvula*** (Schrader) Nees, Weeping Lovegrass. Cp (DE, FL, GA, NC, SC, VA), Pd (DE, GA, NC, SC, VA), Mt (GA, NC, SC, VA, WV): roadsides; common (uncommon in WV), native of s. Africa. May-June. Very commonly planted as a roadbank stabilizer, *E. curvula* is fire resistant and shows some capability to spread into adjacent natural habitats. [= RAB, C, FNA, HC, K, WV, Z; > *E. curvula* var. *conferta* Stapf]

Eragrostis elliottii S. Watson, Elliott's Lovegrass. Cp (FL, GA, NC, SC): ultisol wet pine savannas, maritime wet grasslands, inland edges of brackish marshes, inland edges of freshwater tidal marshes, calcareously-influenced wet pine savannas; rare. September-October. NC south to FL, west to TX. [= RAB, FNA, GW, HC, K, S, Z]

Eragrostis frankii C.A. Meyer ex Steudel, Lacegrass. Mt (VA, WV), Pd (NC, VA), Cp (VA), {FL?, GA}: disturbed areas; uncommon (NC Watch List). September. MA and MN south to FL and AR. [= RAB, C, FNA, G, GW, K, S, W, WV, Z; > *E. frankii* var. *frankii* – F, HC]

Eragrostis hirsuta (Michaux) Nees, Bigtop Lovegrass. Cp (DE, FL, GA, NC, SC, VA), Pd (GA, NC, SC, VA), Mt (GA, NC, SC, VA, WV): fields, roadsides, disturbed areas; common (uncommon in Mountains, rare in VA and WV Mountains, rare in DE). July-October. MD south to FL, west to TX, north in the interior to TN, AR, and MO; Central America. [= RAB, C, FNA, K, S, W, WV, Z; > *E. hirsuta* var. *hirsuta* – F, G, HC; > *E. hirsuta* var. *laevivaginata* Fernald – F, G, HC]

Eragrostis hypnoides (Lamarck) Britton, Sterns, & Poggenburg, Creeping Lovegrass, Teal Lovegrass. Cp (DE, FL, GA, NC, SC, VA), Pd (DE, GA, NC, SC, VA), Mt (NC, VA, WV): marshes, shores, riverbanks; uncommon (rare in DE). September. Throughout most of North America, south to South America. [= RAB, C, F, FNA, G, GW, HC, K, S, W, WV, Z]

Eragrostis intermedia A.S. Hitchcock, Plains Lovegrass. Cp (GA), Pd (GA, VA), {NC, SC}: {habitat); rare. Reported for scattered locations as far east as NC and SC (Kartesz 1999), e. GA (Jones & Coile 1988), e. TN (Chester et al. 1993). [= C, F, FNA, G, HC, K, Z]

*? ***Eragrostis japonica*** (Thunberg) Trinius, Pond Lovegrass. Cp (FL, GA, SC): moist or wet sandy areas; rare. SC and TN south to Central America, South America, and West Indies; Old World tropics. Perhaps introduced from the Old World.

Reported for SC by HC, G, and Small (1933), sw. GA by Jones & Coile (1988), and for w. TN by Chester et al. (1993). [= FNA, K, Z; *? E. glomerata* (Walter) L.H. Dewey – G, GW, HC, S]

*? ***Eragrostis lugens*** Nees, Mourning Lovegrass. Cp (FL, NC, SC), Pd (GA, NC, SC): marshes, roadsides, low fields; rare, introduced (NC Watch List). June-October. Perhaps only introduced from further south and west. [= RAB, FNA, HC, K, S, W, Z]

* ***Eragrostis mexicana*** (Hornemann) Link *ssp.* ***mexicana***, Mexican Lovegrass. Pd (DE), Cp (SC): disturbed areas, waste areas near wool-combing mills; rare, native of w. North America and Mexico. Reported to be naturalized as far east and north as SC, DE, and MD (Kartesz 1999). [= FNA, K; > *E. neomexicana* Vasey – C, F, G, HC; > *E. mexicana* – C, F, G, HC]

* ***Eragrostis mexicana*** (Hornemann) Link *ssp.* ***virescens*** (J. Presl) S.D. Koch & Sánchez. Cp (FL): disturbed areas; rare, native of South America and w. North America. Reported as an introduction on ballast in MD and FL. [= FNA, K; = *E. virescens* J. Presl – HC]

* ***Eragrostis minor*** Host, Little Lovegrass. Pd (DE, GA, NC, SC, VA), Mt (NC, SC, VA, WV), Cp (DE, FL, VA): disturbed areas, in cinders along railroads; uncommon, native of Europe. July-September. [= C, FNA, K, Z; *? E. poaeoides* Palisot de Beauvois ex Roemer & J.A. Schultes – RAB, F, G, HC, W, WV; *? E. eragrostis* (Linnaeus) Palisot de Beauvois – S]

Eragrostis pectinacea (Michaux) Nees ex Steudel *var.* ***pectinacea***, Carolina Lovegrass. Cp (DE, FL, GA, NC, SC, VA?), Pd (GA, NC, SC, VA?}, Mt (GA, NC, SC, VA, WV): fields, roadsides, disturbed areas; common (rare in VA). July-August. ME and WA south to Central America and West Indies. [= FNA, K, Z; < *E. pectinacea* – C, GW, W; = *E. pectinacea* – F, HC, S, WV; > *E. pectinacea* – G; > *E. diffusa* Buckley – G]

Eragrostis pectinacea (Michaux) Nees ex Steudel *var.* ***miserrima*** (Fournier) J. Reeder. Cp (FL): disturbed habitats; rare. From FL and westwards and southwards. [= FNA, K, Z; = *E. tephrosanthos* J.A. Schultes – HC, S; < *E. pectinacea* – GW]

* ***Eragrostis pilosa*** (Linnaeus) Palisot de Beauvois *var.* ***pilosa***, India Lovegrass. Cp (FL, GA, NC, SC, VA), Pd (DE, GA, NC, SC, VA), Mt (GA, NC, SC, VA, WV): fields, roadsides, disturbed areas; common (rare in DE and WV), native of tropical regions of the Old and New World. July-October. Var. *perplexa* (L.H. Harvey) S.D. Koch is also introduced but is not known from our area. [= FNA; = *E. pilosa* – RAB, S, W; > *E. multicaulis* Steudel – F, G, HC; > *E. pilosa* – F, G, HC; < *E. pilosa* – K, WV, Z]

Eragrostis refracta (Muhlenberg) Scribner, Coastal Lovegrass. Cp (DE, GA, NC, SC, VA), Pd (NC, SC, VA): pinelands, savannas, woodlands, marshes; common (uncommon in Piedmont, rare in DE). July-October. DE south to FL, west to TX. [= RAB, C, F, FNA, G, GW, HC, K, S, Z; *? E. virginica* (Zuccarini ex Roemer) Steudel]

* ***Eragrostis secundiflora*** J. Presl *ssp.* ***oxylepis*** (Torrey) S.D. Koch, Red Lovegrass. Cp (FL, GA, NC, SC, VA): sandy roadsides, coastal dunes, and disturbed areas; rare, native of sw. United States. First reported for SC by Nelson & Kelly (1997). [= FNA, K, Z; = *E. oxylepis* (Torrey) Torrey – GW, HC; < *E. secundiflora* – S]

Eragrostis spectabilis (Pursh) Steudel, Purple Lovegrass, Tumblegrass. Cp (DE, FL, GA, NC, SC, VA), Pd (DE, GA, NC, SC, VA), Mt (GA, NC, SC, VA, WV): sandy fields, roadsides, woodlands; common. August-October. ME west to ND, south to FL and TX. [= RAB, C, FNA, G, GW, HC, K, S, W, WV, Z; > *E. spectabilis* var. *spectabilis* – F; > *E. spectabilis* var. *sparsihirsuta* Farwell – F; *E. pectinacea*, misapplied]

* ***Eragrostis trichodes*** (Nuttall) Wood. Pd (VA): disturbed areas; rare, native of w. North America. [= C, FNA, K, Z; > *E. trichodes* var. *trichodes* – F, HC]

* ***Eragrostis unioloides*** (Retzius) Nees ex Steudel, Chinese Lovegrass. Cp (FL, GA): disturbed areas; rare, native of Asia. Reported for s. GA (Jones & Coile 1988, FNA, GW, HC). [= FNA, GW, HC, K, S, Z]

* ***Eragrostis atrovirens*** (Desvaux) Trinius ex Steudel, Thalia Lovegrass. Cp (AL, FL, LA, MS): disturbed areas; rare, native of Africa. [= FNA, K] {add to key; add to synonymy}

* ***Eragrostis elongata*** (Willdenow) Jacquin f., Long Lovegrass. Cp (SC): waste areas near wool-combing mills; rare, native of se. Asia and Australia. [= FNA, K] {not yet keyed}

* ***Eragrostis leptostachya*** (R. Brown) Steudel, Australian Lovegrass, is reported for NC (Kartesz 1999). {investigate} [= FNA, K] {not yet keyed}

* ***Eragrostis plana*** Nees, South African Lovegrass. Cp (SC): waste areas near wool-combing mills; rare, native of South Africa. [= FNA, K] {not yet keyed}

* ***Eragrostis setifolia*** Nees, Neverfail. Cp (SC): waste areas near wool-combing mills; rare, native of Australia. [= FNA, K] {not yet keyed}

* ***Eragrostis tef*** (Zuccagni) Trotter, Teff. Cp (SC): waste areas near wool-combing mills; rare, native of Africa. This is the grain used in making Ethiopian bread. [= FNA, HC, K] {not yet keyed}

Eremochloa Büse 1852 (Centipede Grass)

A genus of about 11 species, native of Asia and Australia. References: Thieret in FNA (2003a).

Identification notes: In the autumn, the inflorescences make this grass readily recognizable at a distance: a short, tight lawn grass with a reddish aspect.

* ***Eremochloa ophiuroides*** (Munro) Hackel, Centipede Grass. Cp (FL, GA, NC, SC, VA), Pd (GA, NC, SC): lawns, roadsides, sometimes weedy in more natural sites; common (rare in VA), native of se. Asia. Now very commonly planted as a lawn and roadside grass in the Coastal Plain from se. NC southward. Stalter & Lamont (1996) report the VA occurrence of this species. [= RAB, FNA, HC, K]

Eriochloa Kunth 1816 (Cup Grass)

A genus of 320-30 species, of the tropical, subtropical, and warm temperate Old World and New World. References: Crins (1991)=Z; Shaw, Webster, & Bern in FNA (2003a); Shaw & Webster (1987)=Y.

1 Lemma of fertile floret with an awn >0.2 mm long; second glume awned; panicle compact, the raceme-like lateral branches close together and ascending-appressed, of irregular lengths; spikelets 8-16 on a typical, primary branch.....***E. contracta***
1 Lemma of fertile floret lacking an awn; second glume not awned; panicle open, the raceme-like lateral branches remote and divergent, the lowermost longest, the upper gradually reduced in length to the apex (*E. acuminata* var. *acuminata*, *E. michauxii* var. *michauxii*) **or** the panicle compact (*E. villosa*); spikelets 12-40 on a typical, primary branch.
2 Spikelets 2.0-2.5 mm wide .....***E. villosa***
2 Spikelets 1.1-1.8 mm wide.
3 Annual, 3-12 dm tall; spikelets 1.1-1.4 mm wide.....***E. acuminata** var. **acuminata***
3 Perennial, 5-25 dm tall; spikelets 1.3-1.8 mm wide ..... ***E. michauxii** var. **michauxii***

* ***Eriochloa acuminata*** (J. Presl) Kunth *var.* ***acuminata***. Cp (GA, SC), Pd (GA): disturbed areas, waste areas near wool-combing mills; rare, presumably native of further south. Reported for scattered locations in GA (Jones & Coile 1988, as *E. gracilis*). Reported for NC (Kartesz 1999), but the specimen basis is of cultivated material. [= FNA, K, Y, Z; < *E. acuminata* – C; = *E. gracilis* (Fournier) A.S. Hitchcock var. *gracilis* – HC]

* ***Eriochloa contracta*** A.S. Hitchcock, Prairie Cupgrass. Pd (VA), Mt (VA), Cp (SC): disturbed areas, waste areas around wool-combing mills; rare, native of midwestern United States. [= C, F, FNA, G, GW, HC, K, Y, Z]

Eriochloa michauxii (Poiret) A.S. Hitchcock *var.* ***michauxii***, Longleaf Cupgrass. Cp (FL, GA, SC): coastal freshwater and slightly brackish marshes, flatwoods, disturbed areas; rare (GA Special Concern). Se. SC south to FL, west to AL, or possibly LA. Var. *simpsonii* A.S. Hitchcock is endemic to sw. FL. [= FNA, HC, K, Y, Z; < *E. michauxii* – GW, S]

* ***Eriochloa villosa*** (Thunberg) Kunth, Chinese Cupgrass. Mt (VA), Pd (DE): fields, meadows, other disturbed areas (open edge of railroad bed); rare, native of e. Asia. See Belden et al. (2004) for additional information about the first occurrence in Virginia. [= C, FNA, HC, K, Y]

Eriochloa punctata (Linnaeus) Desvaux ex Hamilton, Louisiana Cupgrass. Cp (GA): marshes, creek banks; rare. MS west to TX, and south into the New World Tropics; reported for e. GA (FNA). [= FNA, HC, K] {not yet keyed; synonymy incomplete}

Eustachys Desvaux 1810 (Finger-grass)

A genus of ca. 12 species, of tropical and warm temperate regions. References: Aulbach in FNA (2003a). McKenzie, Urbatsch, & Aulbach-Smith (1987)=Z. Key based on Z.

1 Lateral nerves of the fertile lemma glabrous; culms stout, 7-15 dm tall; spikes 8-16 (-20), 7-12 cm long.....***E. glauca***
1 Lateral nerves of the fertile lemma pubescent; culms slender, 3-10 dm tall; spikes 1-20, 2.5-9 cm long.
2 Keel of the fertile lemma appressed brownish-ciliate; spikes 1-6; [native].
3 Spikes 5-10 cm long; spikelets >3 mm long.....***E. floridana***
3 Spikes 2.5-6 cm long; spikelets <2.5 mm long.....***E. petraea***
2 Keel of the fertile lemma glabrous; spikes 7-20; [aliens, in disturbed situations].
4 Spikelets >2.4 mm long; sterile floret oblanceolate, acute.....***E. distichophylla***
4 Spikelets <2.1 mm long; sterile floret widely cuneate, truncate .....***E. retusa***

* ***Eustachys distichophylla*** (Lagasca y Segura) Nees, Weeping Finger-grass. Cp (GA): disturbed areas; rare, native of South America. In GA and FL (Kartesz 1999). [= FNA, K, Z; = *Chloris distichophylla* Lagasca y Segura – HC]

Eustachys floridana Chapman, Florida Finger-grass. Cp (FL, GA): sandhills, pine flatwoods; rare (GA Special Concern). E. GA south to c. peninsular FL, west to w. Panhandle FL and s. AL. [= FNA, K, Z; = *Chloris floridana* (Chapman) Wood – HC, S] {synonymy}

Eustachys glauca Chapman, Saltmarsh Finger-grass. Cp (FL, GA, NC, SC): marshes and marsh edges; rare. June-October. Se. NC south to FL and west to s. AL. [= FNA, K, Z; = *Chloris glauca* (Chapman) Wood – RAB, GW, HC, S]

Eustachys petraea (Swartz) Desvaux, Dune Finger-grass. Cp (FL, GA, NC, SC): dune slacks and sand flats, sometimes in disturbed areas; common (uncommon north of GA). (May-) June-October. NC (Dare County) south to FL and west to TX. [= FNA, K, Z; = *Chloris petraea* Swartz – RAB, GW, HC, S]

* ***Eustachys retusa*** (Lagasca y Segura) Kunth, Argentine Finger-grass. Cp (FL, GA, SC): sandy fields, along railroads; rare, native of Argentina. June. reported for Bryan County, GA (Carter, Baker, & Morris 2009). [= FNA, K, Z; *? Chloris argentina* (Hackel) Lillo & Parodi – RAB, G, HC]

* ***Eustachys caribaea*** (Sprengel) Herter, Chickenfoot Grass. Cp (GA): disturbed areas; rare, native of South America. [= FNA, K; = *Chloris capensis* – HC, misapplied] {add to synonymy; not yet keyed}

Eustachys neglecta (Nash) Nash. Native. Cp (FL): pinelands, sandy fields; uncommon. N. and peninsular FL, se. AL, and e. TX. [= FNA, K; = *Chloris neglecta* Nash – HC, S] {synonymy incomplete; not yet keyed}

Festuca Linnaeus 1753 (Fescue)

A genus of about 500 species, nearly cosmopolitan in temperate regions. References: Darbyshire & Pavlick in FNA (2007a); Darbyshire (1993)=X; Aiken & Darbyshire (1990)=Y; Tucker (1996)=Z; Soreng & Terrell (1998). Key based in part on C and Y. [also see *Vulpia*]

1 Leaves 0.2-3 mm wide, often involute.
2 Plant loosely tufted, often rhizomatous; basal sheaths disintegrating into fibers; spikelets 6-13 mm long ..... ***F. rubra*** *ssp.* ***rubra***
2 Plant tufted, lacking rhizomes; basal sheaths persistent, remaining firm and entire; spikelets 3-9 mm long.
3 Lemmas 2.3-4.0 (-4.4) mm long, awnless, or with a minute projection to 0.4 mm long; anther 1.5-2.2 (-2.5) mm long; spikelets 3.0-6.0 (-6.5) mm long ..... ***F. filiformis***
3 Lemmas 3.8-5.5 mm long, with an awn 0.5-2.5 mm long; anther (2.3-) 2.5-3.0 mm long; spikelets 5.5-9.0 mm long ..... ***F. trachyphylla***
1 Leaves 3-12 mm wide, flat.
4 Larger lemmas 5.5-10 mm long; leaf blades auriculate at the base; anthers 2-4 mm long ..... ***[see Schedonorus]***
4 Larger lemmas 3.3-5.2 mm long; leaf blades not auriculate at the base; anthers 0.8-1.5 mm long; [subgenus *Subulatae*, section *Obtusae*].
5 Ligules 2-9 mm long; [rare introduction] ..... ***F. thurberi***
5 Ligules 0.1-1.5 (-2) mm long; [common natives].
6 Principal lowermost panicle branches with 8-20 spikelets clustered at the end; spikelets broadly ovate, 4-6 mm wide ..... ***F. paradoxa***
6 Principal lowermost panicle branches with 2-7 spikelets scattered along the outer half; spikelets narrowly ovate, 2-4 mm wide ..... ***F. subverticillata***

* ***Festuca filiformis*** Pourret, Hair Fescue, Fineleaf Sheep Fescue. Mt, Pd (NC, VA): lawns, disturbed areas; rare, native of Eurasia. May-June. [= C, FNA, K, Y, Z; ? *F. capillata* Lamarck – RAB, F, HC; ? *F. ovina* Linnaeus var. *capillata* (Lamarck) Alefeld – G; ? *F. tenuifolia* Sibthorp – W]

Festuca paradoxa Desvaux, Cluster Fescue. Cp (GA, NC, SC, VA), Pd (DE, GA, NC, SC, VA), Mt (GA, NC, SC, VA): bottomlands, uplands over mafic rock; common (rare in VA Mountains, rare in DE and VA Piedmont). May-July. PA west to WI and IA, south to SC, c. GA, and e. TX. [= RAB, C, F, FNA, G, GW, HC, K, W, Z; ? *F. shortii* Kunth ex Wood – S, misapplied]

Festuca rubra Linnaeus *ssp.* ***rubra***, Red Fescue. Mt (NC, SC, VA, WV), Pd (DE, GA, NC, VA), Cp (DE, GA, NC, VA): roadsides, fields, disturbed areas, pastures, grassy balds; common. April-July. In our area, this species is considered to be partly native and partly introduced. This species is circumboreal, extending south in North America to GA and MO. Many varieties or subspecies have been described in the *F. rubra* complex. [= FNA, K; < *F. rubra* – RAB, C, G, HC, S, WV, Y, Z; > *F. rubra* var. *rubra* – F; > *F. rubra* var. *commutata* Gaudin – F]

Festuca subverticillata (Persoon) Alexeev, Nodding Fescue. Mt (GA, NC, SC, VA, WV), Pd (DE, GA, NC, SC, VA), Cp (DE, FL, GA, NC, SC, VA): moist to wet forests, woodlands, and disturbed areas; common (uncommon in DE Coastal Plain). May-July. ME, QC, and MB south to FL and e. TX. [= C, FNA, K, Y, Z; ? *F. obtusa* Biehler – RAB, F, G, GW, HC, S, W, WV]

* ***Festuca thurberi*** Vasey. Cp (SC): waste areas near wool-combing mills; rare (possibly only a waif), native of sw. United States (NM, CO, WY, and UT). [= FNA, K]

* ***Festuca trachyphylla*** (Hackel) Krajina, Hard Fescue. Pd (DE, GA, NC, VA), Mt (NC, VA, WV), Cp (NC, SC, VA): meadows, pastures, disturbed areas; uncommon (rare in DE), native of Eurasia. May-June. The nomenclatural debate about the application of the name *F. trachyphylla* is summarized in Darbyshire & Pavlick (1997). [= C, K, Y, Z; < *F. ovina* – RAB, S, W, WV, in a broad sense (misapplied as to our material); < *F. ovina* var. *ovina* – F, G, HC; < *F. ovina* var. *duriuscula* (Linnaeus) W.D.J. Kock – F, G, HC, misapplied as to our material]

Festuca versuta Beal, Texas Fescue. Native, east to TN according to K1, but not considered to be distributed east of the Mississippi River by FNA or K2. [= FNA, K] {not keyed; not mapped}

Gastridium Palisot de Beauvois 1812 (Nitgrass)

A genus of 2 species, annuals, of s. Europe, n. Africa, and w. Asia. References: Wipff in FNA (2007a).

* ***Gastridium phleoides*** (Nees & Meyen) C.E. Hubbard, Nitgrass. Cp (SC): disturbed areas; rare, native of sw. Asia. [= FNA, K] {synonymy incomplete}

Gaudinia Palisot de Beauvois 1812

A genus of about 4 species, annuals or perennials, native of the Mediterranean region. References: Daniel in FNA (2007a).

* *Gaudinia fragilis* (Linnaeus) Palisot de Beauvois, Oatgrass. Ballast, reported from Mobile, AL. [= FNA, K; = *Avena fragilis* Linnaeus]

Glyceria R. Brown 1810 (Mannagrass)

A genus of about 40 species, nearly cosmopolitan. References: Barkworth & Anderton in FNA (2007a); Tucker (1996)=Z. [also see *Torreyochloa*]

1 Spikelets 10-40 mm long, linear, subterete, 5-15× as long as wide, terete or nearly so in cross-section; [section *Glyceria*].
2 Lemma (6-) 7-8.5 (-10) mm long, acute to acuminate; palea longer than the lemma, extending 1.5-3 mm beyond the lemma apex ..... ***G. acutiflora***
2 Lemma 2.4-6.0 mm long, obtuse to notched; palea about as long as the lemma (ranging from shorter than the lemma and included, to projecting up to 1.5 mm beyond the lemma apex).
3 Lemma (3.5-) 4.0-6.0 mm long, the apex with 1-2 strongly developed lobes, and also often toothed between the lobes; leaf blades 2-12 cm long; primary panicle branches 1.5-9.5 cm long ..... ***G. declinata***
3 Lemma 2.4-4.8 mm long, the apex rounded or with a few poorly developed rounded teeth; leaf blades 18-32 cm long; primary panicle branches 3-17 cm long.

4 Culms 2.5-8 dm tall; pedicels 1-6 mm long ..... ***G. notata***
4 Culms 7-18 dm tall; pedicels 0.7-1.7 mm long.
5 Lemmas hispidulous on the veins, the hairs ca. 0.1 mm long ..... ***G. arkansana***
5 Lemmas scabrous on the veins, the prickles ca. 0.05 mm long ..... ***G. septentrionalis***
1 Spikelets 2.5-8 mm long, ovate to oblong, 1.5-3× as long as wide, laterally compressed in cross-section.
5 Upper glumes 2.5-5 mm long, longer than wide; [w. VA and possibly NC northward]; [section *Hydropoa*] ..... ***G. grandis** var. **grandis***
5 Upper glumes 0.6-3.7 mm long, if > 3 mm long, then shorter than wide; [collectively widespread]; [section *Striatae*].
6 Inflorescence compact (at maturity), the branches stiffly ascending to appressed, the tips never nodding; ligule < 1 mm long.
7 Inflorescence branches elongate, appressed; lower internodes of the inflorescence 2-8 cm long; spikelets with 3-4 flowers, 3.5-4 mm long; lemma 1.9-2.8 mm long; leaves 2-5 mm wide; [Mountains, rarely elsewhere] ..... ***G. melicaria***
7 Inflorescence branches short, stiffly ascending; lower internodes of the inflorescence 0.8-2.0 (-2.5) cm long; spikelets with 4-7 flowers, 4-8 mm long; lemma 3.0-3.7 mm long; leaves 3-10 mm wide; [Coastal Plain, rarely disjunct inland to the Mountains of VA] ..... ***G. obtusa***
6 Inflorescence lax and diffuse (at maturity), the branches spreading to somewhat ascending, the tips often nodding or drooping; ligule 1-6 mm long.
8 Glumes tapering from below midlength to the narrowly acute (< 45 degree) tips; lemmas > 2× as long as wide; [endemic to seepage at high elevations in the Great Smoky Mountains, NC and TN and nearby] ..... ***G. nubigena***
8 Glumes narrowing from midlength or above to the acute or rounded (> 45 degree) tips; lemmas < 2× as long as wide; [collectively widespread].
9 Lemma 1.4-2.1 mm long, the veins prominently raised.
10 Leaf blades 6-15 mm wide; anthers 0.5-0.8 mm long; culms 2.5-8 mm thick; [rare introduction] ..... ***G. elata***
10 Leaf blades 2-6 mm wide; anthers 0.2-0.6 mm long; culms 1.5-3.5 mm thick; [common] ..... ***G. striata** var. **striata***
9 Lemma 1.8-4.0 mm long, the veins visible, but not raised; ligule 2-6 mm long.
11 Lemma 2.4-4.0 mm long, projecting conspicuously beyond the palea; spikelets 5-8 mm long, with (4-) 5-10 flowers ..... ***G. canadensis***
11 Lemma 1.8-2.5 mm long, more-or-less equal to the palea; spikelets 3-5 mm long, with 2-5 (-6) flowers ..... ***G. laxa***

Glyceria acutiflora Torrey. Mt (GA, VA, WV), Cp (DE): shallow water and wet mucky soils in mountain ponds, wet pastures; uncommon (rare in DE and GA). June-July. ME west to MI, south to DE, VA, nw. GA (Jones & Coile 1988), e. TN, and MO; also in e. Asia. [= C, F, FNA, G, GW, HC, K, W, WV, Z; = *Panicularia acutiflora* (Torrey) Kuntze – S]

Glyceria arkansana Fernald, Arkansas Mannagrass. Swamps. IL south to LA and AR; disjunct in w. NY. The VA report is in error. The appropriate treatment of this taxon needs further investigation. [= F, HC, K, Z; < *G. septentrionalis* – C, G; = *G. septentrionalis* A.S. Hitchcock var. *arkansana* (Fernald) Steyermark & Kučera – FNA]

Glyceria canadensis (Michaux) Trinius, Rattlesnake Mannagrass. Mt (NC, VA, WV), Cp (DE, VA), Pd (DE): bogs, seepages, and wet meadows; rare. June-August. NL (Newfoundland) west to MN, south to NJ, VA, nw. NC, and IL. [= C, F, G, K, WV, Z; = *G. canadensis* var. *canadensis* – FNA, HC, W]

* ***Glyceria declinata*** de Brébisson. Cp, Pd (SC), Mt (NC): disturbed moist areas; rare, native of Europe. Documented for Alleghany County, NC (D. Poindexter, pers. comm. 2009) [= FNA] {check for additional synonymy}

* ***Glyceria elata*** (Nash) M.E. Jones. Pd (GA): {habitat unknown}; rare, native of w. North America. Reported for GA by FNA; presumably a chance introduction. [= FNA] {add synonymy}

Glyceria grandis S. Watson *var.* ***grandis***, American Mannagrass. Mt (NC?, VA, WV), Cp (VA), Pd (DE): wet, mucky soils of open wetlands; rare. July. NS west to AK, south to VA, IA, NM, and OR. Attributed to w. NC by Tucker (1996). [= FNA, K; < *G. grandis* – C, F, G, GW, HC, WV, Z; = *Panicularia grandis* (S. Watson) Nash – S; *? G. maxima* (Hartman) Holmberg ssp. *grandis* (S. Watson) Hultén]

Glyceria laxa (Scribner) Scribner, Lax Mannagrass. Mt (NC, VA, WV), Cp (DE): bogs; rare. June-August. PE south to NC, mostly Appalachian. Though often described as a hybrid of *G. canadensis* and either *G. striata* var. *striata* and/or *G. grandis* var. *grandis*, *G. laxa* ranges south of the distribution of both *G. canadensis* and *G. grandis* var. *grandis*. It is best considered as a species, perhaps of hybrid origin. [= F, G, K, WV; = *G. canadensis* (Michaux) Trinius var. *laxa* (Scribner) A.S. Hitchcock – RAB, FNA, HC; = *G.* ×*laxa* – C; < *G. canadensis* – GW]

Glyceria melicaria (Michaux) F.T. Hubbard, Northeastern Mannagrass. Mt (GA, NC, VA, WV), Pd (NC): mountain swamp forests and seepages; common (uncommon in NC and WV, rare in GA). June-August. NS west to QC, south to n. GA (Jones & Coile 1988) and KY. [= RAB, C, F, FNA, G, GW, HC, K, W, WV, Z; = *Panicularia melicaria* (Michaux) A.S. Hitchcock – S]

* ***Glyceria notata*** Chevallier, Marked Mannagrass. Reported for TN (FNA). [= FNA] {add synonymy}

Glyceria nubigena W.A. Anderson, Smoky Mountain Mannagrass. Mt (NC, TN): moderate to high elevation seepages in the Great Smoky Mountains, sometimes in areas appearing dry (such as heath balds), nearly endemic to Great Smoky Mountains National Park; rare. June-July. Endemic to the Great Smoky Mountains of w. NC and e. TN. *G. nubigena* has nearly the same range as *Rugelia nudicaulis,* but is more restricted to seepage. The distinctions and relationship between this taxon and *G. grandis* need further investigation. [= RAB, FNA, HC, K, W, Z]

Glyceria obtusa (Muhlenberg) Trinius, Coastal Mannagrass. Cp (DE, NC, SC, VA), Mt (VA): blackwater swamp forests, wet meadows, freshwater marshes; common (uncommon in NC, SC, VA). June-September. NS south to SC, on or near the Coastal Plain; disjunct to w. VA in Shenandoah Valley sinkhole ponds. [= RAB, C, F, FNA, G, GW, HC, K, W, Z; = *Panicularia obtusa* (Muhlenberg) Kuntze – S]

Glyceria septentrionalis A.S. Hitchcock, Floating Mannagrass, Eastern Mannagrass. Cp (DE, GA, NC, SC, VA), Pd (DE, GA, NC, SC, VA), Mt (NC, VA, WV): shallow water, wet mucky soils, floodplain sloughs, cypress ponds; common (uncommon in NC, SC, VA, and WV, rare in GA). May-June. MA west to MN, south to SC, ne. GA, and TX. [= RAB, F, GW, HC, K, W, WV, Z; < *G. septentrionalis* – C, G (also see *G. arkansana*); = *G. septentrionalis* var. *septentrionalis* – FNA; = *Panicularia septentrionalis* (A.S. Hitchcock) Bicknell – S]

Glyceria striata (Lamarck) A.S. Hitchcock *var.* ***striata***, Fowl Mannagrass. Mt (GA, NC, SC, VA, WV), Pd (DE, GA, NC, SC, VA), Cp (DE, FL, GA, NC, SC, VA): wet meadows, seepages, bogs, marshes, swamp forests; common. April-June. NL

(Newfoundland) west to BC, south to FL and CA. Var. *stricta* (Scribner) Fernald is more northern. [= C, F, G, HC, Z; < *G. striata* – RAB, FNA, GW, K, W, WV; = *Panicularia striata* (Lamarck) A.S. Hitchcock – S; = *G. striata* ssp. *striata*]

Gymnopogon Palisot de Beauvois 1812 (Beard Grass, Skeleton Grass)

A genus of about 15 species, in temperate and tropical areas of the Americas. References: Smith in FNA (2007b); Smith (1971)=Z.

Identification notes: When sterile, *Gymnopogon* is sometimes confused with *Dichanthelium*. *Gymnopogon* differs in having the sheaths conspicuously overlapping (vs. not overlapping in *Dichanthelium*) and leaves that are definitely cordate-clasping and of stiff texture (only a few *Dichanthelium* have this combination).

1 Awn of the lemma 4.5-12 mm long; inflorescence branches with spikelets distributed from the tip nearly to the base; leaves 5-15 mm wide; [Coastal Plain, Piedmont, and Mountains]..... ***G. ambiguus***
1 Awn of the lemma 0.8-1.6 (-3.5) mm long; inflorescence branches with spikelets distributed from the tip nearly to the base (*G. chapmanianus*) or to roughly the midpoint, the basal portion naked (or some branches rarely with a few spikelets) (*G. brevifolius*); leaves 2-8 mm wide; [Coastal Plain and lower Piedmont].
  2 Spikelets 1-flowered; first glume 2.3-3.7 mm long..... ***G. brevifolius***
  2 Spikelets 2-4-flowered; first glume 3.8-5 mm long ..... ***G. chapmanianus***

Gymnopogon ambiguus (Michaux) Britton, Sterns, & Poggenburg, Eastern Beard Grass. Cp (DE, FL, GA, KY, NC, SC, VA), Pd (GA, NC, SC, VA), Mt (KY, NC, SC, VA, WV); Ip (KY): prairies, glades, barrens, dry pinelands and woodlands, dry fields; common (rare in Mountains, rare in DE and KY). August-October. S. NJ west to KY, OH, and MO, south to s. FL and TX. [= RAB, C, F, FNA, G, HC, K, S, W, WH, WV, Z]

Gymnopogon brevifolius Trinius, Pineland Beard Grass. Cp (DE, FL, GA, NC, SC, VA), Pd (GA, NC, SC, VA), Mt (GA), Ip (KY): pine savannas, sandhills, dry woodlands, prairies, calcareous glades; common (rare in KY Interior Low Plateau, rare in DE and VA Coastal Plain, rare in lower Piedmont of GA, NC, SC, VA). August-October. S. NJ south to s. FL, west to LA and AR; disjunct in the Highland Rim of KY and TN. [= RAB, C, F, FNA, G, HC, K, S, WH, Z]

Gymnopogon chapmanianus A.S.Hitchcock, Chapman's Beard Grass. Cp (FL, GA): sandhills and other xeric, sandy habitats; rare (rare in GA). Se. GA south to s. FL. [= FNA, HC, K, S, WH; > *G. chapmanianus* – Z; > *G. floridanus* Swallen – Z]

Hackelochloa Kuntze 1891 (Pitscale Grass

* ***Hackelochloa granularis*** (Linnaeus) Kuntze, Pitscale Grass. Cp (GA): disturbed areas; rare, native of the Old World. Reported for sw. GA and other Gulf Coast states (Thieret in FNA 2003a, Jones & Coile 1988, Kartesz 1999). [= FNA, HC, K; = *Rytilix granularis* (Linnaeus) Skeels – S; = *Mnesithea granularis* (Linnaeus) Koning & Sosef]

Hainardia W. Greuter 1967 (Thintail)

A genus of 1 species, an annual, native of Europe. References: Smith in FNA (2007a); Tucker (1996)=Z.

* ***Hainardia cylindrica*** (Willdenow) W. Greuter, Thintail. Cp (SC): waste areas around wool-combing mills; rare, native of the Old World. April-June. [= FNA, K, Z; = *Lepturus cylindricus* (Willdenow) Trinius – RAB; = *Monerma cylindrica* (Willdenow) Cosson & Durieu – HC]

Heteropogon Persoon 1806 (Tanglehead)

A genus of about 10 species, pantropical and extending into subtropical and warm temperate areas. References: Barkworth in FNA (2003a).

* ***Heteropogon melanocarpus*** (Elliott) Elliott ex Bentham, Sweet Tanglehead. Cp (FL, GA, NC, SC): sandy roadsides, disturbed areas; rare, probably naturalized from further south (or even from the Old World). September-October. The species is widespread in the Old World and New World tropics, north in North America to se. NC. [= RAB, FNA, HC, K, S]

Holcus Linnaeus 1753 (Velvet Grass, Soft Grass)

A genus of 8 species, usually perennial, native of Europe, n. Africa, and w. Asia. References: Standley in FNA (2007a); Tucker (1996)=Z.

1 Plant not rhizomatous; upper culm internodes velvety-villous; lemma awn 1-2 mm long, recurved as a hook ..... ***H. lanatus***
1 Plant strongly rhizomatous; upper culm internodes glabrous; lemma awn 3-5 mm long, straight or geniculate..... ***H. mollis ssp. mollis***

* ***Holcus lanatus*** Linnaeus, Velvet Grass, Soft Grass, Yorkshire-fog. Mt (GA, NC, SC, VA, WV), Pd (DE, GA, NC, SC, VA), Cp (DE, NC, SC, VA): pastures, disturbed areas, roadsides, hedge-rows; common (rare in SC), native of Europe. May-October. [= RAB, C, F, FNA, G, HC, K, W, WV, Z; = *Notholcus lanatus* (Linnaeus) Nash – S]

* ***Holcus mollis*** Linnaeus *ssp.* ***mollis***, Creeping Soft Grass. Mt (NC): lawns; rare, native of Europe. September. This European species is known from scattered sites in e. North America. The species was documented for our area by Clay (1995). [= FNA; < *H. mollis* – C, F, G, HC, K, Z]

Hordeum Linnaeus 1753 (Barley)

A genus of about 40 species, north temperate and in South America. Many recent authors place most of our species (other than *H. vulgare)* in *Critesion* Rafinesque. References: von Bothmer, Baden, & Jacobsen in FNA (2007a); Tucker (1996)=Z; Petersen & Seberg (2003); Blattner (2004).

1 Rachis remaining intact at maturity; leaves 5-12 mm wide, with well-developed auricles; [section *Hordeum*] ..... ***H. vulgare***
1 Rachis disarticulating at maturity; leaves 1-5 mm wide, not auriculate (except in *H. murinum* ssp. *leporinum*).
  2 Perennial; glumes 25-150 mm long; [intersectional hybrid derivative of section *Sibirica* and section *Critesion*] .... ***H. jubatum*** *ssp.* ***jubatum***
  2 Annual; glumes 7-22 (-28) mm long.
    3 Leaves auriculate; glumes of the central spikelet (in the triad) with ciliate margins; [section *Hordeum*] ..... ***H. murinum*** *ssp.* ***leporinum***
    3 Leaves not auriculate; glumes of the central spikelet (in the triad) with scabrous margins; [section *Critesion*] ..... ***H. pusillum***

* ***Hordeum jubatum*** Linnaeus *ssp.* ***jubatum***, Foxtail Barley, Squirreltail Barley. Cp (DE, NC, SC, VA), Pd (DE, VA), Mt (NC, VA, WV): disturbed areas; common (uncommon in DE Piedmont, rare in NC, SC, VA, and WV), apparently introduced in our area, native of w. United States. May-August. A tetraploid taxon. [= FNA, K; < *H. jubatum* – RAB, C, F, G, HC, W, WV, Z; = *Critesion jubatum* (Linnaeus) Nevski]

* ***Hordeum murinum*** Linnaeus *ssp.* ***leporinum*** (Link) Arcangeli. Pd (DE, GA, NC, VA), Cp (SC, VA): disturbed areas; rare, native of Mediterranean Europe. May. A tetraploid taxon. [= FNA, K, Z; = *H. leporinum* Link – RAB, C, HC; < *Hordeum murinum* Linnaeus – G, S; = *Critesion murinum* (Linnaeus) Á. Löve ssp. *leporinum* (Link) Á. Löve]

Hordeum pusillum Nuttall, Little Barley. Cp (DE, FL, GA, NC, SC, VA), Pd (DE, GA, NC, SC, VA), Mt (GA, NC, SC, VA): roadsides, ditches, disturbed areas; common (rare in VA Mountains). April-June. Se. NY west to MN, south to n. FL, s. TX, and s. AZ. A diploid taxon. [= RAB, C, F, FNA, G, HC, K, S, W, Z; = *Critesion pusillum* (Nuttall) Á. Löve]

* ***Hordeum vulgare*** Linnaeus, Barley. Cp (FL, NC, SC, VA), Pd (NC, SC, VA), Mt (VA): cultivated fields, commonly cultivated, rare as a waif, native of Eurasia. May-June. A diploid taxon. The original wild form is often treated as *H. vulgare* ssp. *spontaneum* and the cultivated, non-shattering derivative as ssp. *vulgare* (Hancock 2004). The wild form was used as a food source since at least 19,000 years ago, and ssp. *vulgare* developed by 8,500 years ago. [= RAB, C, F, K, Z; > *H. aegiceras* Nees ex Royle – G; > *H. vulgare* var. *vulgare* – G, HC; > *H. vulgare* var. *trifurcatum* (Schlechtendahl) Alefeld – G, HC; > *H. vulgare* ssp. *vulgare* – FNA; > *H. vulgare* ssp. *spontaneum* (K. Koch) Thellung]

* ***Hordeum brachyantherum*** Nevski *ssp.* ***brachyantherum*** is reported for se. PA (Rhoads & Klein 1993) and also is apparently known from specimens from GA (Sorrie, pers. comm.). A tetraploid taxon. [= FNA, K; ? *Critesion brachyantherum* (Nevski) Barkworth & D.R. Dewey] {not yet keyed}

* ***Hordeum depressum*** (Scribner & J.G. Smith) Rydberg, Low Barley. Cp (SC): waste areas around wool-combing mills; rare, native of w. North America. A tetraploid taxon. [= FNA, HC, K; = *Critesion depressum* (Scribner & J.G. Smith) Á. Löve] {not yet keyed}

Imperata Cirillo 1792 (Cogongrass, Satintail)

A genus of about 8-9 species, of tropical, subtropical, and warm temperate areas of both hemispheres. References: Gabel in FNA (2003a); Ward (2004c)=Z; Hall (1998)=Y.

* ***Imperata cylindrica*** (Linnaeus) Palisot de Beauvois, Cogongrass, Brazilian Satintail. Cp (FL, GA, SC): grassy roadside; common (rare north of FL), introduced fom the tropics. See Nelson (1993) for first report from SC. An extremely aggressive and dangerous weed, now well-established and rapidly invading fire-maintained Coastal Plain areas (such as longleaf pine and slash pine flatwoods and longleaf pine clayhills) on the Gulf Coastal Plain of FL, AL, and MS. Hall (1998) argues that *I. cylindrica* and *I. brasiliensis* are not distinct. The only character considered to separate them is that *I. brasiliensis* has 1 anther and *I. cylindrica* has 2. Ward (2004c) treats the 2 taxa at varietal level. Both putative taxa are present in the Gulf Coast area of FL, GA, AL, and LA. [= Y; > *I. cylindrica* – FNA, HC, K; > *I. brasiliensis* Trinius – FNA, HC, K, S; > *I. cylindrica* var. *cylindrica* – Z; > *I. cylindrica* var. *mexicana* (Ruprecht) D.B. Ward – Z]

Koeleria Persoon 1805 (Junegrass, Koeleria)
[also see *Rostraria*]

A genus of about 60 species, north and south temperate. References: Standley in FNA (2007a)

Koeleria macrantha (Ledebour) J.A. Schultes, Junegrass. Pd (DE): South to DE, MD, PA, KY, AL, LA, TX, and Mexico. [= FNA, K; < *K. pyramidata* (Lamarck) Palisot de Beavois – C]

Lachnagrostis Trinius 1820

A genus of about 20 species, annuals and perennials, of the Southern Hemisphere. References: Harvey in FNA (2007a); Soreng et al. (2003).

* ***Lachnagrostis filiformis*** (G. Forst.) Trinius, Pacific Bentgrass. Cp (SC): waste areas around wool-combing mill; rare, perhaps only a waif, native of Australia. [= FNA; = *Agrostis avenacea* J.F. Gmelin – K]

Lagurus Linnaeus 1753 (Hare's-tail Grass)

A monotypic genus, an annual, of the Mediterranean region. References: Tucker in FNA (2007a); Tucker (1996)=Z.

* ***Lagurus ovatus*** Linnaeus, Hare's-tail Grass. Cp (FL, NC): on ballast, other disturbed areas; rare, native of Mediterranean Europe. April-June. [= RAB, FNA, HC, K, Z]

Leersia Swartz 1788 (Cutgrass)

A genus of about 17-18 species, tropical and warm temperate. References: Pyrah in FNA (2007a); Tucker (1988)=Z.

1 Lower panicle branches whorled or closely approximate; spikelets 4.0-5.5 mm long, 1.5-2.0 mm broad; stamens 3 ..... ***L. oryzoides***
1 Lower panicle branches alternate (rarely opposite); spikelets 2.2-5.0 mm long, 0.8-4.0 mm broad; stamens 2 or 6.
2 Spikelets suborbicular-falcate, 3.0-4.0 mm broad, < 2× as long as broad; principal leaf-blades 10-15 mm wide; stamens 2 ..... ***L. lenticularis***
2 Spikelets narrowly elliptic-falcate, 1.0-2.0 mm broad, > 2× as long as wide; principal leaf-blades usually < 7 mm wide; stamens 2 or 6.
3 Spikelets 3.8-4.7 mm long, 1.5-2.0 mm broad; panicle branches short, bearing spikelets nearly to their bases; stamens 6 ..... ***L. hexandra***
3 Spikelets 2.2-3.5 mm long, 0.8-1.2 mm broad; panicle branches long, filiform, the longer ones bearing spikelets only in their upper half; stamens 2 ..... ***L. virginica***

Leersia hexandra Swartz, Southern Cutgrass. Cp (FL, GA, NC, SC, VA): clay-based Carolina bays, limesink ponds, lakes, pools, usually in places where periodically or seasonally inundated; uncommon (rare in VA). June-August. Pantropical, ranging north in North America to MD, TN, and TX. This species is considered a serious weed in the Old World and New World tropics; in our area, however, it is uncommon and not weedy. [= RAB, C, F, FNA, G, GW, HC, K, Z; = *Homalocenchrus hexandrus* (Swartz) Kuntze – S]

Leersia lenticularis Michaux, Catchfly Cutgrass. Cp (FL, GA, NC, SC, VA): floodplain forests and swamps; uncommon. September-October. Se. VA south to ne. FL and Panhandle FL, west to e. TX, north in the interior to IN and MN. [= RAB, C, F, FNA, G, GW, HC, K, Z; = *Homalocenchrus lenticularis* (Michaux) Kuntze – S]

Leersia oryzoides (Linnaeus) Swartz, Rice Cutgrass. Cp (DE, FL, GA, NC, SC, VA), Pd (DE, GA, NC, SC, VA), Mt (GA, NC, SC, VA, WV): marshes, riverbanks, pond-shores; common. August-October. NS west to BC, south to Panhandle FL and CA; also in Europe and e. Asia. [= RAB, C, F, FNA, G, GW, HC, K, WV, Z; = *Homalocenchrus oryzoides* (Linnaeus) Pollich – S]

Leersia virginica Willdenow, White Grass, White Cutgrass. Cp (DE, FL, GA, NC, SC, VA), Pd (DE, GA, NC, SC, VA), Mt (GA, NC, SC, VA, WV): floodplain forests, swamps, streambanks; common. August-October. QC west to MN and SD, south to c. peninsular FL and TX. [= RAB, C, FNA, G, GW, HC, K, WV, Z; > *L. virginica* var. *virginica* – F; > *L. virginica* var. *ovata* (Poiret) Fernald – F; = *Homalocenchrus virginicus* (Willdenow) Britton – S]

Leptochloa Palisot de Beauvois 1812 (Sprangletop, Feathergrass)

A genus of about 30 species, pantropical and extending into warm temperate areas. The circumscription of *Leptochloa* has been controversial; many earlier authors have preferred to separate *Diplachne* as a separate genus. References: Snow in FNA (2003a); Snow (1998); Cronquist (1991).

1 Spikelets 1-2.5 mm long, with 2-4 flowers; sheaths sparsely pilose with long, pustular-based hairs ..... ***L. panicea*** *ssp.* ***brachiata***
1 Spikelets 3.5-10 mm long, with 5-12 flowers; sheaths glabrous (rarely slightly scabrous).
2 Lemmas 2-3 mm long, the apex obtuse to truncate, with the midrib often extended as a mucro ..... ***L. uninervia***
2 Lemmas 3-5 mm long, the apex acuminate or awned.
3 Lemmas acuminate; leaf blades 5-10 mm wide ..... ***L. panicoides***
3 Lemmas awned; leaf blades 1-3 mm wide.
4 Low sprawling grasses, < 5 dm tall; lemma awns (1-) 2.5-5 mm long; first glume 2.5-3.5 mm long; second glume 4-7 mm long ..... ***L. fascicularis*** *var.* ***maritima***
4 Taller grasses, usually 5-10 dm tall; lemma awns 0.5-2.5 mm long; first glume 1.3-3.4 mm long; second glume 2.2-5 mm long.
5 First glume 2.3-3.4 mm long; second glume 3.4-5.0; lemmas 4-5 mm long, with an awn 0.5-2.5 mm long ..... ***[L. fascicularis*** *var.* ***acuminata]***
5 First glume 1.3-2 mm long; second glume 2.2-3.5; lemmas 3-4 mm long, with an awn 0.5-1 mm long ..... ***L. fascicularis*** *var.* ***fascicularis***

Leptochloa fascicularis (Lamarck) A. Gray *var.* ***fascicularis***, Bearded Sprangletop. Mt (WV), Pd* (NC*), Cp* (SC*): bed of artificial impoundment, brackish habitats, disturbed areas; rare, adventive from further west. September. Widespread in e. North America, primarily west of the Appalachians (adventive further east), and extending into South America. Reported (as *L. fascicularis*) for SC by Nelson & Kelly (1997). [= C, G; < *L. fascicularis* – RAB, GW, HC, S; < *L. fusca* (Linnaeus) Kunth ssp. *fascicularis* (Lamarck) N. Snow – FNA, K; = *Diplachne fascicularis* (Lamarck) Palisot de Beauvois – F]

Leptochloa fascicularis (Lamarck) A. Gray *var.* ***maritima*** (Bicknell) Gleason, Salt-meadow Grass. Cp (DE, NC, VA): fresh to brackish marshes, overwash flats, other disturbed brackish habitats; common (rare in NC and VA). August-October. Along the coast from s. NH south to se. NC. This taxon appears to warrant status as a species separate from *L. fascicularis*. [= C, G; < *L. fascicularis* – RAB, GW, HC, S; = *Diplachne maritima* E.P. Bicknell – F; < *L. fusca* (Linnaeus) Kunth ssp. *fascicularis* (Lamarck) N. Snow – FNA, K; = ***Leptochloa maritima*** (E.P. Bicknell) LeBlond & Sorrie ined.]

Leptochloa panicea (Retzius) Ohwi *ssp.* ***brachiata*** (Steudel) N. Snow, Red Sprangletop. Pd (GA, NC, SC, VA), Cp (NC, SC, VA): disturbed areas; uncommon. June-October. Widespread in the Western Hemisphere. The more familiar name, *L. filiformis*, must be replaced for reasons of nomenclatural priority. [= FNA, K; < *L. filiformis* (Lamarck) Palisot de Beauvois – RAB, C, F, G, GW, HC, K, S, W]

* ***Leptochloa panicoides*** (J. Presl) A. Hitchcock & Chase, Amazon Sprangletop. Pd (VA), Cp (GA): drawdown habitats on lake margins; rare, native of South America. Belden et al. (2004) discuss the VA occurrences along the banks of the Roanoke (Staunton) River at Kerr Reservoir. Also reported for e. GA in the Coastal Plain (Sorrie, pers. comm.). [= C, FNA, G, GW, HC, K; *? Diplachne halei* Nash – F; *? Leptochloa floribunda* Doell – S; = *Diplachne panicoides* (J. Presl) McNeill]

* ***Leptochloa uninervia*** (J. Presl) A. Hitchcock & Chase. Cp (FL, GA, SC, VA), Pd (NC): disturbed areas; rare, adventive from further west. July-August. Widespread in the Western Hemisphere, the native range obscure, but not likely native in our area. Reported for SC by Nelson & Kelly (1997). [= RAB, C, G, GW, HC, K, S; = *L. fusca* (Linnaeus) Kunth ssp. *uninervia* (J. Presl) N. Snow – FNA, K; = *Diplachne uninervia* (J. Presl) Parodi]

* ***Leptochloa decipiens*** (R. Brown) Stapf ex Maiden *ssp.* ***peacockii*** (Maiden & Betche) N. Snow. Cp (SC): waif at wool-combing mill; rare, introduced, probably not established. [= K] {not keyed}

* ***Leptochloa digitata*** (R. Brown) Domin. Cp (SC): waif at wool-combing mill; rare, introduced, probably not established. [= K] {not keyed}

* ***Leptochloa divaricatissima*** S.T. Blake. Cp (SC): waif at wool-combing mill; rare, introduced, probably not established. [= K] {not keyed}

* ***Leptochloa dubia*** (Kunth) Nees. Cp (SC): waif at wool-combing mill; rare, introduced, probably not established. Also reported for NC by Kartesz (1999), but the documentation indicates that it was cultivated at a Soil Conservation Service test nursery in Chapel Hill, Orange County. [= FNA, HC, K] {not keyed}

* ***Leptochloa fascicularis*** (Lamarck) A. Gray *var.* ***acuminata*** (Nash) Gleason. Reported as adventive in PA and along highways in WV from halophytic habitats of w. United States (Cusick 1994). [= C, G; = *Diplachne acuminata* Nash – F; < *L. fascicularis* – HC; < *L. fusca* (Linnaeus) Kunth ssp. *fascicularis* (Lamarck) N. Snow – FNA, K; = *L. acuminata* (Nash) Mohlenbrock] {not keyed}

Leptochloa panicea (Retzius) Ohwi *ssp.* ***mucronata*** (Michaux) Nowack. Cp (LA, MS), Pd* (GA*): {habitats}; rare. [= K] {not yet keyed; add to synonymy}

* ***Leptochloa virgata*** (Linnaeus) Palisot de Beauvois, Tropical Sprangletop. Cp (SC): waif at wool-combing mill; rare, introduced, probably not established. [= FNA, HC, K] {not keyed}

Limnodea L.H. Dewey 1894

A monotypic genus, and annual, of sc. United States and adjacent Mexico. References: Snow in FNA (2007a); Brandenburg & Thieret (2000)=Z; Tucker (1996)=Y.

Limnodea arkansana (Nuttall) L.H. Dewey. Cp (AL, FL, LA, MS, SC*): hammocks, moist forests (Panhandle FL westward), waste at wool-combing mill, probably not established (SC); rare, introduced, native of sc. United States (w. FL, c. and s. AL, west through MS, LA, and AR to OK, TX, and adjacent Mexico). [= FNA, HC, K, S, Z; = *Cinna arkansana* (Nuttall) G. Tucker – Y]

Lolium Linnaeus 1753 (Rye-grass, Darnel, Fescue)

A genus of about 5 species, annuals and perennials, native to Europe, n. Africa, and temperate Asia. References: Terrell in FNA (2007a); Darbyshire (1993)=Y; Aiken & Darbyshire (1990)=X; Tucker (1996)=Z. Key based in part on C and X. [also see *Schedonorus*]

1 Inflorescence paniculate (spikelets borne on branches off the central axis) ..... ***[see Schedonorus]***
1 Inflorescence spikelike (spikelets sessile on the central axis).
  2 Glumes (12-) 15-25 mm long, subcoriaceous, equaling or surpassing the uppermost lemma (therefore the length of the spikelet); florets 4-9 per spikelet; annual ..... ***L. temulentum***
  2 Glumes 4-12 mm long, herbaceous, shorter than the lemmas (therefore shorter than the spikelet); florets (2-) 5-22 per spikelet; annual or perennial.
    3 Lemmas (at least the upper) awned, the awns to 15 mm long; florets 11-22 per spikelet; annual or perennial.... ***L. perenne*** *var.* ***aristatum***
    3 Lemmas awnless; florets (2-) 5-10 per spikelet; perennial..... ***L. perenne*** *var.* ***perenne***

* ***Lolium perenne*** Linnaeus *var.* ***aristatum*** Willdenow, Italian Rye-grass, Annual Rye-grass. Cp (GA, NC, SC, VA), Pd (NC, SC), Mt (NC, SC, VA, WV), {FL}: fields, roadsides, pastures, disturbed areas; common (rare in VA), native of Eurasia. April-

July. [= C, Z; = *L. multiflorum* Lamarck – RAB, F, FNA, G, HC, S, WV; = *L. perenne* ssp. *multiflorum* (Lamarck) Husnot – K; < *L. perenne* – W]

* ***Lolium perenne*** Linnaeus *var.* ***perenne***, English Rye-grass, Perennial Rye-grass. Cp (DE, GA, NC, SC, VA), Pd (DE, GA, NC, VA), Mt (GA, NC, VA, WV), {FL}: fields, roadsides, pastures, disturbed areas; common (uncommon in GA, NC, SC, VA), native of Eurasia. April-July. [= C, Z; = *L. perenne* – RAB, F, FNA, G, HC, S, WV; = *L. perenne* ssp. *perenne* – K; < *L. perenne* – W]

* ***Lolium temulentum*** Linnaeus *ssp.* ***temulentum***, Darnel. Pd (GA, NC, VA), Cp (FL, NC, VA), {SC}: fields, roadsides, pastures, disturbed areas; common (rare in FL and VA), native of Eurasia. May-June. [= FNA; < *L. temulentum* – RAB, C, F, HC, S, Z; > *L. temulentum* var. *leptochaetum* A. Braun – G; > *L. temulentum* var. *macrochaeton* A. Braun – G; > *L. temulentum* ssp. *temulentum* – K]

Luziola Antoine Laurent de Jussieu 1789 (Southern Water Grass)

A genus of about 12 species, from s. North America south to tropical South America. References: Martínez-y-Pérez, Mejía-Saulés, & Sosa (2008)=X; Terrell in FNA (2007a); Tucker (1988)=Z; Judziewicz et al. (2000)=Y. Key based on Terrell in FNA (2007a).

1 Culms prostrate; leaves conspicuously clustered towards the apex of the culms, floating, 1-5 (-8) cm long; pistillate inflorescence an inconspicuous axillary raceme, 1.1-3.5 cm long, with 2-5 florets ..... ***L. fluitans*** *var.* ***fluitans***

1 Culms suberect to erect; leaves scattered along the culm, not floating, > 6 cm long; pistillate inflorescence an axillary panicle, 2-21.5 (-58) cm long, with 18-250 (-350) florets.

2 Pistillate florets 3-5 mm long; achenes striate..... ***L. bahiensis***

2 Pistillate florets 2-2.5 mm long; achenes smooth..... ***L. peruviana***

*? ***Luziola bahiensis*** (Steudel) Hitchcock. Cp (AL, FL, MS): streams and riverbanks; rare. Apparently native (Anderson & Hall 1993), but considered native of South America by some authors. [= FNA, HC, K, X]

Luziola fluitans (Michaux) Terrell & H. Robinson *var.* ***fluitans***, Southern Water Grass. Cp (GA, NC, SC), Pd? (GA?): aquatic in water of natural lakes, slow-moving blackwater rivers, and other stagnant waters; rare (NC Watch List). August-October. Var. *fluitans* ranges from ne. NC to c. FL and west to e. TX; var. *oconnerii* (Guzman M.) G. Tucker occurs in the highlands of w. Mexico (Tucker 1988). A very unusual grass, truly aquatic, with flexuous stems and unwettable, floating leaves. In addition to floating leaves (helpful in the field but not in the herbarium!), other useful characters include two secondary blade nerves on either side of the midnerve and virtually as prominent as the midnerve, and which extend onto the sheath where they occur with another 5 or so strong nerves; often with cilia 0.5-1 mm long at the summit of the ventral face of the sheath (an unusual place); and a hyaline ligule about 1 mm long on the same plane as the sheath (i.e., free from the base of diverging blades). [= FNA, Y, Z; < *L. fluitans* – K, X; < *Hydrochloa carolinensis* Palisot de Beauvois – RAB, GW, HC, S]

* ***Luziola peruviana*** Gmelin, Peruvian Water Grass. Cp (FL): disturbed wet areas; rare. FL Panhandle. Apparently an introduction, occurring in disturbed situations. See Anderson & Hall (1993). [= FNA, HC, K, X]

Megathyrsus (Pilger) B.K. Simon & S.W.L. Jacobs 2003 (Guinea Grass)

A genus of 3 species. References: Wipff & Thompson in FNA (2003a), amended in FNA (2007a).

* ***Megathyrsus maximus*** (Jacquin) B.K. Simon & S.W.L. Jacobs, Guinea Grass. Cp (AL, FL, GA): disturbed areas, pine plantations; common, native of Africa. Introduced in the Gulf states (GA, AL, FL) (FNA; Carter, Baker, & Morris 2009). [= FNA (2007a); = *Urochloa maxima* – FNA (2003a), K; = *Panicum maximum* Jacquin – HC, S]

Melica Linnaeus 1753 (Melic)

A genus of about 80 species, north temperate, s. Africa and s. South America. References: Barkworth in FNA (2007a); Tucker (1996)=Z.

1 First glume oblong, 6.5-10 mm long, 2-4× as long as wide, acute to obtuse at the apex, about the same length and width as the second glume; inflorescence with (0-) 1-5 branches from the lower nodes only; fertile lemmas 2; leaves 1-6 mm wide; [common, widespread in our area] ..... ***M. mutica***

1 First glume broadly ovate, 5-8 mm long, 1.5-2× as long as wide, obtuse to rounded at the apex, shorter and broader than the second glume; inflorescence with 2-10 (or more) branches from most nodes; fertile lemmas (2-) 3; leaves 3-12 mm wide; [rare, Mountains of NC and VA, northwards and westwards]..... ***M. nitens***

Melica mutica Walter, Two-flower Melic. Cp (FL, GA, NC, SC, VA), Pd (GA, NC, SC, VA), Mt (GA, NC, SC, VA, WV): forests and woodlands, including coastal fringe and maritime forests; common (rare in WV). April-May. MD west to IN and IL, south to FL and TX. [= RAB, C, F, FNA, G, HC, K, S, W, WV, Z]

Melica nitens (Scribner) Nuttall ex Piper, Three-flower Melic. Mt (GA, NC, VA, WV): rocky upland woodlands, barrens, and glades, over calcareous rocks (such as limestone, calcareous shale); rare. May-June. PA west to s. MN and NE, south to nw. GA and TX. [= RAB, C, F, FNA, G, HC, K, W, WV, Z]

Melinis Palisot de Beauvois 1812 (Natalgrass)

A genus of ca. 22 species, native to Africa and w. Asia. References: Wipff in FNA (2003a).

* ***Melinis repens*** (Willdenow) Zizka *ssp.* ***repens***, Rose Natalgrass. Cp (FL, GA), Pd (GA), Mt (GA): disturbed areas, roadsides, railroad embankments, other disturbed areas; common (rare north of FL), native of Africa. Reported for several s. GA counties (Carter, Baker, & Morris 2009); the report for NC by Kartesz (1999) is an error. [= FNA; < *M. repens* – K; *? Rhynchelytrum roseum* (Nees) Stapf & C.E. Hubbard ex Bews – HC; < *Rhynchelytum repens* (Willdenow) C.E. Hubbard]

Microstegium Nees in Lindley 1836 (Sasa-grass, Japanese-grass)

A genus of about 15 species, of subtropical Asia and Africa. References: Barden (1987); Fairbrothers & Gray (1972); Winter, Schmitt, & Edwards (1982); Koyama (1987); Thieret in FNA (2003a).

* ***Microstegium vimineum*** (Trinius) A. Camus, Japanese Stilt-grass, Flexible Sasa-grass, Japanese-grass. Pd (DE, GA, NC, SC, NC, VA), Mt (GA, NC, SC, VA, WV), Cp (DE, FL, GA, NC, SC, VA): disturbed areas, colonizing moist, rich soil, especially in floodplains; common (uncommon in DE Coastal Plain), native of tropical se. Asia. The following chronological synopsis of flora accounts of *Microstegium* is perhaps instructive: not treated by Small (1933), "local" (Fernald 1950), "rarely introduced and possibly not established" (Gleason & Cronquist 1952), "sporadically naturalized" (Godfrey & Wooten 1979), "a rapidly spreading pernicious invader on moist ground, too common" (Wofford 1989). RAB report it from fewer than 1/3 of the counties of the Carolinas (in 1968); it is now undoubtedly in every county, an abundant weed in most of them. This species has become a very serious pest, now ranking as one of the most destructive introduced plants in our area, forming extensive and dense patches, sprawling over and eliminating nearly all other herbaceous plants. Eradication is very difficult, and considering its obvious colonizing abilities, only temporary. Hunt & Zaremba (1992) document the continuing northern expansion of *Microstegium* into NY and CT. Redman (1995) discusses its habitat preferences in MD and DC. Koyama (1987) reports it as "common as undergrowth of forests" in Japan, part of its native distribution. [= RAB, C, FNA, GW, K, W; = *Eulalia viminea* (Trinius) Kuntze – G; > *Eulalia viminea* var. *viminea* – F; > *Eulalia viminea* var. *variabilis* Kuntze – F; > *M. vimineum* var. *vimineum* – HC; > *M. vimineum* var. *imberbe* (Nees) Honda – HC]

Milium Linnaeus 1753 (Wood-millet, Millet-grass)

A genus of 4 species, north temperate. References: Crins in FNA (2007a); Haines (2010)=X; Tucker (1996)=Z; Fernald (1950b)=Y.

Milium effusum Linnaeus *var.* ***cisatlanticum*** Fernald, American Wood-millet, Millet-grass. Mt (NC, VA, WV): forests at high (or rarely moderate) elevations; rare. June. A circumboreal species, ranging in North America south to w. NC (Swain County), e. TN (Sevier County), w. VA, WV, OH, IN, IL, and MN. The American plants are sometimes segregated as var. *cisatlanticum* Fernald (Fernald 1950b). Though considered "probably accidentally introduced and established" in NC by Radford, Ahles, & Bell (1968), the native occurrence of this northern species is more plausible; the only known occurrence in NC (not recently seen) is in the Great Smoky Mountains National Park. [= FNA, K, Y; < *M. effusum* – RAB, C, F, G, HC, W, WV, Z; = *M. effusum* ssp. *cisatlanticum* (Fernald (A. Haines – X]

Miscanthus Andersson 1855 (Eulalia)

References: Barkworth in FNA (2003a).

* ***Miscanthus sinensis*** Andersson, Eulalia, Chinese Silver Grass. Mt (GA, NC, SC, VA, WV), Pd (DE, GA, NC, SC, VA), Cp (DE, FL, NC, SC, VA): roadsides; common (uncommon in DE, rare in FL), native of e. Asia. September-November. This species is becoming aggressively weedy. Forms with leaves cross-variegated or linear-variegated with yellow are cultivated and sometimes escape or persist (in addition to the much more common green-leaved form). [= RAB, C, FNA, G, K, S, W, WV; > *M. sinensis* var. *variegatus* Beal – F, HC; > *M. sinensis* var. *zebrinus* Beal – F, HC]

Muhlenbergia Schreber 1789 (Muhly)

A genus of about 176 species, of North America south to Andean South America, and e. and se. Asia. *Muhlenbergia* is a large and diverse genus, recently reclassified by Peterson, Romaschenko, & Johnson (2010); the subgenera used here follow that classification. References: Peterson, Romaschenko, & Johnson (2010); Pohl (1969); Gustafson & Peterson (2007)=Y; Morden & Hatch (1989)=Z; Peterson in FNA (2003a).

1 Panicle open and diffuse, > 4 cm broad, the spikelets borne on slender or capillary pedicels longer than the lemmas.
  2 Plant with rhizomes, the rhizomes prominent, creeping, and covered with imbricate scales; culms and sheaths strongly compressed at base, the leaves distichous; spikelets 1.5-2 mm long; [subgenus incertae sedis] ..... ***M. torreyana***

2 Plant without rhizomes, tufted with erect culms (a "bunchgrass"); culm and sheaths terete, the leaves not distichous; spikelets 1.5-5 mm long (excluding awns, if present).
3 Spikelets 1.5-2 mm long, awnless; [subgenus *Pseudosporobolus*] ..... ***M. uniflora***
3 Spikelets 2.5-5 mm long (excluding awns), awned or awnless; [subgenus *Trichochloa*].
4 Lemma awn 0-1.5 (-4) mm long; glume bodies (1.1-) 2.0-3.3 (-3.6) mm long, < ½ as long as the lemma bodies, acuminate, not awned (rarely the second with a short awn < 0.6 mm long); spikelets usually brown or bronze (when fresh); basal sheaths usually very fibrous ..... ***M. expansa***
4 Lemma awn (2-) 3-35 mm long; glume bodies (0.3-) 0.7-1.7 (-2.4) mm long, > ½ as long as the lemma body, one or both glumes sometimes awned; spikelets usually purple (when fresh); basal sheaths rarely strongly fibrous.
5 Lemma awn (2-) 3-13 (-18) mm long, first glume awnless (or rarely with an awn to 3.2 mm long), second glume awnless (or rarely with an awn up to 5.0 mm long), palea awnless; lemma lacking setaceous teeth flanking the awn; flowering late August-October; [widespread in our area, particularly in rocky, clayey, or sandy glades, barrens, and woodlands with prairie affinities] ..... ***M. capillaris***
5 Lemma awn (8-) 12-26 (-35) mm long, first glume awn (0.5-) 1-7 (-10) mm long, second glume awn (1-) 5-19 (-25) mm long, palea awn-tipped; lemma with two setaceous teeth flanking the awn, the teeth 0.5-2.5 (-4.7) mm long; flowering October-November; [sandy maritime situations on barrier islands of the outer Coastal Plain] ..... ***M. sericea***

1 Panicle slender, dense, < 2.5 cm broad, the spikelets sessile or on non-capillary pedicels shorter than the lemmas; [subgenus *Muhlenbergia*].
5 Glumes minute, 0-0.5 mm long; plant lacking rhizomes; culms weak, decumbent and cespitosely branching in their lower portions, rooting at the nodes, the upper portions erect and sparsely branched ..... ***M. schreberi***
5 Glumes well-developed, 1-7 mm long; plant with scaly rhizomes (except for *M. cuspidata*); culms firm (rarely sprawling), few or solitary (rarely forming dense colonies).
6 Glumes 5-7 mm long (tapered to arched or straight awns), about double the length of the lemma (excluding its awn); panicle dense and spike-like, 2-6 cm long and 3-10 mm broad ..... ***M. glomerata***
6 Glumes 1.2-3 mm long, shorter than to barely exceeding the lemma; panicle usually slender, arching, generally less dense and not spike-like, often with some elongated (though appressed) branches, 4-50 cm long, 2-15 mm broad.
7 Callus glabrous; plant lacking scaly rhizomes (with slender stolons and a hard, knotty crown); leaves 0.5-2 mm wide; [calcareous cliffs] ..... ***M. cuspidata***
7 Callus bearded (sometimes only slightly so) (glabrous in *M. glabriflora*); plant with scaly rhizomes; leaves (1-) 2-14 mm wide; [various habitats].
8 Panicle linear, loosely flowered, much exceeding the leaves; culm erect, simple or sparingly branched; glumes relatively broad, the body ovate, 1.2-2.5 mm long, abruptly narrowed to the acuminate tip; ligule obsolete or shorter than the elongate cartilaginous summit of the leaf sheath.
9 Lemmas awnless or awn < 0.5 mm long; spikelets 1.5-2.5 mm long; leaf blades usually (1-) 2-6 mm wide ..... ***M. sobolifera***
9 Lemma awn 1-11 mm long (rarely awnless); spikelets 3-5 mm long; leaf blades (2) 6-10 (-13) mm wide (often > 8 mm wide) ..... ***M. tenuiflora***
8 Panicle lanceolate, densely (rarely loosely) flowered, leaves often extending conspicuously into the inflorescence; culm geniculate, freely branched; glumes relatively narrow, the body lanceolate, 2-3 mm long, tapering from base to apex; ligule usually obvious above the short cartilaginous summit of the leaf sheath.
10 Culm glabrous throughout (including below the nodes).
11 Glumes 1.4-2.0 mm long; ligule 0.2-0.5 mm long ..... ***M. bushii***
11 Glumes 2-4 (-5) mm long; ligule 0.8-1.5 mm long ..... ***M. frondosa***
10 Culm pubescent, at least below the nodes.
12 Lemma awn 7-12 mm long; spikelets loosely clustered, on pedicels 2-4 mm long ..... ***M. sylvatica***
12 Lemma awnless or with a short awn tip (rarely to 9 mm long); spikelets densely clustered, on pedicels < 1 mm long.
13 Lemma glabrous below, or with short basal bearding; ligule 0.5-1.5 mm long ..... ***M. glabrifloris***
13 Lemma pilose basally; ligule 0.5-1 mm long ..... ***M. mexicana***

Muhlenbergia bushii Pohl, Bush's Muhly. Pd (VA), Mt (GA), Cp (KY), {NC}: wet oak flatwoods, bottomlands, and other moist forests; rare. IN west IA, south to NE and TX; apparently disjunct eastward in scattered localities, including in n. GA (Jones & Coile 1988) and VA. The habitat is variously given in floras as "dry woods" or "moist woods." [= C, FNA, K; = *M. brachyphylla* Bush – F, G, HC]

Muhlenbergia capillaris (Lamarck) Trinius, Hairgrass. Pd (DE, GA, NC, SC, VA), Cp (FL, GA, KY, NC, SC, TN, VA), Mt (GA, KY, NC, TN, VA, WV), Ip (KY, TN): in the Piedmont and Interior Low Plateau primarily in clayey or thin rocky soils (especially in areas which formerly burned and were prairie-like) and in open woodlands, in the Coastal Plain in savannas, dry woodlands, and coastal grasslands (where sometimes in close proximity with *M. sericea*), in the Mountains around calcareous rock outcrops; uncommon (rare in WV, rare in KY Mountains, rare in KY Coastal Plain, rare in DE Piedmont). Late August-October. The species is widespread in e. North America. *M. capillaris* and its relatives, *M. expansa* and *M. sericea*, have been the subject of an herbarium morphological study by Morden & Hatch (1989), who conclude that the three taxa are not sharply separable and should be recognized only at the varietal level. If one considers behavior in the field, ecology, and geography in conjunction with morphologic characters, however, there is little doubt that the three taxa are biological species. Distribution and typical habitat are different for the three species, but *M. capillaris* can be found growing with or in proximity to each of the other two (I have not seen *M. sericea* and *M. expansa* together). In such situations, the two taxa present are readily distinguishable at a glance, and there is no evidence of intermediates or hybrids. Gustafson & Peterson (2007) also concluded that the three taxa are separable as species. [= F, FNA, G, W, Y; < *M. capillaris* – RAB, GW (also see *M. sericea*); = *M. capillaris* var. *capillaris* – C, HC, K, S, Z]

Muhlenbergia cuspidata (Torrey ex Hooker) Rydberg, Plains Muhly. Mt (VA), Ip (KY, TN): dolomite and limestone palisade cliffs; rare. OH west to MT and AB, south to sw. VA, KY, MO, OK, and NM. The VA occurrences are on dolomite and limestone palisade cliffs along the New, Roanoke, and Shenandoah rivers. [= C, F, FNA, G, HC, K]

* *Muhlenbergia emersleyi* Vasey, Bull Muhly. Reported as introduced in NC (Kartesz 1999) from its native range in TX, NM, AZ, and Mexico, based on a specimen at the UNC Herbarium. However, the specimen makes clear that it was cultivated at a Soil Conservation Service test nursery; there is no evidence that the species is established in our area. [= FNA, HC, K] {rejected; not keyed; not mapped}

Muhlenbergia expansa (Poiret) Trinius, Savanna Hairgrass. Cp (FL, GA, NC, SC, VA): pine savannas, pine flatwoods, mesic areas in sandhill-pocosin ecotones; common (rare in VA). September-October. Se. VA south to FL, west to e. TX (nearly exactly the range of *Pinus palustris*). An important part of the grassy component of many longleaf pine savannas, *M. expansa*'s flowering is stimulated by fire, and, lacking fire, it may be found in large populations in solely vegetative condition. It can be distinguished in sterile condition from other savanna bunchgrasses (*Sporobolus teretifolius*, *S. pinetorum*, *S. floridanus, S. curtissii, Aristida stricta*, and *A. beyrichiana*) by the following characteristics: old leaf bases fibrous and curly (rather than hardened and cartilaginous) and ligules 1-3 mm long (rather than 0.2 to 0.5 mm long). The open panicle somewhat resembles that of several species of similar habitat which often co-occur with *M. expansa – Sporobolus teretifolius, S. pinetorum*, *S. curtissii, S. floridanus*, and *Calamovilfa brevipilis*, but the panicle of *M. expansa* is capillary, flexuous, and fragile, tending to break up over the winter (vs. fine-textured but not capillary, the branches rigid and ascending, more likely to persist over the winter in relatively intact condition). The vegetative characters listed above and under *Calamovilfa brevipilis* are also useful. See *M. capillaris* for a discussion of recent studies on the *M. capillaris* complex. [= RAB, F, FNA, GW, HC, S, Y; = *M. capillaris* var. *trichopodes* (Elliott) Vasey – C, K, Z]

Muhlenbergia frondosa (Poiret) Fernald, Smooth Wirestem Muhly. Mt (GA, KY, NC, VA, WV), Pd (DE, GA, NC, VA), Cp (KY, NC), Ip (KY): moist forests and disturbed areas; common (uncommon in GA, NC, VA, and WV, rare in Piedmont, rare in NC Coastal Plain, rare in KY Mountains). September-October. This species is widespread in e. North America, south to ne. GA and west into the Plains. [= RAB, C, F, FNA, G, GW, HC, K, W, WV; = *M. mexicana* – S, misapplied]

Muhlenbergia glabriflora Scribner, Clay-pan Muhly. Ip (KY, TN), Cp (KY), Pd (NC, VA): open oak flatwoods, other open habitats, in clayey soils; rare. October-November. VA and NC west to IA, MO, AL, and TX, local and apparently rare in all of that range. In NC, only known from one collection, that from Durham County in 1936, with vague habitat data. F describes the habitat as "dry exsiccated or baked soils, prairies, gravels or rocky slopes," Pohl (1969) as "mostly on low ground, in shade on heavy clay soils." [= C, F, G, HC, K; = *M. glabrifloris* – FNA, orthographic variant]

Muhlenbergia glomerata (Willdenow) Trinius, Spiked Muhly. Mt (NC, VA): fens and seeps over mafic (amphibolite) or ultramafic (olivine) rocks; rare. August-October. This species is widespread in n. North America, ranging south in a scattered and disjunct pattern to NC. [= RAB, C, F, FNA, GW, HC, K, W; < *M. racemosa* (Michaux) Britton, Sterns, & Poggenburg – G, S]

Muhlenbergia mexicana (Linnaeus) Trinius, Hairy Wirestem Muhly. Mt (NC, VA, WV), Pd (DE, VA): forest edges; uncommon (rare in DE, NC, and WV). September-October. The epithet is a misnomer; the species is largely northern, occurring nearly throughout the United States and s. Canada. [= RAB, C, F, G, HC, K, W, WV; > *M. mexicana* var. *filiformis* (Torrey) Scribner – FNA; > *M. mexicana* var. *mexicana* – FNA; = *M. foliosa* (Roemer & J.A. Schultes) Trinius – S]

Muhlenbergia schreberi J.F. Gmelin, Nimblewill, Dropseed. Mt (GA, KY, NC, SC, VA, WV), Pd (DE, GA, NC, SC, VA), Cp (DE, FL, GA, KY, NC, SC, VA), Ip (KY): bottomland and other moist forests, dry forests, disturbed areas; common (uncommon in FL). August-October. This species is widespread in e. United States. [= RAB, C, F, FNA, GW, HC, K, S, W, WV; > *M. schreberi* var. *schreberi* – G; > *M. schreberi* var. *palustris* (Scribner) Scribner – G; > *M. palustris* Scribner]

Muhlenbergia sericea (Michaux) P.M. Peterson, Dune Hairgrass, Sweet Grass. Cp (FL, GA, NC, SC): maritime dry grasslands, maritime wet grasslands, interdune swales, low dunes, sometimes edges of freshwater or brackish marshes, apparently limited to the barrier islands (sometimes in close proximity with *M. capillaris*); uncommon, though sometimes locally abundant (SC Rare). October-November. This species is a very conspicuous part of the Outer Banks flora in the autumn, especially showy and abundant between Rodanthe (Chicamacomico) and Avon (Kinnakeet), Dare County, NC, and also abundant on Ocracoke Island, Hyde County, NC. The capillary pedicels and awns of its purple inflorescences are so light as to be moved by the slightest breeze. By December or January they fade to tan, but remain showy. This grass is a major component of baskets made in the Low Country of SC by the Gullah, who call it "sweet grass." I agree with Curtis (1843), Blomquist (1948), Pinson & Batson (1971), Gould (1975), and others who consider *M. sericea* (as *M. filipes*) a species distinct from *M. capillaris*. Its range is from NC (slightly north of Oregon Inlet, Dare County, south of Nags Head) south to FL and west to TX, primarily on barrier islands. In addition to a discussion of its relationship to *M. capillaris*, Pinson and Batson (1971) and Morden & Hatch (1989) provide descriptions, not elsewhere available. See *M. capillaris* for a discussion of recent studies on this complex. [= FNA, Y; < *M. capillaris* – RAB, GW; = *M. capillaris* var. *filipes* (M.A. Curtis) Chapman ex Beal – HC, K, S, Z; = *M. filipes* M.A. Curtis]

Muhlenbergia sobolifera (Muhlenberg ex Willdenow) Trinius, Rock Muhly. Mt (GA, KY, NC, VA, WV), Pd (DE, VA), Cp (VA), Ip (KY), Cp (KY): dry wooded limestone slopes, rock outcrops and rocky forests; uncommon (rare in DE, GA, and NC, rare in VA Coastal Plain). July-September. ME, WI, and KS south to n. GA, n. AL, n. MS, and c. TX. [= RAB, C, F, FNA, G, HC, K, S, W, WV]

Muhlenbergia sylvatica Torrey ex A. Gray, Woodland Muhly. Mt (GA, KY, NC, SC, VA, WV), Pd (DE, NC, VA), Ip (KY), Cp (KY, VA): bottomland and other moist forests, calcareous or mafic streambanks; uncommon (rare in DE,GA, and NC). September. ME and MN south to SC, ne. GA, AL, and TX. [= RAB, C, FNA, K, W, WV; > *M. sylvatica* var. *sylvatica* – F, G, GW, HC; = *M. umbrosa* Scribner – S]

Muhlenbergia tenuiflora (Willdenow) Britton, Sterns, & Poggenburg, Slender Muhly. Mt (GA, KY, NC, VA, WV), Pd (DE, GA, NC, VA), Cp (DE, VA), Ip (KY), {SC}: moist forests and disturbed areas, up to at least 1400 meters; uncommon (rare in DE, GA, NC, and SC Piedmont, rare in DE and VA Coastal Plain). August-October. NH, WI, and NE south to GA, AL, MS, and OK. Two varieties are sometimes recognized: var. *tenuiflora*, with lemma awn 4-11 mm long and the sheaths and stems retrorsely hirsute, especially around the nodes, and var. *variabilis* (endemic to the Southern Appalachians), with lemma awn 1-4 mm long or absent, and the sheaths and stems glabrous or nearly so. The validity of the varieties needs further assessment. [= RAB, F, FNA, G, HC, K, S, W, WV; > *M. tenuiflora* var. *tenuiflora* – C; > *M. tenuiflora* var. *variabilis* (Scribner) Pohl – C]

Muhlenbergia torreyana (J.A. Schultes) A.S. Hitchcock, Pinebarren Smokegrass. Cp (DE, GA, NC), Ip (TN), {KY?}: in the Coastal Plain in moist soils of depression meadows and clay-based Carolina bays, often under or near *Taxodium ascendens*, in the Interior Low Plateau and Cumberland Plateau in moist grassy oak savannas; rare. August-November. NJ to GA in the Coastal Plain, and disjunct in KY (?)and TN; currently known to be extant only in NJ, NC, and TN. It was first discovered in NC in 1987. Although it rarely flowers except following fire, it can be recognized in sterile condition by its forming clonal patches

with evenly spaced, upright, blue-green tufts, each tuft a flattened stem with 5-10 ascending-erect, rather stiff, usually conduplicate leaves, the summit of each sheath with a pronounced cartilaginous thickening, easily felt by running the flattened stem from base to apex between thumb and forefinger. [= C, F, FNA, G, HC, K; = *Sporobolus torreyanus* (J.A. Schultes) Nash – S]

Muhlenbergia uniflora (Muhlenberg) Fernald. Bogs, wet meadows. South to s. NJ, MD, and se. PA (Rhoads & Klein 1993). [= C, FNA, G, HC, K; > *M. uniflora* var. *uniflora* – F]

Muhlenbergia asperifolia (Nees & Meyen ex Trinius) Parodi, Alkali Muhly, Scratchgrass. Alkaline soils, wetlands, lawns. Reported east and south to MD, PA, n. KY, and OH (Kartesz 1999, 2010). [= C, F, FNA, G, HC, K] {not yet keyed}

Nassella (Trinius) Desvaux 1846

A genus of ca. 116 species, mainly perennials, mainly of South America. References: Barkworth in FNA (2007a). Key based on Barkworth in FNA (2007a).

1 Florets 1.5-2.5 mm long; leaves 0.2-0.6 mm wide, stiff and tightly convolute ..... ***N. trichotoma***
1 Florets 3.4-13 mm long; leaves 1-8 mm wide, flat or convolute.
  2 Crown (surrounding the base of the awn) as wide or wider than long, the rim with hairs <0.5 mm long; floret widest just below the the crown..... ***[N. neesiana]***
  2 Crown longer than wide, the rim with hairs 1-2 mm long; floret widest near or only slightly above the middle.
    3 Florets 6.5-13 mm long; crown usually flaring at the tip; awns 40-90 mm long..... ***N. leucotricha***
    3 Florets 6-8 mm long; crown parallel-sided; awns 30-50 mm long..... ***[N. manicata]***

* ***Nassella leucotricha*** (Trinius & Ruprecht) Pohl, Texas Needlegrass. Cp (SC): waste areas near wool-combing mill; rare, native of sc. United States and Mexico. [= FNA, K; = *Stipa leucotricha* Trinius & Ruprecht – HC]

* ***Nassella trichotoma*** (Nees) Hackel ex Arechavaleta, Serrated Tussockgrass. Cp, Pd (NC, SC): fields; rare, native of South America, perhaps extirpated as a noxious weed. [= FNA; = *Stipa trichotoma* Nees]

* *Nassella manicata* (E. Desv.) Barkworth, Andean Tussockgrass. Reported from MS; perhaps only a waif. [= FNA; = *Stipa manicata* E. Desv.]

* *Nassella neesiana* (Trinius & Ruprecht) Barkworth, Uruguayan Tussockgrass. Known only from old collections on ballast from Mobile, AL. [= FNA; = *Stipa neesiana* Trinius & Ruprecht]

Neeragrostis Bush 1903

A monotypic genus of warm temperate North America and tropical Central America and n. South America. References: Peterson & Harvey (in prep.)=Z.

Neeragrostis reptans (Michaux) Nicora. Mt (WV): shores and wet flats; rare. Reported for scattered locations as far east as c. TN by Chester et al. (1993), as well as in WV, KY, and possibly GA (Kartesz 1999). [= K, Z; = *Eragrostis reptans* (Michaux) Nees – C, F, G, GW, HC]

Oplismenus Palisot de Beauvois 1807 (Woods-grass, Basket-grass)

A genus of about 5 species, widespread in the New World and Old World tropics, subtropics, and warm temperate areas. References: Wipff in FNA (2003a); Crins (1991)=Z; Scholz (1981)=Y; Peterson et al. (1999).

1 Leaf sheaths and culm axis glabrate to pilose (usually sparsely, but dense at sheath summit) with hairs <1.5 mm long; hairs on leaf surfaces similarly long; leaves 1.5-6 cm long; longest leaves with acute to acuminate tip (but not long-acuminate); lemma (7-) 9-11-veined ..... ***O. hirtellus*** *ssp.* ***setarius***
1 Leaf sheaths and culm axis pilose with hairs 3-5 mm long; hairs on leaf surfaces similarly long; leaves 2.5-10 cm long; longest leaves with long-acuminate tip; lemma 7-veined..... ***O. hirtellus*** *ssp.* ***undulatifolius***

Oplismenus hirtellus (Linnaeus) Palisot de Beauvois *ssp.* ***setarius*** (Lamarck) Mez ex Ekman, Woods-grass. Cp (FL, GA, NC, SC), Pd (GA, SC): hammocks, maritime forests, shell middens, moist forests; common (uncommon in GA, NC, and SC). August-October. *O. hirtellus* is widespread in tropical and subtropical areas of the New and Old World; ssp. *setarius* ranges from e. NC south to FL, west to AR and TX, and south through the Caribbean and Central America to central South America. Scholz (1981) recognizes many other subspecies. This species is undoubtedly native in our area, occurring in undisturbed habitats in natural communities entirely devoid of alien species; the basis of Gould's (1975) assertion that *Oplismenus* is "introduced or adventive in the United States" is unknown. Superficially, *Oplismenus* resembles *Arthraxon*, but has the leaves only slightly cordate at the base (vs. strongly cordate-clasping). Crins (1991) favors treating *O. setarius* as a taxonomically unrecognized component within a polymorphic *O. hirtellus*. [= FNA, K, Y; = *O. setarius* (Lamarck) Roemer & J.A. Schultes – RAB, HC, S; < *O. hirtellus* (Linnaeus) Palisot de Beauvois – Z]

* ***Oplismenus hirtellus*** (Linnaeus) Palisot de Beauvois *ssp.* ***undulatifolius*** (Ard.) U. Scholz. Mt (VA): moist forests; rare, but locally abundant. Native to the Eastern Hemisphere (Asia and perhaps also native ein s. Europe), has been reported as an

introduction in Baltimore Co., MD (Peterson et al. 1999). It can be expected to spread. [= FNA, K, Y; < *O. hirtellus* (Linnaeus) Palisot de Beauvois – Z]

* *Oplismenus burmannii* (Retzius) Palisot de Beauvois. Collected in peninsular FL just south of our area and may eventually appear farther north (Davis, Judd, & Perkins (2006). {not keyed}

Oryza Linnaeus 1753 (Rice)

A genus of about 20 species, native of tropical and warm temperate portions of the Old World. References: Barkworth & Terrell in FNA (2007a); Tucker (1988)=Z; Judziewicz et al. (2000)=Y; Nanda & Sharma (2003)=X.

* ***Oryza sativa*** Linnaeus, Rice. Cp (GA, NC, SC, VA?): marshes, impoundments; rare, of only sporadic occurrence outside of cultivation, native of Asia. October. Perhaps the single most important food crop in the world, developed as a crop in Asia and cultivated at least since 10,000 years BP (Hancock 2004). Rice was an important crop before the Civil War in SC, GA, and extreme se. NC. Most rice planted today in our area is in waterfowl impoundments. [= RAB, C, FNA, G, GW, HC, K, S, X, Y, Z]

Oryzopsis Michaux 1803 (Ricegrass)

A monospecific genus, a perennial, of ne. North America. References: Barkworth in FNA (2007a). [also see *Piptatherum*]

Oryzopsis asperifolia Michaux, Rough-leaved Ricegrass, Whiteseed Mountain-ricegrass. Mt (VA, WV): high elevation pine-oak/heath barrens and woodlands; rare. NL (Newfoundland) west to BC, south to w. VA (Rockingham County), WV, n. IN, SD, NM, and UT. This grass forms large cespitose clumps, the leaves evergreen and somewhat bicolored (green on the upper surface, bluish on the lower). [= C, F, FNA, G, HC, K, WV]

Panicum Linnaeus 1753 (Panic Grass)
(contributed by Richard J. LeBlond)

{INTRODUCTION: Describe differences between *Panicum*, *Dichanthelium*, *Urochloa* (=*Brachiaria*), and *Paspalidium* (now in *Setaria*), all of which are treated as *Panicum* in RAB. Describe collection methods and character analysis.} [also see *Dichanthelium, Megathyrsus, Phanopyrum, Setaria, Steinchisma*, and *Urochloa*]

There has been considerable controversy over the generic limits of *Panicum*. In its broader recent conceptions, it has been considered to include (in our area) taxa sometimes and variously segregated as *Brachiaria, Dichanthelium, Eriochloa, Paspalidium, Phanopyrum, Steinchisma*, and *Urochloa*. All were originally recognized based on morphological characteristics, to which have recently been added anatomical, chemical, and other evidence. Crins (1991) recognizes *Eriochloa*, *Urochloa* (including *Brachiaria*), *Paspalidium*, and *Panicum* as genera, with *Panicum* subdivided into subgenera *Panicum*, *Agrostoides*, *Dichanthelium*, *Phanopyrum*, and *Steinchisma*. We prefer to recognize most of the segregates as genera, pending further analyses, since there is little evidence that these groups are more closely related to one another than they are to other genera recognized in the Paniceae. *Phanopyrum* and *Dichanthelium* are the only segregate groups with C_3 photosynthesis. *Eriochloa* and *Urochloa* (including *Brachiaria*) have C_4 photosynthesis, with PEP-ck decarboxylation. *Panicum* and *Setaria* (*Paspalidium)* have C_4 photosynthesis, with NAD-me or NADP-me decarboxylation. *Steinchisma*, in addition to its unusual expansion of the palea, apparently has a peculiar photosynthetic pathway, described by Crins (1991) as "intermediate between" C_3 and C_4 photosynthesis; "the leaves have Kranz anatomy, but there are fewer organelles than usual in the outer sheath."

We agree with Hansen & Wunderlin (1988) that "*Dichanthelium* is as 'good' a grass genus as many others (e.g. *Brachiaria*, *Sacciolepis*, and many more in other tribes)." Despite arguments to the contrary, there is little doubt that *Dichanthelium* is a natural group. Zuloaga, Ellis, and Morrone (1993) argue against the recognition of *Dichanthelium* as a genus, preferring to treat it as a subgenus under *Panicum*. They state, however, "within *Panicum*, *Dichanthelium* can be distinguished at the subgeneric level by the following set of characters: lax inflorescences; ellipsoid to obovoid spikelets; upper glume and lower lemma usually 7-11 nerved; upper anthecium apiculate or shortly crested, and simple papillae on the lemma and palea. Anatomically, all species are non-Kranz or C_3, with the outer parenchymatous sheath lacking specialized chloroplasts", etc. The argument that *Phanopyrum* also has C_3 photosynthesis does not materially affect the issue of the taxonomic rank at which to recognize the groups.

We also agree with Hansen & Wunderlin (1988) that "the acceptance of *Dichanthelium* provides a more consistent generic classification." It offers conveniences, as well, in our area, where *Dichanthelium* and *Panicum* are readily distinguishable from each other, and the combined genus would be very large, indeed. References: Lelong (1986)=Z; Zuloaga & Morrone (1996)=Y; Freckmann & Lelong in FNA (2003a); Haines (2010)=X.

1 Spikelets tuberculate.
  2 Lower lemmas tuberculate-hispid; spikelets 3.2-4.0 mm long; [of dry to mesic prairies and pinelands]..... ***P. brachyanthum***
  2 Lower lemmas warty; spikelets 1.7-2.2 mm long; [of wetlands]..... ***P. verrucosum***

1 Spikelets smooth, not tuberculate.
3 Panicle < 2 cm wide at maturity.
4 Spikelets > 4.5 mm long; first glume > 2.4 mm long; ligule 4-6 mm long; [of coastal dunes]; [subgenus *Panicum*, section *Repentia*] ..... ***P. amarum* *var.* *amarum***
4 Spikelets < 4 mm long; first glume < 2.1 mm long; ligule < 2 mm long; [not of coastal dunes].
5 Blades involute, 1.5-4 mm wide; culms wiry ..... [see ***Coleataenia***]
5 Blades flat, the larger 6-20 mm wide; culms stout.
6 Panicles constricted, 0.3-1.6 cm wide; spikelets subsessile to short-pediceled; summit of fertile palea not enclosed by fertile lemma ..... ***P. hemitomon***
6 Panicles > 1 cm wide; spikelets short to long-pediceled; summit of fertile palea enclosed by fertile lemma ..... [see ***Coleataenia***]
3 Panicle > 2 cm wide at maturity.
7 Lower primary panicle branches in whorls of 4-7 at the nodes, stiffly spreading, naked on the proximal ½, the axils strongly pilose; lower culm internodes appressed papillose-pubescent; first glume acuminate, ½ as long as spikelet; fertile lemma chestnut brown at maturity ..... ***P. bergii***
7 Plants without the above combination of characters.
8 Plants from a cluster of fibrous roots, without rhizomes or hard knotty crowns, annual.
9 First glume 1/5 to 1/4 length of spikelet, broadly rounded to truncate; sheaths usually glabrous; nodes glabrous; [subgenus *Panicum*, section *Dichotomiflora*]
10 Spikelets oblong-lanceolate, (2.0-) 2.4-3.6 mm long, widest below middle, tapering to acuminate tips, second glume and sterile lemma firm, subcoriaceous; most pedicels < 3 mm long and shorter than spikelets..... ***P. dichotomiflorum* *var.* *dichotomiflorum***
10 Spikelets ovoid to slenderly ellipsoid, 1.6-2.3 mm long, widest at middle with acute tips, second glume and sterile lemma thin, submembraneous; some to many pedicels > 3 mm long and longer than spikelets ..... ***P. dichotomiflorum* *var.* *puritanorum***
9 First glume 1/3 to 1/2 length of spikelet, acute to subacute; sheaths villous or hispid; nodes often bearded; [subgenus *Panicum*, section *Panicum*].
11 Spikelets 4.5-6 mm long; panicle branches often nodding or drooping at maturity ..... ***P. miliaceum***
11 Spikelets 1.8-3.6 mm long; panicle branches ascending-spreading at maturity.
12 Spikelets long-acuminate, (2.6-)3.0-3.6 mm long; mature panicle slender, usually 2-3 times as long as wide ..... ***P. flexile***
12 Spikelets short-pointed to acuminate, 1.8-2.5 (-2.8) mm long; mature panicle usually > ½ as wide to wider than long.
13 Sheaths glabrous except for the short-ciliate margins; culm nodes and internodes glabrous ..... ***P. bisulcatum***
13 Sheaths hispid to villous; culm nodes usually pubescent to bearded, internodes hispid to glabrous.
14 Panicle usually equal to or longer than culm; largest blades usually 10-20 mm wide; spikelets acuminate, lanceolate to lance-ovoid ..... ***P. capillare***
14 Panicle usually not as long as culm; largest blades usually 10 mm or less wide; spikelets short-pointed, ellipsoid, ovoid, or obovoid.
15 Herbage purple-tinged; blades 2-6 mm wide, ascending; pulvini glabrous to sparsely pilose; spikelets 1.8-2.2 mm long, > 2× as long as wide; mature fertile lemma blackish ..... ***P. lithophilum***
15 Herbage yellow-green to green; blades 2-12 mm wide, spreading; pulvini glabrous or pilose; spikelets 1.4-2.4 mm long, < 2× as long as wide; mature fertile lemma straminous.
16 Culm blades 5-12 mm wide; blade of flag (inflorescence bract) usually > ½ as long as panicle; panicle ellipsoid to obovoid; pulvini glabrous; secondary panicle branches and pedicels divergent; spikelets 1.9-2.4 mm long ..... ***P. gattingeri***
16 Culm blades 2-6 mm wide; blade of flag usually < ½ as long as panicle; panicle broadly ovoid to deltoid; pulvini pilose; secondary panicle branches and pedicels appressed; spikelets 1.4-2.1 mm long ..... ***P. philadelphicum***
8 Plants with rhizomes or hard knotty crowns, perennial.
17 Plants with hard crowns, lacking rhizomes; fertile lemma 1.2-1.6 mm long ..... [see ***Coleataenia***]
17 Plants with rhizomes; fertile lemma 1.6-4 mm long.
18 Rhizomes about 1 cm thick with pubescent scale-like leaves; lower portion of culm hard, nearly woody ..... ***P. antidotale***
18 Rhizomes less than 1 cm thick with glabrous scale-like leaves; culms not woody.
19 First glume truncate apically ..... ***P. repens***
19 First glume acute to obtuse.
20 Culms slightly compressed below; ligules 0.5 mm long or less; spikelets subsessile and subsecund, usually some obliquely bent above the first glume; fertile lemma 1.8-2.2 mm long ..... [see ***Coleataenia***]
20 Culms terete; ligules 1-6 mm long; spikelets pediceled and not at all secund, essentially straight; fertile lemma 2-4 mm long; (subgenus *Panicum*, section *Repentia*].
21 Panicle narrow, the branches erect; sheaths longer than internodes; spikelets 4.3-7.7 mm long; fertile lemma 3-4 mm long.
22 Rhizomes usually elongate; culms solitary to loosely tufted, 0.2-1.5 m tall; leaves 0.7-3.6 dm long; panicles 2-6 cm wide, the primary branches usually 1-2 per node, loosely flowered; spikelets 4.7-7.7 mm long; first glumes 2.5-5.5 mm long, ⅔-¾ as long as the spikelet, 7-9 nerved, the nerves thickened and raised; fertile lemma 1.3-1.8 mm wide ..... ***P. amarum* *var.* *amarum***
22 Rhizomes usually short; culms usually tufted, 1-2 (-3) m tall; leaves 2-5 dm long; panicles 3-10 cm wide, the primary branches usually 2 or more per node, densely flowered; spikelets 4.0-5.9 mm llong; first glumes 2-3.5 mm long, ½-⅔ as long as the spikelet, 3-5 (-7) nerved, the nerves thin and wiry; fertile lemma 1.0-1.5 mm wide ..... ***P. amarum* *var.* *amarulum***
21 Panicle with divergent to spreading-ascending branches; upper sheaths shorter than internodes; spikelets 2.8-5 mm long; fertile lemma 2-2.6 mm long.
23 Spikelets 2.8-3.5 mm long; first glume ½ length of spikelet, blunt to acute ..... ***P. virgatum* *var.* *cubense***
23 Spikelets 3.2-5 mm long; first glume b length of spikelet, acuminate.
24 Rhizomes short, densely interlocking, culms subascending at base, densely clumped ..... ***[P. virgatum* *var.* *spissum]***
24 Rhizomes elongate, or if short, then culms horizontally divergent at base, loosely clumped ..... ***P. virgatum* *var.* *virgatum***

Panicum amarum Elliott *var.* ***amarulum*** (A.S. Hitchcock & Chase) P.G. Palmer, Southern Seabeach Grass. Cp (DE, FL, GA, NC, SC, VA), Mt* (WV*): coastal dunes and shores, sandflats, and sandhills; common (uncommon in WV, rare in FL, GA, NC, SC, VA). July-November. NJ s. to FL and West Indies, w. to TX and Mexico; restricted to the Coastal Plain except for WV (where apparently introduced). Although well-marked individuals of var. *amarulum* and var. *amarum* are quite distinctive, only the number and structure of first glume nerves appears to be a constant over the range of the two taxa (Palmer 1975). Primarily a coastal plant, var. *amarulum* has been found in the Sandhills of NC (Richmond Co.). Blomquist 1948 says this taxon "does not seem to grow naturally in North Carolina." [= K, Z; = *P. amarulum* A.S. Hitchcock & Chase – RAB, C, F, G, HC, S, WV; = *P. amarum* ssp. *amarulum* (A.S. Hitchcock & Chase) Freckmann & Lelong – FNA; not ***Panicum***]

Panicum amarum Elliott *var.* ***amarum***, Bitter Seabeach Grass. Cp (DE, FL, GA, NC, SC, VA): coastal dunes and shores; common. August-November. CT s. to FL, w. to TX; restricted to the coast. See note under var. *amarulum*. [= K, Z; = *P. amarum* – RAB, C, F, G, HC, S; = *P. amarum* ssp. *amarum* – FNA; not ***Panicum***]

* ***Panicum antidotale*** Retzius, Blue Panic Grass. Cp (NC?, SC): open, disturbed areas and fields; rare, native of India and c. Asia. Reported for NC and SC (FNA, Kartesz 1999). Established in NC, SC; AL; TX west to CA. [= FNA, HC, K; not ***Panicum***]

* ***Panicum bergii*** Arechavaleta, Berg's Panic Grass. Cp (GA): ditches and shallow, sporadically flooded depressions in grasslands; rare, native of South America. Reported for sc. GA (HC), AL (Kartesz 1999), and se. TX. [= FNA, HC, K, S; > *P. pilcomayense* Hackel; ***Panicum*** s.s.]

* ***Panicum bisulcatum*** Thunberg, Blackseed Panic Grass. Cp (GA, SC): wet, disturbed, open areas; rare, native of Asia. Reported introduction in SC, GA, and PA (Kartesz 1999), and as a ballast plant for se. PA (Philadelphia) (Rhoads & Klein 1993, as *P. acroanthum* Steudel). [= FNA, K; > *P. acroanthum* Steudel]

Panicum brachyanthum Steudel, Prairie Panic Grass. Cp (GA): prairies and pinelands; rare. W. LA, AR, OK, and e. TX; disjunct eastward in sc. MS and sw. GA. [= FNA, HC, K]

Panicum capillare Linnaeus, Old-witch Grass, Tumbleweed, Tickle Grass. Mt (GA, NC, SC, VA, WV), Pd (DE, GA, NC, SC, VA), Cp (DE, FL, VA): open sandy or stony soil, fields, roadsides, waste places, often weedy in cultivated soil; common (rare in SC). August-November. E. to c. Canada, s. to FL and TX; Bermuda. Plants formerly known as *P. capillare* var. *occidentale* Rydberg, ranging from Canada south to NJ, WV, KY, TX, and CA, are distinguished by long-acuminate spikelets 2.5-4 mm long that are mostly subsessile or short-pedicelled. In our region, *P. capillare* has short-acuminate spikelets 1.8-2.8 mm long, mostly on long pedicels. [= RAB, K, S, WV, Z; < *P. capillare* – C, Y (also see *P. gattingeri*); > *P. capillare* var. *capillare* – F, HC, W; = *P. capillare* ssp. *capillare* – FNA; = *P. capillare* var. *agreste* Gattinger – G; ***Panicum*** s.s.]

Panicum dichotomiflorum Michaux *var.* ***dichotomiflorum***, Spreading Panic Grass, Fall Panic Grass. Mt (GA, NC, SC, VA, WV), Pd (DE, GA, NC, SC, VA), Cp (DE, FL, GA, NC, SC, VA): marshy shores, exposed wet soils, alluvial deposits in floodplain forests, spoil banks, ditches; common. July-October. E. Canada west to BC, south to FL and TX; also in the Bahamas (Sorrie & LeBlond 1997). Plants with geniculate bases, enlarged lower nodes and sheaths, and panicles with included peduncles and divergent branches have been recognized as var. *geniculatum* (A. Wood) Fernald. [= K; < *P. dichotomiflorum* – RAB, GW, S, WV, Z; > *P. dichotomiflorum* var. *geniculatum* (Wood) Fernald – F, G, W; > *P. dichotomiflorum* var. *dichotomiflorum* – F, G, W; = *P. dichotomiflorum* ssp. *dichotomiflorum* – FNA; < *P. dichotomiflorum* var. *dichotomiflorum* – HC; ***Panicum*** s.s.]

Panicum dichotomiflorum Michaux *var.* ***puritanorum*** Svenson, Puritan Panic Grass. Cp (DE, VA): wet sands and peats of seasonally exposed pond and lake shores; rare. July-October. NS, NH, and NY south to DE (Sorrie & LeBlond 2008) and VA; IN and IL. Plants from DE northward typically have slender culms 0.3-6 dm long and leaves 1-8 mm wide. Plants with floral characters of var. *puritanorum* but with nominate-like stout culms 0.8-2 m long and leaves 7-25 mm wide occur in bottomlands in se. VA, and have been recognized as *P. dichotomiflorum* var. *imperiorum* Fernald. For the time being they are placed here based on floral characters (they will key here), but need further study. [= F, G, K; < *P. dichotomiflorum* – C; > *P. dichotomiflorum* var. *imperiorum* Fernald – F; = *P. dichotomiflorum* ssp. *puritanorum* (Svenson) Freckmann & Lelong – FNA; > *P. dichotomiflorum* var. *puritanorum* – HC; ***Panicum*** s.s.]

Panicum flexile (Gattinger) Scribner, Wiry Panic Grass. Pd (GA, NC, SC, VA), Mt (GA, NC, VA, WV), Cp (FL): glades and openings over mafic rocks, damp sandy meadows, open woods; rare. July-October. NY, sw. QC, S. ON, and ND south to FL and TX. First reported for SC by Nelson & Kelly (1997). [= RAB, C, F, FNA, G, HC, K, S, W, WV, Y, Z; ***Panicum*** s.s.]

Panicum gattingeri Nash, Gattinger's Panic Grass. Mt (NC, VA, WV), Pd (NC, VA), {GA}: damp or dry, usually calcareous sandy soils of fields, roadsides, shores, and cultivated ground; common in Mountains, uncommon in Piedmont (rare in VA). August-October. NY, sw. QC, and MN south to NC, TN, GA, AL, and AR. [= RAB, F, HC, K, S, WV; < *P. capillare* – C, Y; = *P. philadelphicum* Bernhardi ex Trinius ssp. *gattingeri* (Nash) Freckmann & Lelong – FNA; = *P. capillare* Linnaeus var. *campestre* Gattinger – G, W; = *P. philadelphicum* var. *campestre* (Gattinger) A. Haines – X; ***Panicum*** s.s.]

Panicum hemitomon J.A. Schultes, Maidencane. Cp (DE, FL, GA, NC, SC, VA), Mt (VA): lake, pond, and river shores, swamp borders, marshes, ditches, often in shallow water; common (rare in VA). June-July. Coastal Plain from s. NJ south to FL, west to TX; also TN; South America. Often forming dense colonies in the low margin and shallow waters of limesink ponds. [= RAB, C, F, FNA, G, GW, HC, K, S, W, Z; not ***Panicum***]

Panicum lithophilum Swallen, Flatrock Panic Grass. Pd (GA, NC, SC), Mt (NC): soil islands on granitic flatrocks and domes; rare. August-October. Restricted to granite outcrops in NC, SC, and ec. GA. There is some question about the distinctness of this taxon from *P. philadelphicum*; Zuloaga & Morrone (1996) did not consider it separable from *P. philadelphicum*. [= RAB, HC, K; = *P. philadelphicum* Bernhardi ex Trinius ssp. *lithophilum* (Swallen) Freckmann & Lelong – FNA; < *P. capillare* Linnaeus var. *sylvaticum* Torrey – W; < *P. philadelphicum* – Y; ***Panicum*** s.s.]

* ***Panicum miliaceum*** Linnaeus *ssp.* ***miliaceum***, Broomcorn Millet, Proso Millet, Hog Millet. Cp (FL, NC), Mt (VA), Pd (DE, VA): planted in wildlife food plots, sometimes persistent or self-sowing; uncommon (rare in FL, NC, and VA), introduced, native of Eurasia. July-October. [= C, FNA, K; < *P. miliaceum* – F, G, HC, S, Y; ***Panicum*** s.s.]

Panicum philadelphicum Bernhardi ex Trinius, Woodland Panic Grass. Pd (DE, GA, NC, SC, VA), Mt (GA, NC, SC, VA, WV), Cp (DE, VA): glades, barrens, desiccated pondshores, riversides, or other rocky or dry sandy soil of open woods and roadsides; common (uncommon in WV, rare in DE and SC). NS west to WI, south to GA and e. TX. Plants formerly known as *P. tuckermanii* Fernald, ranging from se. Canada south to n. VA and OH, are distinguished by included or short-exerted

peduncles less than one-third as long as the panicles. [= RAB, C, G, K, S, WV; > *P. philadelphicum* – F, HC; > *P. tuckermanii* Fernald – F, HC; = *P. philadelphicum* Bernhardi ex Trinius ssp. *philadelphicum* – FNA; < *P. capillare* Linnaeus var. *sylvaticum* Torrey – W; < *P. philadelphicum* – Y (also see *P. lithophilum*); = *P. philadelphicum* var. *philadelphicum* – X; ***Panicum*** s.s.]

* ***Panicum repens*** Linnaeus, Torpedo Grass. Cp (FL, GA, NC, SC): ditches, roadbanks, disturbed coastal sands, in areas where ship's ballast was deposited; common (uncommon in GA, rare north of GA), native of Europe. First reported for NC by Leonard (1971b); reported for numerous counties in the GA Coastal Plain (Carter, Baker, & Morris 2009). [= FNA, GW, HC, K, S; ***Panicum*** s.s.]

Panicum verrucosum Muhlenberg, Warty Panic Grass. Cp (DE, FL, GA, NC, SC, VA), Pd (GA, NC, SC, VA), Mt (GA, NC, SC, VA, WV): wet pinelands, marshes, shores, ditches; common (uncommon in Piedmont, rare in Mountains). August-October. MA and PA west to MI and IN, south to FL and se. TX. Spikelets deep green, the warty surface unique among *Panicum* in our region. [= RAB, C, F, FNA, G, GW, HC, K, S, W, Z; not ***Panicum***]

Panicum virgatum Linnaeus *var.* ***cubense*** Grisebach, Blunt Panic Grass. Cp (DE, FL, GA, NC, SC, VA?): wet to dry sandy pinelands; uncommon. June-October. Coastal Plain from MA to FL, west to MS; also in MI; West Indies. [= F, HC, S; < *P. virgatum* – RAB, C, FNA, G, GW, W, Z; < *P. virgatum* var. *virgatum* – K]

Panicum virgatum Linnaeus *var.* ***spissum*** Linder, Tufted Switchgrass. Cp (DE): gravelly or sandy fresh to brackish shores and swamps; rare. E. Canada south to PA, MD, and DE (Kartesz 1999). [= F, HC, K; < *P. virgatum* – C, FNA, G; not ***Panicum***]

Panicum virgatum Linnaeus *var.* ***virgatum***, Switchgrass. Cp (DE, FL, GA, NC, SC, VA), Pd (GA, NC, SC, VA), Mt (GA, NC, SC, VA, WV): dry or wet sandy soils of pinelands, fresh and brackish marshes, shores; common (uncommon in Mountains). June-October. Sw. QC and ND south to FL and TX, west to NV; Bermuda; Central and South America. [= F, HC, S; < *P. virgatum* – RAB, C, FNA, G, GW, W, WV, Z; < *P. virgatum* var. *virgatum* – K; not ***Panicum***]

* *Panicum miliaceum* Linnaeus ssp. *ruderale* (Kitagawa) Tzvelev, Panic Millet. [= FNA, K; = *P. miliaceum* ssp. *spontaneum* (Kit.) Tzvelev – C; < *P. miliaceum* – F, G, HC; ***Panicum*** s.s.] {not yet keyed}

Parapholis C.E. Hubbard 1946 (Sickle Grass)

A genus of 6 species, annuals, of Eurasia. References: Worley in FNA (2007a); Tucker (1996)=Z.

* ***Parapholis incurva*** (Linnaeus) C.E. Hubbard, Sickle Grass, Hard Grass, Thin-tail. Cp (DE, NC, VA): sandy and muddy flats, brackish or salt marshes; rare, native of Europe. [= RAB, C, FNA, HC, K, Z; = *Pholiurus incurvus* (Linnaeus) Schinzius & Thellung – F, G; *? Lepturus filiformis* (Roth) Trinius]

Pascopyrum A. Löve 1980 (Wheatgrass)

A monotypic genus, perennial, of c. and w. North America. *Pascopyrum* is octoploid, derived from *Elymus* and *Leymus*. References: Barkworth in FNA (2007a).

* ***Pascopyrum smithii*** (Rydberg) A. Löve, Western Wheatgrass. Mt (GA): disturbed areas; rare. Reported for ne. GA (Rabun County) by Jones & Coile (1988), as *Agropyron smithii* Rydberg. It is also reported for TN and KY (Kartesz 1999). [= FNA, K; = *Elytrigia smithii* (Rydberg) Nevski – C; = *Agropyrum smithii* Rydberg – F, G, W]

Paspalum Linnaeus 1759 (Paspalum, Crown Grass, Beadgrass)
(by Alan S. Weakley & Richard J. LeBlond)

A genus of 300-400 species, of tropical and warm temperate regions. References: Allen & Hall in FNA (2003a); Banks (1966)=Z; Silveus (1942)=Y. Key based closely on FNA and on Banks (1966).

1 Spikelets solitary, not associated with rudimentary spikelets or naked pedicels.
  2 Panicles usually composed of a terminal pair of branches, sometimes with 1 (-5) additional branches below the terminal pair.
    3 Upper glumes pubescent on the back or margins.
      4 Spikelets 1.3-1.9 mm long; upper glumes pilose along the margins ..... ***[P. conjugatum]***
      4 Spikelets 2.4-3.2 mm long; upper glumes sparsely pubescent on the back ..... ***P. distichum***
    3 Upper glumes glabrous.
      5 Spikelets elliptic, acute or acuminate at the tip ..... ***P. vaginatum***
      5 Spikelets ovate to broadly elliptic, obtuse to broadly acute at the tip.
        6 Spikelets 1.9-2.3 mm long; leaf blades flat ..... ***P. minus***
        6 Spikelets 2.5-4.0 mm long; leaf blades flast or longitudinally folded ..... ***P. notatum***
  2 Panicles with 1-70 branches, if > 1, the branches arranged racemosely.
    7 Panicle branches 7-70, the axes extending beyond the outermost spikelets; panicle branches disarticulating at maturity ..... ***P. fluitans***
    7 Panicle branches 1-6, terminating in a spikelet; panicle branches persistent.
      8 Upper florets olive to dark brown ..... ***P. scrobiculatum***
      8 Upper florets pale to tan.
        9 Axes of panicle branches not broadly winged, 0.6-1.3 mm wide.
          10 Spikelets orbicular, 2.8-3.2 mm wide ..... ***P. laeve*** *var.* ***circulare***
          10 Spikelets slightly longer than broad, 2.0-2.5 mm wide ..... ***P. laeve*** *var.* ***laeve***
        9 Axes of panicle branches broadly winged, 1.8-3.3 mm wide.

11 Spikelets 3.2-4.0 mm long; upper lemmas with a few short hairs at their tips ..... ***P. acuminatum***
11 Spikelets 1.7-2.1 mm long; upper lemmas glabrous ..... ***P. dissectum***
1 Spikelets paired, or at least the second nonfunctional spikelet represented by a naked pedicel.
12 Spikelets 1.0-1.3 mm long ..... ***[P. paniculatum]***
12 Spikelets 1.3-4.1 mm long
13 Margins of upper glumes and lower lemmas pilose.
14 Panicle branches 2-7; spikelets 2.3-4.0 mm long ..... ***P. dilatatum***
14 Panicle branches (4-) 10-30; spikelets 1.8-2.8 mm long ..... ***P. urvillei***
13 Margins of upper glumes and lower lemmas neither ciliate-lacerate, winged, nor pilose (if pubescent, the hairs not pilose).
15 Upper florets olive to dark brown.
16 Panicle branches 10-28 (or more).
17 Plants annual; axes of panicle branches broadly winged, the wings about as wide as the central portion; [common native] ..... ***P. boscianum***
17 Plants perennial; axes of panicle branches narrowly winged, the wings narrower than the central portion; [rare exotics].
18 Axes of panicle branches 0.5-1.2 mm wide; spikelets 1.1-1.8 mm wide ..... ***P. conspersum***
18 Axes of the panicle branches 1.0-1.7 mm wide; spikelets 1.8-2.4 mm wide ..... ***P. virgatum***
16 Panicle branches 1-10 (or to 28 in *P. boscianum*, keyed under both leads).
19 Plants annual.
20 Spikelets 1.3-1.8 mm wide, broadly elliptic to orbicular, glabrous; panicles with 1-10 (-28) branches, the axes 0.7-2.3 mm wide ..... ***P. boscianum***
20 Spikelets 1.7-2.4 mm wide, broadly obovate, shortly pubescent; panicles with 1-5 branches, the axes 0.8-1.3 mm wide ..... ***[P. convexum]***
19 Plants perennial.
21 Plants cespitose, rhizomes poorly developed; culms 10-20 dm tall; panicle branches ascending, divaricate, or reflexed.
22 Leaves 7-18 mm wide ..... ***P. conspersum***
22 Leaves 2.5-4 mm wide ..... ***P. plicatulum***
21 Plants not cespitose, rhizomatous; culms 1-15 dm tall; panicle branches ascending.
23 Rhizomes long, evident ..... ***P. nicorae***
23 Rhizomes short, indistinct ..... ***P. plicatulum***
15 Upper florets white, stramineous, or golden brown.
24 Lower lemmas with well-developed cross-ribs over the veins; upper glumes absent ..... ***P. malacophyllum***
24 Lower lemmas not ribbed over the veins; upper glumes present.
25 Panicles with 15-100 branches.
26 Plants annual; upper glumes and lower lemmas rugose ..... ***[P. racemosum]***
26 Plant perennial; upper glumes and lower lemmas smooth.
27 Plant rhizomatous; panicle branch axes 0.9-1.2 mm wide; panicle branches often arcing ..... ***P. intermedium***
27 Plant cespitose; panicle branch axes 0.3-0.6 mm wide; panicle branches straight.
28 Panicle branches spreading to reflexed (rarely ascending); leaf blades 10-23 mm wide; axes of panicle branches 0.3-0.4 mm wide ..... ***P. coryphaeum***
28 Panicle branches erect to ascending; leaf blades 4.9-6.1 mm wide; axes of panicle branches 0.5-0.6 mm wide ..... ***[P. quadrifarium]***
25 Panicles with 1-15 branches.
29 Spikelets 1.3-2.5 mm long.
30 Upper glumes (and usually also the lower lemmas) shortly pubescent.
31 Lower glumes present ..... ***[P. langei]***
31 Lower glumes absent.
32 Panicles both terminal and axillary, the axillary panicles partially or completely enclosed by the subtending leaf sheath ..... **[see Key A]**
32 Panicles all terminal ..... ***P. caespitosum***
30 Upper glumes and lower lemmas glabrous.
33 Panicles both terminal and axillary, the axillary panicles partially or completely enclosed by the subtending leaf sheath ..... **[see Key A]**
33 Panicles all terminal.
34 Upper panicle branches erect ..... ***P. monostachyum***
34 Upper panicle branches spreading to ascending.
35 Upper glumes and lower lemmas 5-veined ..... ***P. caespitosum***
35 Upper glumes and lower lemmas 3-veined.
36 Lower sheaths villous or hirsute ..... ***P. praecox*** *var.* ***curtisianum***
36 Lower sheaths glabrous or sparsely papillose pubescent ..... ***P. praecox*** *var.* ***praecox***
29 Spikelets 2.5-4.1 mm long.
37 Spikelet pairs barely if at all imbricate; lower glumes usually present ..... ***P. bifidum***
37 Spikelet pairs imbricate; lower glumes absent or present.
38 Upper glumes pubescent; lower lemmas usually pubescent.
39 Lower glumes present ..... ***[P. langei]***
39 Lower glumes absent ..... ***P. pubiflorum***
38 Upper glumes glabrous; lower lemmas usually glabrous.
40 Upper florets golden brown ..... ***P. floridanum***
40 Upper florets pale to tan.
41 Terminal panicle branches erect ..... ***P. monostachyum***
41 Terminal panicle branches spreading to ascending.
42 Plants decumbent, rooting at the lower nodes; spikelets obovate to elliptic ..... ***P. pubiflorum***
42 Plants rhizomatous; spikelets orbicular to elliptic.
43 Spikelets 2.9-4.1 mm long; 1.9-3.1 mm wide, suborbicular to elliptic; upper glumes 5-veined; leaf blades flat ..... ***P. floridanum***

43 Spikelets 2.1-3.1 mm long, 2.0-2.8 mm wide, orbicular or nearly so; upper glumes 3-veined; leaf blades laterally folded.
44 Lower sheaths villous or hirsute ..... ***P. praecox*** *var.* ***curtisianum***
44 Lower sheaths glabrous or sparsely papillose pubescent ..... ***P. praecox*** *var.* ***praecox***

Key A: *Paspalum setaceum* complex
(by Richard J. LeBlond)

1 Leaves glabrous to glabrate (if glabrate, also see var. *stramineum* in couplet 8).
2 Blades crowded toward the base, often recurved, 3-8 mm wide; spikelets 1.4-1.9 mm long, usually glabrous..... ***P. setaceum*** *var.* ***longepedunculatum***
2 Blades not especially crowded toward the base, erect, ascending or spreading, 2-20 mm wide; spikelets 1.6-2.6 mm long, pubescent or glabrous.
3 Blades 3-8 mm wide; spikelets 1.6-1.9 mm long, pubescent, subacute; [of GA and FL southward]..... ***P. propinquum***
3 Blades 2-20 mm wide; spikelets 1.7-2.6 mm long (if < 2.0 then larger leaves usually > 7 mm wide), glabrous or pubescent, rounded to blunt; [plants of FL northward and westward].
4 Plants erect to spreading; blades 3-20 mm wide; spikelets 1.7-2.6 mm long; [of NJ to TX]..... ***P. setaceum*** *var.* ***ciliatifolium***
4 Plants stiffly erect; blades 2-6 mm wide; spikelets 2.0-2.6 mm long; [of GA and FL]..... ***P. setaceum*** *var.* ***rigidifolium***
1 Leaves variously pubescent.
5 Leaves villous to villous-hirsute, 2-10 mm wide; spikelets 1.3-1.9 mm long.
6 Leaves villous, 2-7 mm wide, not especially crowded toward the base, erect to spreading; [widespread]..... ***P. setaceum*** *var.* ***setaceum***
6 Leaves villous-hirsute, 3-10 mm wide, crowded toward the base, recurved; [of n. FL south to Cuba]..... ***P. setaceum*** *var.* ***villosissimum***
5 Leaves puberulent, pilose, or hirsute, 3-15 mm wide; spikelets 1.6-2.5 mm long.
7 Leaves puberulent at least distally on the adaxial surface (and often also pilose in var. *stramineum*); spikelets 1.6-2.2 mm long.
8 Plants erect to spreading; leaves puberulent and often pilose to nearly glabrous except for the puberulent distal adaxial surface; spikelets glabrous to pubescent ..... ***P. setaceum*** *var.* ***stramineum***
8 Plants spreading to prostrate; leaves densely puberulent; spikelets pubescent..... ***P. setaceum*** *var.* ***psammophilum***
7 Leaves pilose or hirsute but not puberulent; spikelets 1.8-2.5 mm long.
9 Plants mostly erect; leaves pilose; spikelets usually glabrous; sterile lemma midnerve usually present..... ***P. setaceum*** *var.* ***muhlenbergii***
9 Plants mostly widely spreading; leaves hirsute; spikelets glabrous or pubescent; sterile lemma midnerve present or absent ..... ***P. setaceum*** *var.* ***supinum***

Paspalum acuminatum Raddi, Brook Paspalum, Canoe Grass. Pd (GA): wet areas, often disturbed; rare, possibly only adventive in our area. C. GA and ne. TX south to s. FL and s. TX, south through the New World tropics to s. South America. [= FNA, HC, K]

Paspalum bifidum (Bertoloni) Nash, Pitchfork Paspalum, Pitchfork Crown Grass. Cp (FL, GA, NC, SC, VA), Pd (GA, SC): mesic to wet longleaf pine savannas and mesic swales in sandhills; uncommon (rare north of SC). August-October. Se. VA south to s. FL, west to se. MO, se. OK, and e. TX. [= RAB, C, GW, HC, K, S, Y; > *P. bifidum* var. *bifidum* – F, G; > *P. bifidum* var. *projectum* Fernald – F, G]

Paspalum boscianum Flügge, Bull Paspalum. Cp (FL, GA, NC, SC, VA), Pd (GA, NC, SC, VA), Mt (GA, SC, VA): low fields, ditches; common (uncommon in VA). July-October. MD, KY, and TX south through tropical America. [= RAB, C, F, FNA, G, GW, HC, K, S, W, Y]

Paspalum caespitosum Flügge. Cp (AL, FL): pinelands, hammocks; rare. S. AL and n. FL south to s. FL; West Indies, Mexico and Central America. [= FNA, GW, HC, K, S]

Paspalum conjugatum Bergius, Sour Paspalum. Cp (AL, FL, LA, MS): disturbed areas, forest edges; uncommon. Ne. FL, FL Panhandle, and s. AL west to e. TX, south in the New World tropics; Old World tropics. [= FNA, HC, K, S] {synonymy incomplete}

* ***Paspalum conspersum*** Schrad., Scattered Paspalum. Cp (GA): roadsides, other disturbed areas; rare, native of Mexico south to South America. [= FNA] {synonymy incomplete}

* ***Paspalum coryphaeum*** Trinius, Emperor Crown-grass. Cp (FL), Pd (NC): disturbed areas; rare, native of South America. [= FNA, K] {synonymy incomplete}

* ***Paspalum dilatatum*** Poiret *ssp.* ***dilatatum***, Dallis Grass. Cp (DE, FL, GA, NC, SC, VA), Pd (GA, NC, SC, VA), Mt (GA, NC, SC, VA, WV): roadsides, fields, disturbed areas; common (uncommon in DE, rare in WV), native of tropical America. May-October. Other subspecies occur in the native range in South America. [< *P. dilatatum* – RAB, C, F, FNA, G, GW, HC, K, S, W, Y]

Paspalum dissectum (Linnaeus) Linnaeus, Mudbank Crown Grass, Walter Paspalum. Cp (DE, GA, NC, SC, VA), Pd (NC, SC), Mt (VA): mud flats, drawdown zones; uncommon (rare in NC, SC, and VA). September. NJ, IL, and KS south to s. FL and e. TX; Cuba. [= RAB, C, F, FNA, G, GW, HC, K, S, Y]

Paspalum distichum Linnaeus, Joint Paspalum, Knotgrass. Cp (GA, NC, SC, VA), Pd (GA, NC, SC), Mt (NC): brackish and freshwater marshes; uncommon (rare in VA). June-August. NJ, KS, and WA south to s. FL, s. TX, s. CA and through the New World and Old World tropics. [= RAB, C, F, FNA, G, HC, K, S, W, Y; < *P. distichum* – GW (also see *P. vaginatum*); = *P. paspaloides* (Michaux) Scribner]

Paspalum floridanum Michaux, Florida Paspalum. Cp (DE, FL, GA, NC, SC, VA), Pd (GA, NC, SC, VA), Mt (GA, NC, SC, VA): wet forests, pine savannas; common (rare in Mountains). August-October. NJ, IL, and KS south to s. FL and e. TX. [= RAB, C, FNA, GW, K, W; > *P. floridanum* – G; > *P. difforme* Le Conte – G, HC, S, Y; > *P. floridanum* var. *floridanum* – F, HC, S, Y; > *P. floridanum* var. *glabratum* Engelmann ex Vasey – F, HC, S, Y; > *P. giganteum* Baldwin ex Vasey – HC, S, Y]

Paspalum fluitans (Elliott) Kunth, Water Paspalum, Horsetail Crown Grass. Cp (GA, NC, SC, VA), Pd (NC, VA), Mt (WV): mucky soils in swamp forests, moist riverbanks; uncommon (rare in WV). October. MD, IL, and KS south to s. FL and s. TX, and south through tropical America to c. South America. [= RAB, C, F, G, HC, K; = *P. repens* P.J. Bergius – FNA, GW, S, Y]

* ***Paspalum intermedium*** Munro ex Morong. Cp (GA): drainage canals; rare, native of South America. Escaped in sc. GA (Tift County, where growing along drainage canals in Tifton) (Jones & Coile 1988). [= FNA, HC, K]

Paspalum laeve Michaux *var.* ***circulare*** (Nash) Stone. Mt (WV), {FL?, GA, NC, VA}: {need additional herbarium work to fully determine range and abundance of varieties} June-August. [= F; < *P. laeve* – RAB, C, FNA, G, GW, K, W; = *P. circulare* Nash – HC, S, WV, Y]

Paspalum laeve Michaux *var.* ***laeve***. Cp (FL, GA, NC, SC, VA), Pd (GA, NC, SC, VA), Mt (GA, NC, SC, VA, WV): forest edges and disturbed areas; common. {need additional herbarium work to fully determine range and abundance of varieties} June-August. Overall distribution of *P. laeve* s.l.: MA, NY, MI, and KS south to s. FL and e. TX. [< *P. laeve* – RAB, C, FNA, G, GW, K, W; > *P. laeve* var. *laeve* – F; > *P. laeve* var. *pilosum* Scribner – F; > *P. laeve* – HC, S, WV, Y; > *P. longipilum* Nash – HC, S, WV, Y]

Paspalum langei (E. Fournier) Nash, Rustyseed Paspalum. Cp (FL, LA): calcareous hardwood hammocks; rare. N. peninsular FL (Alachua County) and Panhandle FL (Jackson County) west to se. TX, and south through the New World tropics to South America. [= FNA, K; ? *P. botteri* (E. Fournier) Chase] {synonymy incomplete}

* ***Paspalum malacophyllum*** Trinius, Ribbed Paspalum. Cp (GA): old fields, disturbed areas; rare, native of Mexico to South America. [= FNA, HC]

Paspalum minus E. Fournier, Matted Paspalum. Cp (AL, FL, LA, MS): disturbed areas; uncommon. FL Panhandle (Escambia County) and s. AL west to e. TX. [= FNA, K] {synonymy incomplete}

Paspalum monostachyum Vasey, Gulfdune Paspalum. Cp (MS): coastal dunes, wet prairies; rare. S. FL peninsula; s. MS; sw. LA west to TX and Tamaulipas. [= FNA, HC, K, S] {synonymy incomplete}

* ***Paspalum nicorae*** Parodi, Brunswickgrass. Cp (GA): disturbed areas; rare, native of Brazil. Also reported for peninsular FL (Wunderlin & Hansen 2006). [= FNA, HC, K]

* ***Paspalum notatum*** Flügge, Bahia Grass. Cp (FL, GA, NC, SC, VA), Pd (GA, SC, VA), Mt (GA): roadsides and disturbed areas, sometimes planted as a coarse turfgrass or a pasture grass; common (uncommon north of FL, rare in VA Piedmont, native of tropical America. June-October. [= FNA, G, GW, Y; > *P. notatum* var. *notatum* – HC, K; > *P. notatum* Flügge var. *saurae* Parodi – RAB, HC, K]

Paspalum plicatulum Michaux, Brownseed Paspalum. Cp (FL, GA, SC): pine savannas, fields; common (uncommon south of FL). May-July. Se. SC south to s. FL, west to s. TX, and south through tropical America to s. South America. [= RAB, FNA, GW, HC, K, S, Y]

Paspalum praecox Walter *var.* ***curtisianum*** (Steudel) Vasey, Curtis's Crown Grass. Cp (FL, GA, NC, SC, VA): pine savannas; rare (NC Watch List, VA Rare). June-October. NC south to s. FL, west to e. TX. The variety was named for the Rev. Moses Ashley Curtis (of Hillsborough, NC), not Allen Hiram Curtiss (of Jacksonville, FL); the correct spelling of the epithet is therefore "*curtisianum*." [= RAB, F, G; = *P. praecox* var. *curtissianum* – C, orthographic error; < *P. praecox* – FNA, GW, K; = *P. lentiferum* Lamarck – HC, S, Y]

Paspalum praecox Walter *var.* ***praecox***, Early Crown Grass. Cp (FL, GA, NC, SC): pine savannas; common (rare north of FL) (NC Watch List). May-July. [= RAB, C, F, G; < *P. praecox* – FNA, GW, K; = *P. praecox* – HC, S, Y]

Paspalum propinquum Nash. Cp (FL, GA): {habitat}; uncommon. June-September. GA and FL. [= HC, S; < *P. setaceum* – K]

Paspalum pubiflorum Ruprecht *var.* ***glabrum*** Vasey, Hairyseed Crown Grass. Mt (GA, NC, VA, WV), Pd (DE, GA, NC, VA), Cp (FL, SC, VA): disturbed areas; uncommon (rare in DE, FL, and WV). September-October. PA west to KS and CO, south to FL and s. TX and Mexico; Cuba. [= C, F, G, HC, S, Y; < *P. pubiflorum* – RAB, FNA, GW, K, W]

* ***Paspalum scrobiculatum*** Linnaeus, Indian Paspalum. Cp (GA): disturbed areas; rare, native of India. [= FNA, HC, K]

Paspalum setaceum Michaux *var.* ***ciliatifolium*** (Michaux) Vasey. Cp (FL, GA, NC, SC, VA), Pd (GA, NC, SC, VA), Mt (GA, NC, SC, VA): dry open areas and woodlands, disturbed areas; common. June-September. S. NJ south to s. FL, west to e. TX, interior to s. WV, se. KY, e. TN, n. AL, n. MS, c. AR, and e. OK. [= FNA, Z; < *P. setaceum* – RAB, GW, K, W; < *P. setaceum* var. *ciliatifolium* – C (also see var. *longepedunculatum*); = *P. ciliatifolium* Michaux var. *ciliatifolium* – F, G; = *P. ciliatifolium* Michaux – HC, S, WV, Y]

Paspalum setaceum Michaux *var.* ***longepedunculatum*** (LeConte) A. Wood. Cp (FL, GA, NC, SC): pine flatwoods and pine savannas; rare. June-September. Se. NC south to s. FL, west to s. MS. [= F, FNA, Z; < *P. setaceum* – RAB, GW, K, W; < *P. setaceum* var. *ciliatifolium* – C; = *P. longepedunculatum* LeConte – G, HC, S, Y]

Paspalum setaceum Michaux *var.* ***muhlenbergii*** (Nash) Fernald. Mt (GA, NC, SC, VA), Pd (GA, NC, SC, VA), Cp (DE, FL, GA, NC, SC, VA): dry or moist soils; common. June-September. NH west to MI, c. IL, s. IA, and c. KS, south to n. FL, s.AL, s. MS, s. LA, and c. TX. [= C, FNA, Z; < *P. setaceum* – RAB, GW, K, W; > *P. setaceum* var. *calvescens* Fernald – F; > *P. ciliatifolium* Michaux var. *muhlenbergii* (Nash) Fernald – F; = *P. ciliatifolium* Michaux var. *muhlenbergii* (Nash) Fernald – G; = *P. pubescens* Muhlenberg ex Willdenow – HC, S, WV, Y]

Paspalum setaceum Michaux *var.* ***psammophilum*** (Nash) D. Banks. Cp? (VA?): maritime grasslands, sandy disturbed areas; rare. June-September. MA south to DC (VA?) in the Coastal Plain. [= C, FNA, Z; < *P. setaceum* – K; = *P. psammophilum* Nash – F, G, HC, Y]

Paspalum setaceum Michaux *var.* ***rigidifolium*** (Nash) D. Banks. Cp (FL, GA, NC?, SC?): sandhills; rare. June-September. Ne. GA, immediately adjacent to SC (and reported for NC by HC) south to s. FL; Cuba. [= FNA, Z; < *P. setaceum* – RAB, GW, K, W; = *P. rigidifolium* Nash – HC, S, Y]

Paspalum setaceum Michaux *var.* ***setaceum***, Thin Paspalum. Cp (DE, FL, GA, NC, SC, VA), Pd (GA, NC, SC, VA), Mt (GA, NC, SC, VA, WV): sandhills, savannas, dry soils; common (uncommon in Piedmont and Mountains, uncommon in DE). June-September. MA and CT south to s. FL, west to e. TX, inland to w. VA, s. WV, s. MO and AR; Cuba. [= C, FNA, Z; < *P. setaceum* – RAB, GW, K, W; > *P. setaceum* – G, HC, S, WV, Y; > *P. debile* Michaux – F, HC, S, Y; > *P. setaceum* var. *setaceum* – F]

Paspalum setaceum Michaux *var.* ***stramineum*** (Nash) D. Banks, Yellow Sand Paspalum. Cp (FL, GA, NC): dry sandy soils; rare. June-September. MI west to MT, south to LA, and NM; scattered eastwards, especially near the coast, perhaps at least in part as introductions. [= C, FNA, Z; < *P. setaceum* – RAB, GW, K, W; = *P. ciliatifolium* Michaux var. *stramineum* (Nash) Fernald – F, G; = *P. stramineum* Nash – HC, Y]

Paspalum setaceum Michaux *var.* ***supinum*** (Bosc ex Poiret) Trinius. Cp (FL, GA, NC, SC, VA?): sandy soils, old fields; uncommon. June-September. E. NC (e. VA?) south to s. FL, west to s. MS. Also reported for the Coastal Plain of Virginia by Tatnall (1946); needing confirmation of the specimen identification. [= F, FNA, Z; < *P. setaceum* – RAB, GW, K, W; = *P. supinum* Bosc ex Poiret – HC, S]

Paspalum setaceum Michaux *var.* ***villosissimum*** (Nash) D. Banks. Cp (FL): sandy pine flatwoods and fields; uncommon. N. FL (very near GA) south to s. FL; Cuba. [= FNA, Z; < *P. setaceum* – GW, K; < *P. debile* Michaux – HC; = *P. villosissimum* Nash – S]

* ***Paspalum urvillei*** Steudel, Vasey Grass. Cp (FL, GA, NC, SC, VA), Pd (GA, NC, SC, VA): roadsides, fields, and disturbed areas; common, native of South America. May-July. [= RAB, C, F, FNA, G, GW, HC, K, S, Y]

Paspalum vaginatum Swartz, Sand Knotgrass, Seashore Crown Grass. Cp (FL, GA, NC, SC), Pd (NC): brackish marshes, rarely inland in disturbed places; rare. July. NC south to s. FL, west to s. TX, southward through the New World tropics; Old World tropics. [= RAB, FNA, HC, K, S, Y; < *P. distichum* – GW]

* ***Paspalum virgatum*** Linnaeus, Talquezal. Cp (GA): disturbed areas; rare, native of Mexico, Central America, and South America. [= FNA, K] {synonymy incomplete}

* *Paspalum convexum* Flügge, Mexican Paspalum. Disturbed areas. MS, LA, and e. TX, native of tropical America. [= FNA, K] {synonymy incomplete}

Paspalum denticulatum Trinius. Cp (AL): wet disturbed areas; rare. FL, AL, LA, TX southward. {synonymy incomplete; not yet keyed}

* *Paspalum paniculatum* Linnaeus, Arrocillo. Disturbed areas, native of tropical America. Ec. MS and sw. FL. [= FNA, K] {synonymy incomplete}

* *Paspalum quadrifarium* Lamarck, Tussock Paspalum. Disturbed areas. S. MS. Native of South America. [= FNA] {synonymy incomplete}

* *Paspalum racemosum* Lamarck, Peruvian Paspalum. Disturbed areas. MS and other widely scattered localities in North America, native of n. South America. [= FNA, K] {synonymy incomplete}

Pennisetum L.C. Richard ex Persoon 1805

A genus of 80-130 species, perennials and annuals, mainly of the tropics and subtropics. References: Wipff in FNA (2003a). Key adapted from FNA.

1 Primary bristles (immediately subtending each spikelet) scabrous.
  2 Panicles with 9-16 fascicles per cm of length; plants 0.3-1.2 m tall.....***P. alopecuroides***
  2 Panicles with 30-40 fascicles per cm of length; plants 2-8 m tall.....***P. purpureum***
1 Primary bristles conspicuously long-ciliate.
  3 Spikelets 9-12 mm long.....***P. villosum***
  3 Spikelets 2.5-7 mm long.
    4 Fascicles not disarticulating from the rachises; fascicles 33-160 per cm of inflorescence; panicles 4-200 cm long; leaves 7-70 mm wide.....***P. glaucum***
    4 Fascicles disarticulating from the rachises at maturity; fascicles 8-37 per cm of inflorescence; panicles 2-32 cm long; leaves 2-13 mm wide.
      5 Spikelets 4.5-7 mm long; leaves 2-3.5 mm wide, folded or conduplicate and superficially appearing even narrower; rachis pubescent.....***P. setaceum***
      5 Spikelets 2.5-5.6 mm long; leaves 2-13 mm wide, flat; rachis scabrous.
        6 Inner bristles fused for < ¼ of their length; many outer bristles exceeding the spikelets; terminal bristles 10.5-23 mm long, noticeably longer than the other bristles in the fascicle.....***P. ciliare***
        6 Inner bristles fused for ⅓-½ of their length; outer bristles not exceeding the spikelets; terminal bristles 2.9-6.5 mm long, usually not noticeably exceeding the other bristles in the fascicle.....***P. setigerum***

* ***Pennisetum alopecuroides*** (Linnaeus) Sprengel, Chinese Fountaingrass. Cp (DE), Pd (DE, VA), Mt (VA): disturbed areas; rare, native of e. Asia. [= FNA, HC, K]

* ***Pennisetum ciliare*** (Linnaeus) Link, Buffelgrass. Cp (FL): disturbed areasl rare, native of Africa. Known in our area from ne. FL, s. AL, e. TN, and ec. MS. [= FNA, HC; = *P. ciliare* var. *ciliare* – K; = *Cenchrus ciliaris* Linnaeus]

* ***Pennisetum glaucum*** (Linnaeus) R. Brown, Pearl Millet. Cp (FL), Mt (VA, WV), Pd (VA), {GA, NC, SC}: disturbed areas; common, native of the Old World. [= RAB, FNA, HC, K, WH; ? *Chaetochloa lutescens* (Weigel) Stuntz – S; = *Setaria glauca* (Linnaeus) Palisot de Beauvois – WV]

* ***Pennisetum purpureum*** Schumacher, Elephant Grass, Napier Grass. Cp (AL, FL): swamps, wet grasslands, disturbed areas; uncommon, native of Africa. Naturalized in FL north to the FL-GA border, and in AL (Diamond & Woods 2009). [= FNA, HC, K]

* ***Pennisetum setaceum*** (Forskål) Chiovenda, Tender Fountaingrass Cp (FL): disturbed areas; rare, native of e. Mediterranean Europe. Reported as an introduction in FL, TN, and KY (Wipff in FNA 2003a). [= FNA, HC, K]

* ***Pennisetum setigerum*** (Vahl) Wipff. Cp (FL): disturbed areas; rare, native of Africa. Known in our area from ne. FL and ec. MS. [= FNA; = *P. ciliare* (Linnaeus) Link var. *setigerum* (Vahl) Leeke – K; = *Cenchrus setigerus* Vahl]

* ***Pennisetum villosum*** R. Brown ex Fresenius, Feathertop. Reported as an introduction in GA (Kartesz 1999). [= C, FNA, HC, K; ? *Cenchrus longisetus* M.C. Johnston]

Phalaris Linnaeus 1753 (Canary-grass)

A genus of about 16-22 species, north temperate and South American. References: Barkworth in FNA (2007a); Tucker (1996)=Z.

1 Perennial, with scaly rhizomes; inflorescence **either** obviously paniculate, 7-25 cm long, with ascending to appressed branches, the main branches of the inflorescence apparent, the inflorescence outline thus appearing lobed, **or** densely spikelike, 1.5-15 cm long.
2 Glumes broadly winged; fertile lemmas ovate-lanceolate, densely pubescent ..... ***P. aquatica***
2 Glumes not winged; fertile lemmas narrowly lanceolate, glabrous to sparsely pubescent ..... ***P. arundinacea***
1 Annual, without rhizomes; inflorescence densely spikelike or almost capitate, 1-9 cm long, the branches not apparent, the inflorescence outline a single ovoid, ellipsoid, or lanceolate form.
3 Spikelets borne in clusters, the lower 4-7 spikelets in each cluster with a staminate terminal floret ..... ***P. paradoxa***
3 Spikelets borne singly; all spikelets with a bisexual terminal floret.
4 Keels of the glumes broadly winged (the wing ca. 1 mm wide); sterile florets 2.0-4.5 mm long ..... ***P. canariensis***
4 Keels of the glume narrowly winged (the wing < 0.5 mm wide); sterile florets 0.5-2.5 mm long.
5 Sterile floret 1 ..... ***P. minor***
5 Sterile florets 2.
6 Nerves of the glumes scabrous; panicle cylindric in outline, 6-18 cm long; glumes 3.5-4.0 mm long; sterile florets 0.5-1.5 mm long ..... ***P. angusta***
6 Nerves of the glumes not scabrous; panicle narrowly ovate in outline, usually 2-6 cm long; glumes 5-6 mm long; sterile florets 1.5-2.5 mm long ..... ***P. caroliniana***

* ***Phalaris angusta*** Nees ex Trinius. Cp (FL, GA, SC): waterfowl impoundments, marshes; uncommon, native of tropical America, perhaps native in LA and TX. [= GW, FNA, HC, K, Z]

* ***Phalaris aquatica*** Linnaeus, Bulbous Canary-grass. Cp (NC, SC, VA): disturbed areas; rare, native of Europe. [= K, Z; *? P. tuberosa* Linnaeus var. *stenoptera* (Hackel) Hitchcock – HC]

*? ***Phalaris arundinacea*** Linnaeus, Reed Canary-grass, Ribbon Grass. Mt (NC, VA, WV), Pd (DE, NC, VA), Cp (DE, VA): moist forests, moist disturbed areas, bogs; common (rare in VA Coastal Plain). June. NL (Newfoundland) west to AK, south to NC, TN, AR, NM, CA; Mexico; Eurasia. A variegated form, *P. arundinacea* forma *variegata* (Parn.) Druce, is cultivated for ornament, as Ribbon Grass. [= RAB, C, F, FNA, GW, K, S, W, WV, Z; > *P. arundinacea* var. *arundinacea* – G, HC; > *P. arundinacea* var. *picta* Linnaeus – G, HC]

* ***Phalaris canariensis*** Linnaeus, Birdseed Grass, Canary-grass. Cp (FL, GA, NC, SC, VA), Pd (DE, GA, NC, SC, VA), Mt (VA, WV): disturbed areas; rare, native of Mediterranean Europe. [= RAB, C, F, FNA, G, GW, HC, K, S, WV, Z]

Phalaris caroliniana Walter, Maygrass. Cp (FL, GA, NC, SC, VA), Pd (GA, NC, SC): ditches, roadsides, disturbed areas; uncommon. May-June. NC west to OR, south into Mexico, the original distribution now obscured. [= RAB, C, F, FNA, G, GW, HC, K, S, Z]

* ***Phalaris minor*** Retzius, Lesser Canary Grass. Cp (SC): waste areas near wool-combing mills; rare, native of Mediterranean Europe. Also reported for other scattered states in e. North America, including peninsular FL (Kartesz 1999). [= FNA, HC, K] {synonymy incomplete}

* ***Phalaris paradoxa*** Linnaeus, Mediterranean Canary Grass. {NC}: {habitat}; rare. Reported for NC, MD, NJ, and PA (Barkworth in FNA 2007a; Kartesz 1999). [= FNA, K; > *P. paradoxa* var. *paradoxa* – HC; > *P. paradoxa* var. *praemorsa* (Lamarck) Coss. & Durieu – HC] {synonymy incomplete}

Phanopyrum (Rafinesque) Nash 1903 (Phanopyrum)

Circumscription of this genus is currently in flux. *Phanopyrum* is variously treated as a distinct genus or as a subgenus of *Panicum*. *Panicum verrucosum* perhaps belongs here as well. References: Crins (1991)=Z; Webster (1988)=Y; Freckmann & Lelong in FNA (2003a).

Phanopyrum gymnocarpon (Elliott) Nash, Swamp Phanopyrum, Savanna Phanopyrum. Cp (FL, GA, NC, SC, VA): swamps, seasonally flooded soils of cypress-gum sloughs, tidal (freshwater) cypress-gum swamps, disturbed wet soils, low woods, ditches, muddy banks of streams and lakes, sinks, floodplains, and marshes; uncommon (rare in NC and VA). August-October. Se. VA south to FL, west to TX and AR. [= K, Y; = *Panicum gymnocarpon* Elliott – RAB, FNA, GW, HC, S, Z]

Phleum Linnaeus 1753 (Timothy)

A genus of about 15 species, annuals and perennials, mainly native to Eurasia. References: Barkworth in FNA (2007a); Tucker (1996)=Z; Stace (2010)=Y. Key based on Stace (2010).

1 Spikelets 2.0-3.6 (-3.8) mm long, including the 0.2-1.0 (-1.2) mm long awns; panicle 3-6 (-6.7) mm wide; leaves 2-6 mm wide; ligule usually acute ..... ***P. pratense*** *ssp.* ***bertolonii***
1 Spikelets (3.5-) 4-5.5 mm long, including the (0.8-) 1.0-2.0 mm long awns; panicle 5-10 mm wide; leaves 3-9 mm wide; ligule usually obtuse ..... ***P. pratense*** *ssp.* ***pratense***

* ***Phleum pratense*** Linnaeus *ssp.* ***bertolonii*** (A.P. de Candolle) Bornm., Small Timothy. (NC) {included based on Fernald's report – corroboration and additional information needed} [= FNA; < *P. pratense* – RAB, C, G, HC, K, S, W, Z; = *P. pratense* var. *nodosum* (Linnaeus) Hudson – F; = *P. bertolonii* A.P. de Candolle – Y]

* ***Phleum pratense*** Linnaeus *ssp.* ***pratense***, Timothy. Mt (GA, NC, SC, VA, WV), Pd (DE, GA, NC, SC, VA), Cp (DE, GA, NC, SC, VA): meadows, pastures, roadsides, disturbed areas; common, native of Europe. June-October. The American common name comes from the name of the man who is believed to have introduced it into the United States in 1720, Timothy Hanson; in England, *Phleum* is called "cat's-tail." [= FNA; < *P. pratense* – RAB, C, G, HC, K, S, W, WV, Z; = *P. pratense* var. *pratense* – F; = *P. pratense* – Y]

* *Phleum subulatum* (Savi) Ascherson & Graebner, Italian Timothy. Waif on ballast, reported for MD and Philadelphia, PA. [= FNA, K, Y] {not keyed}

Phragmites Adanson 1763 (Common Reed)

A genus with 3-5 species, nearly worldwide in distribution. References: Haines (2010)=V; Ward (2010)=X; Allred in FNA (2003a), revised in FNA (2007a); Saltonstall & Hauber (2007)=Y; Ward & Jacono (2009); Saltonstall, Peterson, & Soreng (2004)=Z; Saltonstall (2002). Key based on Z and Y.

1 Panicle diffuse and partially drooping, with lower lateral branches naked for 1-4 cm; leaf blades of lower stem leaves abscising from the sheaths by mid-season; leaves lightly scabrous on lower surface; culms stout, to 20 mm in diameter, smooth and glossy; [native on the Gulf Coast, from FL and GA westward, and southward into the tropics] ..... ***P. karka***

1 Panicle erect and relatively compact, with lower lateral branches spikelet-bearing to base

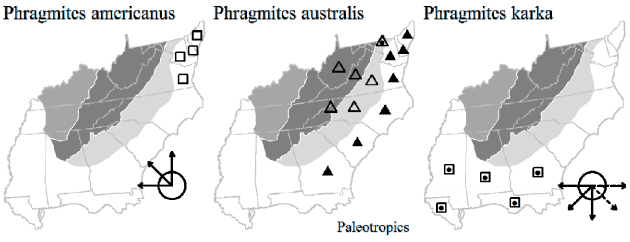
2 Ligules 1.0-1.7 mm long; lower glumes 3.0-6.5 mm long; upper glumes 5.5-11.0 mm long; lemmas 8.0-13.5 mm long; leaf sheaths caducous with age; culms exposed in the winter, smooth and shiny; [native south to WV and VA] ..... ***P. americanus***

2 Ligules 0.4-0.9 mm long; lower glumes 2.5-5.0 mm long; upper glumes 4.5-7.5 mm long; lemmas 7.5-12.5 mm long; leaf sheaths not caducous with age; culms not exposed in the winter, minutely ridged and not shiny; [introduced and weedy] ..... ***P. australis***

Phragmites americanus (Saltonstall, P.M. Peterson, & Soreng) A. Haines, American Reed. Freshwater marshes. New England westward. [= V; = *P. australis* ssp. *americanus* Saltonstall, P.M. Peterson, & Soreng – FNA, X, Y, Z; < *P. australis* – C, K; < *P. communis* Trinius – RAB, G, HC; < *P. communis* var. *berlandieri* (Fournier) Fernald – F]

* ***Phragmites australis*** (Cavanilles) Trinius ex Steudel, Common Reed. Brackish and freshwater Marshes, dredge-spoil deposit islands, ditches. August-October. Nearly worldwide in distribution. Fox, Godfrey, & Blomquist (1950) report its first collection in NC (in 1948). In most of our area, reed is of relatively recent introduction, reported from only nine counties in RAB, but now becoming a serious weed in coastal areas, where it aggressively colonizes freshwater and brackish marshes, excluding the native species. [= V; = *P. australis* ssp. *australis* – X, Y; = *Phragmites australis* (Cavanilles) Trinius ex Steudel var. *australis* – FNA, Z; < *P. australis* – C, GW, K; < *P. communis* Trinius – RAB, G, HC, WV; = *P. communis* var. *communis* – F; < *P. phragmites* (Linnaeus) Karsten – S]

Phragmites karka (Retzius) Trinius ex Steudel, Tropical Reed. Marshes. September-December. Ne. FL south to s. FL, west across the Gulf Coast to sw. United States, south into tropical America. September-October. Reported for Seminole County, GA (Carter, Baker, & Morris 2009). [= X; = *P. australis* (Cavanilles) Trinius ex Steudel ssp. *berlandieri* (E. Fournier) C.F. Reed – Y; = *P. australis* (Cavanilles) Trinius ex Steudel var. *berlandieri* (E. Fournier) C.F. Reed – FNA, Z; < *P. australis* – C, GW, K; < *P. communis* Trinius – RAB, G, HC; < *P. communis* var. *berlandieri* (Fournier) Fernald – F; < *P. phragmites* (Linnaeus) Karsten – S]



Phyllostachys Siebold & Zuccarini 1843 (Bamboo)

A genus of about 50 (or more) species, native of mainly temperate e. Asia. References: Stapleton & Barkworth in FNA (2007a); Duncan & Duncan [in prep.]=Z; Judziewicz et al. (2000)=Y. Key adapted from Z.

1 Internodes at the base of principal culms dissimilar in length, the lowermost internode 1-12 cm long, the next 3 internodes distinctly longer, with nodal junctions mostly straight across ..... ***P. aurea***

1 Internodes at the base of principal culms all similar in length, mostly 4-8 cm, with nodal junctions oblique.

2 Groove on internode (above the branch) yellowish-green, the rest of the culm dull greenish ..... ***P. aureosulcata***

2 Groove on internode (above the branch) the same color as the rest of the culm.

3 Internodes of principal culms densely velvety; outer surface of culm sheaths with abundant erect brown hairs; lowest internode of principal culms ca. 5 cm long; culms pale green atfirst, becoming gray with accumulated waxy powder in age ..... ***P. heterocycla***

3 Internodes of principal culms glabrous or slightly hairy; outer surface of culm sheaths lacking erect brown hairs; lowest internode of principal culms ca. 8.5-12 cm long; culms various (see below, but not as decribed in first lead).

4 Largest culms to 15 cm in diameter and 25 m tall; upper culm sheaths with auricles; outer surface of culm sheaths usually with a green streak down the middle, flanked by streaks of purple and buff; culms medium to dark glossy green at first (some cultivars golden yellow or yellow streaked), remaining so in age ..... ***P. bambusoides***
4 Largest culms to 3.2 (-4) cm in diameter and 10 m tall (rarely taller); upper culm sheaths with or without auricles; outer surface of culm sheaths variously streaked, spotted, or mottled with brown or red (but not as above); culms pale green to green at first, usually becoming purple spotted, gray, or yellow in age.
5 Lowest internode of principal culms ca. 8.5 cm long; culm sheaths with auricles, usually sparsely pubescent with erect, pale hairs, usually pinkish-brown at maturity, marked with numerous brown spots near the tip; culms green at first, usually becoming speckled and then more-or-less completely darkened with purplish spots (remaining green in some cultivars) ..... ***P. nigra***
5 Lowest internode of principal culms ca. 12 cm long; culm sheaths lacking auricles, glabrous, usually green to buff at maturity, striped and marginally bordered with red; culms pale green at first, becoming gray to yellowish in age ..... ***P. rubromarginata***

* ***Phyllostachys aurea*** Carrière ex A. & C. Rivière, Golden Bamboo, Fishpole Bamboo. Cp (DE, FL?, NC, SC, VA), Pd (DE, NC, SC, VA), Mt (VA): suburban woodlands; uncommon (rare in VA Mountains), native of China and Japan. Not known to flower in our area. This is the usual large bamboo cultivated and naturalizing in our area, forming dense stands, up to 15 m tall. [= RAB, FNA, HC, K, Y, Z]

* ***Phyllostachys aureosulcata*** McClure, Yellowgroove Bamboo. Cp (SC), Pd (VA), Mt (WV), {GA}: cultivated as an ornamental, persistent or spreading from plantings; rare, native of China. [= K, WV, Y, Z]

* ***Phyllostachys bambusoides*** Siebold & Zuccarini, Giant Timber Bamboo. Cp (NC, SC), Pd (NC, SC), Mt (NC, SC): cultivated as an ornamental, persistent or spreading from plantings; rare, native of China. [= FNA, HC, K, Y, Z]

* ***Phyllostachys heterocycla*** (Carrière) S. Matsum, Moso Bamboo. Cp (SC): cultivated as an ornamental, persistent or spreading from plantings; rare, native of China. [= Y; *? P. edulis* (Carrière) Houzeau de Lehaie – K; *? P. pubescens* Mazel ex Houzeau de Lehaie – Z]

* ***Phyllostachys nigra*** (Loddiges) Munro, Black Bamboo. Pd (SC), Cp (VA), Mt (WV): cultivated as an ornamental, persistent or spreading from plantings; rare, native of China and Japan. [= K, WV, Y, Z; > *P. nigra* var. *henonis* (Mitf.) Stapf – WV]

* ***Phyllostachys rubromarginata*** McClure. Pd (SC): cultivated as an ornamental, persistent or spreading from plantings; rare, native of China. [= K, Y, Z]

* ***Phyllostachys meyeri*** McClure is reported as introduced in FL, NC, and SC (Kartesz 1999). {investigate} [= K] {not yet keyed}

A number of other species are sometimes cultivated in our area, and may be encountered. Bamboos are seriously under-represented in herbaria, since they rarely flower and are impractical to press. All of the species above should be anticipated in other physiographic provinces and states than those listed.

Piptatherum Palisot de Beauvois 1812

A genus of ca. 30 species, mainly Eurasian. References: Barkworth in FNA (2007a).

1 Glumes 2.5-3.5 mm long; lemmas glabrous; [alien] ..... ***[P. miliaceum]***
1 Glumes 3-8 mm long; lemmas evenly pubescent; [native].
2 Leaves primarily cauline, the basal leaves < 2 cm long or merely represented by sheaths; leaves 8-16 mm wide; florets 4.5-7.5 mm long .... ***P. racemosum***
2 Leaves primarily basal, the basal leaves 4-45 cm long; leaves 0.5-1.8 mm wide; florets 2.2-4.5 mm long.
3 Awns 5-15 mm long, persistent, 1-2× geniculate ..... ***P. canadense***
3 Awns absent or < 2 mm long, caducous ..... ***P. pungens***

Piptatherum canadense (Poiret) Dorn, Mountain Ricegrass. Mt (WV): sandy barrens on quartzite; rare. NL (Newfoundland) west to BC, south to n. NY, MI, and WI; disjunct at Panther Knob, Pendleton County, WV. [= K; = *Oryzopsis canadensis* (Poiret) Torrey – C, F, G, HC, WV]

Piptatherum pungens (Torrey ex Sprengel) Dorn. Mt (WV): {habitat}; {abundance}. NL (Labrador), NU, and YT south to NJ, WV, IN, IL, IA, SD, and CO. [= K; = *Oryzopsis pungens* (Torrey ex Sprengel) A.S. Hitchcock – C, F, G, HC]

Piptatherum racemosum Ricker ex A.S. Hitchcock, Blackseed Ricegrass. Mt (VA, WV), Pd (DE): calcareous woodlands and forests; common (rare in DE and WV). QC and ON west to ND, south to w. VA, e. TN (FNA), sc. KY, sc. MO, and e. NE. [= K; = *Oryzopsis racemosa* (Smith) Ricker ex A.S. Hitchcock – C, F, G, HC, W, WV]

* *Piptatherum miliaceum* (Linnaeus) Cosson, Smilo Grass. Reported as an introduced waif in MD (FNA; Kartesz 1999), NJ, and PA (Kartesz 1999). [= K; ? *Piptatherum miliaceum* ssp. *miliaceum* – FNA; = *Oryzopsis miliacea* (Linnaeus) Bentham & Hooker – HC]

Piptochaetium J. Presl 1830 (Needlegrass)

A genus of about 27 species, of temperate North and South America, and montane tropical South America (Cialdella & Giussani 2002). References: Barkworth in FNA (; Cialdella & Giussani (2002).

1 Florets 7-13 mm long; awns 40-75 mm long; [widespread in our area] ..... ***P. avenaceum***
1 Florets 13.5-22 mm long; awns 62-120 mm long; [endemic to FL] ..... ***P. avenacioides***

Piptochaetium avenaceum (Linnaeus) Parodi, Eastern Needlegrass, Black Oatgrass. Cp (DE, FL, GA, NC, SC, VA), Pd (DE, GA, NC, SC, VA), Mt (GA, NC, SC, VA, WV): upland woodlands and forests, sometimes abundant or even dominant in xeric woodlands over granitic or mafic rocks in the Piedmont; common (uncommon in the Mountains, uncommon in DE Piedmont, rare in DE Piedmont, rare in WV). April-June. [= C, FNA, K, WH; = *Stipa avenacea* Linnaeus – RAB, F, G, HC, S, W, WV]

Piptochaetium avenacioides (Nash) Valencia & Costas. Cp (FL): sandhills. Ne. FL (?) south to c. peninsular FL. [= FNA, K, WH; = *Stipa avenacioides* Nash – HC; = *Stipa avenaceoides* Nash – S, orthographic variant]

Pleioblastus Nakai 1925

A genus of about 20 species, shrubs, native eof China and Japan.

* ***Pleioblastus simonii*** (Carrière) Nakai. Reported for GA (Kartesz 1999). {investigate} [= *Arundinaria simonii* (Carrière) A.& C. Rivière – K]

Poa Linnaeus 1753 (Bluegrass)

A genus of about 500 species, annuals and perennials, cosmopolitan. References: Soreng in FNA (2007a); Tucker (1996)=Z; Haines (2004)=Y; Soreng (1998).

1 Plants with well-developed rhizomes; perennial.
  2 Upper stems strongly flattened; [section *Tichopoa*]..... ***P. compressa***
  2 Upper stems terete or nearly so.
    3 Lower nodes of the panicle with 1-3 branches; [section *Madropoa*] ..... ***P. cuspidata***
    3 Lower nodes of the panicle with 4 or more branches; [section *Poa*] ..... ***P. pratensis***
1 Plants lacking rhizomes; perennial or annual.
  4 Plants dioecious, the florests imperfect; lemmas and glumes scarious and silvery; [rare introduction in our area]; [section *Dioicopoa*] ..... ***P. arachnifera***
  4 Plants not dioecious, the florets perfect; lemmas and glumes not notably scarious and silvery; [collectively common and widespread in our area].
    5 Lemmas not webbed at the base.
      6 Annual; culms decumbent to ascending and 1-3 dm long; inflorescence 2-8 cm long, the ascending branches bearing crowded spikelets above the middle; lemmas 2.4-3.4 mm long; [section *Micrantherae*]..... ***P. annua***
      6 Perennial; culms erect, 3-6 dm long; inflorescence 6-15 cm long, the widely spreading branches bearing a few spikelets near the end; lemmas 3.2-4.4 mm long; [section *Sylvestres*]..... ***P. autumnalis***
    5 Lemmas webbed at the base.
      7 Spikelets (most or all) modified into purplish bulblets; culm bulbous-thickened at ground level; [section *Arenariae*]..... ***P. bulbosa***
      7 Spikelets normal; culm not bulbous-thickened.
        8 Annual; [section *Homalopoa*]..... ***P. chapmaniana***
        8 Perennial.
          9 Marginal veins of the lemma glabrous.
            10 Nodes of the panicle mostly with 4-8 branches; lemmas pubescent or scabrous on the keel.
              11 Sheaths glabrous; ligule 0.7-2.2 (-3.0) mm long; [section *Sylvestres*] ..... ***P. alsodes***
              11 Sheaths scabrous; ligule (2.5-) 3-7 mm long; [section *Pandemos*] ..... ***P. trivialis***
            10 Nodes of the panicles mostly with 2 branches; lemmas glabrous on the keel; [section *Sylvestres*].
              12 Anthers 0.6-0.9 (-1.0) mm long; lemmas broad-acute, obtuse or truncate at the apex, the keel and lateral margins of the lemma forming an apical angle of 42-82 degrees, firm at the tip, the scarious tip absent or up to 0.25 mm long ..... ***P. languida***
              12 Anthers 0.9-1.5 mm long; lemmas acute to acuminate at the apex, the keel and lateral margins of the lemma forming an apical angle of 10-47 degrees, pliable at the tip, the scarious tip prominent and 0.25-0.5 mm long ..... ***P. saltuensis***
          9 Marginal veins of the lemma pubescent, at least basally.
            13 Lower nodes of the panicles mostly with (1-) 2-3 branches.
              14 Ligule truncate, 0-1 mm long; first glume 1.7-2.2 mm long, second glume 2.0-2.8 mm long; anthers 0.5-0.7 mm long; [section *Oreinos*] ..... ***P. paludigena***
              14 Ligule rounded-ovate, 1-2 mm long; first glume 2.5-3.5 mm long, second glume 3.0-3.8 mm long; anthers 1.1-1.4 mm long; [section *Sylvestres*]..... ***P. wolfii***
            13 Lower nodes of the panicles mostly with (4-) 5 or more branches.
              15 Lemmas 5-veined (intermediate veins well-developed); ligule ca. 1 mm long; [section *Sylvestres*] ..... ***P. sylvestris***
              15 Lemmas 3-veined (intermediate veins obscure); ligule either (2-) 3-5 mm long or 0.2-1 (-1.5) mm long.
                16 Ligule 0.2-1 (-1.5) mm long, truncate; culms 4-8 dm tall; anthers 1.2-1.6 mm long; [section *Stenopoa*]..... ***P. nemoralis***
                16 Ligule (2-) 3-5 mm long, ovate-triangular; culms 5-15 dm tall; anthers 0.8-1.2 mm long; [section *Pandemos*] ..... ***P. palustris***

Poa alsodes A. Gray, Woodland Bluegrass. Pd (DE, NC, VA), Mt (NC, VA, WV): rich forests; common (uncommon in NC, VA, and WV Mountains, rare in NC and VA Piedmont). May-June. NS west to SD, south to NC and IL; also in w. United States. [= RAB, C, F, FNA, G, HC, K, S, W, WV, Z]

* ***Poa annua*** Linnaeus, Speargrass, Six-weeks Grass, Annual Bluegrass. Cp (DE, FL, GA, NC, SC, VA), Pd (DE, GA, NC, SC, VA), Mt (GA, NC, SC, VA, WV): fields, roadsides, disturbed areas; common, native of Eurasia. April-May. [= RAB, C, F, FNA, G, GW, HC, K, S, W, WV, Z]

* ***Poa arachnifera*** Torrey, Texas Bluegrass. Pd (GA, NC, SC): disturbed areas; rare, native of sc. United States. April. [= RAB, FNA, HC, K, S]

Poa autumnalis Muhlenberg ex Elliott. Cp (DE, FL, GA, NC, SC, VA), Pd (DE, GA, NC, SC, VA), Mt (GA, NC, SC, VA, WV): moist or dry nutrient-rich forests; common (uncommon in VA Mountains, rare in DE, FL, and WV). April-May. NJ west to MI, south to FL and TX. [= RAB, C, F, FNA, G, GW, HC, K, S, W, Z]

* ***Poa bulbosa*** Linnaeus *ssp.* ***vivipara***, Bulbous Bluegrass. Cp (DE, NC, VA), Pd (GA, NC, VA), Mt (WV): lawns; rare, native of Europe. April-May. [= FNA; < *P. bulbosa* – RAB, C, F, G, HC, K, WV, Z]

Poa chapmaniana Scribner. Cp (DE, FL, GA, NC, SC, VA), Pd (GA, NC, SC, VA), Mt (WV): low fields, roadsides, disturbed areas; common (rare in DE, FL, VA, and WV). April-May. DE west to IA, south to FL and LA. [= RAB, C, F, FNA, G, HC, K, S, W, WV, Z]

* ***Poa compressa*** Linnaeus, Canada Bluegrass. Mt (GA, NC, SC, VA, WV), Pd (DE, GA, NC, SC, VA), Cp (DE, NC, SC, VA): fields, roadsides, disturbed areas; common, native of Europe. May-August. [= RAB, C, F, FNA, G, HC, K, S, W, WV, Z]

Poa cuspidata Nuttall. Mt (GA, NC, SC, VA, WV), Pd (DE, GA, NC, SC, VA), Cp (GA, NC, VA): moist forests; common (rare in DE). March-April. NJ west to s. IN, south to sw. GA and c. AL. [= RAB, C, F, FNA, G, HC, K, S, W, WV, Z]

Poa languida Hitchcock, Drooping Bluegrass. Mt (VA): ultramafic outcrop woodlands, barrens, and glades; rare. April-May. VT and MA west to MN, south to PA, w. VA, KY, and IA. See comments under *P. saltuensis*. [= C, F, G, HC, W; = *P. saltuensis* Fernald & Wiegand ssp. *languida* (Hitchcock) A. Haines – FNA, Y; < *P. saltuensis* – K]

* ***Poa nemoralis*** Linnaeus, Wood Bluegrass. Pd (DE, VA), Mt (NC, VA): disturbed areas, sandy creek bottoms; uncommon (rare in VA), native of Europe. [= C, F, FNA, G, HC; *? P. nemoralis* ssp. *nemoralis* – K]

Poa paludigena Fernald & Wiegand, Bog Bluegrass. Mt (NC, VA, WV), Pd (DE): bogs, especially in deep shade under shrubs; rare. April-May. NY west to MN, south to PA, w. NC, and IL. This species withers and disintegrates shortly after flowering; its ephemeral habit may be responsible for its being overlooked in our area for many years. [= C, F, FNA, G, HC, K]

Poa palustris Linnaeus, Fowl Bluegrass, Fowl Meadow-grass. Cp (DE), Mt (NC, SC, VA, WV), Pd (DE, VA): meadows, moist areas, bogs; common (rare in NC, SC, VA, and WV). June-July. Circumboreal, south in North America to VA, w. NC, MO, and NM. Some populations, especially southwards, may represent introductions. [= RAB, C, F, FNA, G, HC, K, W, WV, Z]

* ***Poa pratensis*** Linnaeus *ssp.* ***pratensis***, Kentucky Bluegrass, Junegrass, Speargrass. Mt (GA, NC, SC, VA, WV), Pd (DE, GA, NC, SC, VA), Cp (DE, FL, NC, SC, VA): lawns, roadsides, disturbed areas; common, native of Europe. April-August. [= FNA, K; < *P. pratensis* – RAB, C, F, G, HC, S, W, WV, Z]

Poa saltuensis Fernald & Wiegand, Old-pasture Bluegrass. Mt (NC, VA, WV): northern hardwood forests, ultramafic outcrop woodlands, barrens, and glades; rare. April-May. NL (Newfoundland) west to MN, south to PA, w. VA, and w. NC. The NC occurrences (on serpentinized olivine barrens) reported as *P. languida* are actually *P. saltuensis*. The taxonomic distinctions between *P. saltuensis* and *P. languida* have been controversial; Haines (2004) provides a detailed and valuable discussion. [= C, F, G, HC, W, WV; < *P. languida* – RAB, Z, misidentification; = *P. saltuensis* var. *saltuensis* – F; = *P. saltuensis* ssp. *saltuensis* – FNA, Y; < *P. saltuensis* – K (also see *P. languida*)]

Poa sylvestris A. Gray, Forest Bluegrass. Mt (GA, NC, SC, VA, WV), Pd (DE, GA, NC, SC, VA), Cp (FL, GA, NC, SC, VA): moist forests; common (rare in FL). April-May. NY west to MN and SD, south to FL and TX. [= RAB, C, F, FNA, G, GW, HC, K, S, W, WV, Z]

* ***Poa trivialis*** Linnaeus *ssp.* ***trivialis***, Rough Bluegrass. Mt (NC, VA, WV), Pd (DE, NC, VA), Cp (DE, VA), {GA}: moist forests, disturbed areas, bottomlands; common (rare in VA Coastal Plain), native of Europe. April-June. [= FNA; < *P. trivialis* – RAB, C, F, G, GW, HC, K, S, W, WV, Z]

Poa wolfii Scribner. Mt (NC): moist rich forests; rare. OH west to MN, south to c. TN, n. AR, and NE; disjunct eastward w. NC. The NC occurrence is based on material from Great Smoky Mountains National Park (Haywood County) (K. Langdon, pers. comm.. 2006). The alleged VA occurrences are in error. [= C, F, G, HC, K, S, W, Z]

* ***Poa infirma*** Kunth. Cp (SC): disturbed areas; rare, native of South America. {investigate} [= FNA, K] {not yet keyed; synonymy incomplete}

Polypogon Desfontaines 1798

A genus of about 18 species, annuals and perennials, of tropical and warm temperate regions. References: Barkworth in FNA (2007a); Tucker (1996)=Z.

1 Inflorescence verticillate, the rachis visible between the verticils; glumes 1.6-2.3 mm long, without awns; spikelets disarticulating near base of pedicel; stoloniferous perennial ..... ***P. viridis***
1 Inflorescence dense, cylindrical, and spikelike; glumes 2-3 mm long, with prominent awns 3.5-7 mm long; spikelets disarticulating near apex of pedicel; annual.
  2 Glumes deeply lobed, the awn borne between the lobes; glume ciliate-fringed; lemma 0.4-0.7 mm long, awnless..... ***P. maritimus*** *var.* ***maritimus***
  2 Glumes slightly notched at the tip, the awn borne from near the tip; glume not ciliate-margined; lemma 0.7-1.1 mm long, awned..... ***P. monspeliensis***

* ***Polypogon maritimus*** Willdenow *var.* ***maritimus***, Meditteranean Beardgrass. Cp (GA, SC): brackish marshes; rare, native of Mediterranean Europe. *P. maritimus* Willdenow is reported as introduced to GA (Small 1933). [= FNA; < *P. maritimus* – HC, K, S, Z]

* ***Polypogon monspeliensis*** (Linnaeus) Desfontaines, Rabbitfoot Grass, Beardgrass, Annual Beardgrass. Cp (FL, GA, NC, SC, VA), Pd (GA): brackish marshes, disturbed areas; uncommon, native of s. Europe to w. Asia. May-July. [= RAB, C, F, FNA, G, GW, HC, K, S, Z]

* ***Polypogon viridis*** (Gouan) Breistr., Water Bent-grass. Cp (SC): introduced on ballast around old ports, probably not persistent; rare, native of the Old World. Distinguished from *Agrostis* in having the spikelet falling as a whole, disarticulating below the glumes. [= FNA, K, Z; = *Agrostis viridis* Gouan – C; > *Agrostis verticillata* Villars – F; > *Agrostis semiverticillata* (Forskål) C. Christensen – G, HC]

Pseudosasa Makino ex Nakai 1925 (Arrow Bamboo)

A genus of about 36 species, native of China, Japan, and Korea. References: Stapleton in FNA (2007a); Duncan & Duncan [in prep.]=Z; Judziewicz et al. (2000)=Y. Key adapted from Z.

* ***Pseudosasa japonica*** (Siebold & Zuccarini ex Steudel) Makino ex Nakai, Arrow Bamboo. Cp (FL, VA): cultivated as an ornamental, persistent or spreading from plantings; uncommon, native of Japan. [= FNA, HC, K, Y, Z; = *Sasa japonica* (Siebold & Zuccarini ex Steudel) Makino]

Puccinellia Parlatore 1848 (Alkali Grass, Goosegrass)

A genus of about 80-120 species, north temperate. References: Davis & Consaul in FNA (2007a).

1 Lemmas 3.0-4.5 mm long; spikelets 5-11-flowered ..... ***[P. maritima]***
1 Lemmas 1.5-2.5 mm long; spikelets 2-6-flowered.
  2 Inflorescence diffuse, the lower branches with spikelets restricted to the distal portions; lower inflorescence branches spreading horizontal to deflexed at maturity; lemma 1.5-2.1 mm long, the midnerve not reaching the apex ..... ***P. distans***
  2 Inflorescence compact, the lower branches bearing spikelets nearly to the base; lower inflorescence branches ascending at maturity; lemma 2.0-2.5 mm long, the midnerve reaching the apex, and often excurrent as a mucro ..... ***P. fasciculata***

* ***Puccinellia distans*** (Jacquin) Parlatore, European Alkali Grass, Goosegrass. Cp (DE, VA), Mt (NC, WV): disturbed roadsides, coastal sands; rare, native of Eurasia. Confirmed for Watauga County, NC (Poindexter, pers. comm. 2009). [= *P. distans* – C, G, HC; > *P. distans var. distans* – F; > *P. distans* ssp. *distans* – K]
*? ***Puccinellia fasciculata*** (Torrey) Bicknell, Eastern Alkali Grass, Saltmarsh Goosegrass. Cp (DE, VA): salt or brackish marshes; rare. NS south to VA; Europe; and in sw. United States. The native or introduced status of this species in ne. North America is controversial. [= C, F, FNA, G, HC, K]

* *Puccinellia maritima* (Hudson) Parlatore, Seaside Alkali Grass, Seaside Speargrass. Salt marshes and ballast near ports. Introduced south to se. PA (Philadelphia), NJ (Camden), and DE, especially on ballast. [= C, F, FNA, G, HC; > *P. americana* Sorenson – K] {synonymy incomplete}

Reimarochloa A.S. Hitchcock 1909

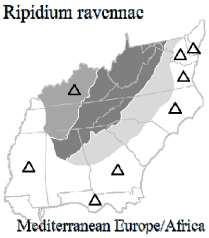
A genus of about 4 species, of the New World tropics. References: Barkworth in FNA (2003a).

Reimarochloa oligostachya (Munro ex Bentham) A.S. Hitchcock. Cp (FL): moist hammocks, wet grasslands; rare. Ne. FL (Duval County) and s. AL south to s. FL; Cuba. [= FNA, HC, K]

Ripidium Trinius 1820 (Ravenna-grass)

References: Hodkinson et al. (2002).

* ***Ripidium ravennae*** (Linnaeus) Trinius, Ravenna-grass, Plume-grass. Cultivated as an ornamental and rarely escaping or persisting; native of s. Europe. In sw. GA, TN, and MD (Kartesz 1999), DC (Steury 2004a), FL (Wunderlin & Hansen 2006). [= *Saccharum ravennae* (Linnaeus) Linnaeus – FNA, K; = *Erianthus ravennae* (Linnaeus) Palisot de Beauvois – F; > *Erianthus ravennae* var. *ravennae* – HC; > *Erianthus ravennae* var. *purpurascens* (Andersss.) Hackel – HC]



Rostraria Trinius 1820

A genus of about 10 species, native of the Mediterranean region and w. Asia. References: Standley in FNA (2007a).

* ***Rostraria cristata*** (Linnaeus) Tzvelev. Cp (FL, SC): waste areas near wool-combing mills, other disturbed areas; rare, introduced, native of Europe. It also occurs at scattered other sites in eastern United States, such as on ballast in se. PA (Rhoads & Klein 1993), and reported for MD, AL, and FL (Kartesz 1999). Not keyed. [= K; > *R. cristata* var. *cristata* – FNA; > *R. cristata* var. *glabriflora* (Trautvetter) Doğan – FNA; = *Lophochloa cristata* (Linnaeus) Hylander; = *Koeleria phleoides* (Villars) Persoon – HC; ? *Koeleria gerardii* (Villars) Shinners]

Rottboellia Linnaeus f. 1782 (Itch-grass)

A genus of about 5 species, native to tropical Asia and Africa. References: Wipff in FNA (2003a); Wipff & Rector (1993)=Z.

* ***Rottboellia cochinchinensis*** (Loureiro) W.D. Clayton, Itch-grass. Cp (FL, GA, NC, VA): disturbed ground; uncommon (rare north of FL), native of tropical se. Asia. August-October. This grass, considered a noxious weed, was found in at least 13 GA counties by 1985 (Duncan 1985; Carter, Baker, & Morris 2009), on a farm in Robeson County, NC in 1984, and in cornfields in Westmoreland County, VA in 2007. [= FNA, K, Z; = *Rottboellia exaltata* Linnaeus f. – HC; = *Manisuris exaltata* (Linnaeus f.) Kuntze – S]

Saccharum Linnaeus 1753 (Plume Grass)

A genus of uncertain circumscription at this time. Clayton & Renvoize (1986) pointed out that the "traditional division [of *Saccharum*] into awned (*Erianthus*) and awnless species seems wholly artificial;" Hodkinson et al. (2002) developed molecular evidence which suggests that our species are not congeneric with *Saccharum*, however. Further study is needed, but likely our native southeastern species will be merged into *Miscanthidium* Stapf, while the introduced *S. ravennae* will be placed in the genus *Ripidium* Trinius (Hodkinson et al. 2002). Sugarcane (*Saccharum officinarum* Linnaeus, *S. sinense* Roxburgh, *S. barberi* Jeswiet, *S. spontaneum* Linnaeus, and cultivars and hybrids derived from those four species) is cultivated further south, notably in FL and LA. References: Webster in FNA (2003a); Webster & Shaw (1995)=Z; Gandhi & Dutton (1993); Hodkinson et al. (2002). [also see *Ripidium*]

1 Lowermost inflorescence node densely hairy; callus hairs (ring of hairs beneath the spikelet) (7-) 9-25 mm long, equal to or longer than the spikelet; stem appressed-pubescent below the inflorescence, on the internodes as well as the nodes.
  2 Lemma awn flattened and spirally twisted at base; callus hairs 9-14 mm long, silvery or tinged with purple; leaves usually glabrous on the upper surface at maturity; [of moist to dry sites, rarely in wetlands] ..... ***S. alopecuroides***
  2 Lemma awn nearly terete, straight or slightly flexuous; callus hairs (7-) 15-20 (-25) mm long, tawny or brown; leaves usually pilose on the upper surface at maturity; [of moist to wet sites, rarely in uplands] ..... ***S. giganteum***
1 Lowermost inflorescence node glabrous; callus hairs (ring of hairs beneath the spikelet) 0-6.5 mm long, shorter than or equal to the spikelet (or absent in *S. brevibarbe*); stem glabrous below the inflorescence, except sometimes on the nodes.
  3 Callus hairs (ring of hairs beneath the spikelet) absent, or of few hairs 0-2 mm long (much shorter than the spikelet); panicle branches closely appressed, the panicle usually 1-3 cm broad; panicle branches glabrous ..... ***S. baldwinii***
  3 Callus hairs (ring of hairs beneath the spikelet) present, dense, 3-6.5 mm long (from about half as long to nearly as long as the spikelet); panicle branches ascending, the panicle usually 4-10 cm broad; panicle branches pubescent.
    4 Awn of the lemma of the upper floret terete at the base, and not spiraled; spikelets dark brown; spikelet pair dissimilar in size, the lemma of the upper floret 0.7-0.8× as long as the lemma of the lower floret; lemma of the lower floret typically 3-nerved ..... ***S. coarctatum***
    4 Awn of the lemma of the upper floret flattened at the base, either spiraled or not; spikelets straw-colored or purplish; spikelet pair homomorphic, the upper lemma 0.9-1.0× as long as the lower lemma; lemma of the lower floret not distinctly nerved.
      5 Awn of the lemma of the upper floret not basally spiraled, 10-18 mm long; lemma of the upper floret entire ..... ***S. brevibarbe*** *var.* ***brevibarbe***
      5 Awn of the lemma of the upper floret basally spiraled, 15-22 mm long; lemma of the upper floret bifid, the tooth on either side of the lemma 2.0-2.5 mm long ..... ***S. brevibarbe*** *var.* ***contortum***

Saccharum alopecuroides (Linnaeus) Nuttall, Silver Plume Grass. Pd (GA, NC, SC, VA), Mt (GA, NC, SC, VA, WV), Cp (FL, GA, NC, SC, VA): fields, roadsides, woodland borders; common (rare in Mountains). October. NJ west to IN, IL, MO, and OK, south to FL and TX. [= FNA; = *Saccharum alopecuroideum* (Linnaeus) Nuttall – Z, orthographic variant; = *Erianthus alopecuroides* (Linnaeus) Elliott – RAB, C, F, G, GW, HC, W, WV; = *Saccharum alopecuroidum* – K, orthographic variant; = *Erianthus divaricatus* (Linnaeus) A.S. Hitchcock – S; **= *Miscanthidium species 1***]

Saccharum baldwinii Sprengel, Narrow Plume Grass. Cp (FL, GA, NC, SC, VA): marshes, clay-based Carolina bays, ditches; common. July-October. E. VA south to FL, west to TX, AR, scattered northward inland to TN and MO. [= FNA, K, Z; = *Erianthus strictus* Elliott – RAB, C, F, G, GW, HC, S; **= *Miscanthidium species 2***]

Saccharum brevibarbe (Michaux) Persoon *var.* ***brevibarbe***, Short-bearded Plume Grass. Cp (NC): marshes, ditches; rare. September-October. MS, AL, and TN west to TX, AR, and OK; disjunct in e. NC. [= FNA, K, Z; < *Erianthus brevibarbis* Michaux – RAB, C, G, GW, S (also see *S. coarctatum*); = *E. brevibarbis* – F; >< *Erianthus coarctatus* Fernald var. *coarctatus* – HC; >< *Erianthus coarctatus* var. *elliottianus* Fernald – HC; **= *Miscanthidium species 3***]

Saccharum brevibarbe (Michaux) Persoon *var.* ***contortum*** (Elliott) R. Webster, Bent-awn Plume Grass. Cp (DE, FL, GA, NC, SC, VA), Pd (GA, NC, SC, VA), Mt (GA, NC, SC, VA): open woodlands and forests, woodland borders; common (rare in Mountains, rare in DE, FL, and VA). Late July-October. DE and MD south to Panhandle FL, west to TX and AR, with scattered occurrences north to TN. [= FNA, K, Z; = *Erianthus contortus* Elliott – RAB, C, F, G, GW, HC, S, W; = *Saccharum contortum* (Elliott) Nuttall; = *Erianthus brevibarbis* Michaux var. *contortus* (Elliott) D.B. Ward; **= *Miscanthidium species 4***]

Saccharum coarctatum (Fernald) R.D. Webster, Brown Plume Grass. Cp (DE, FL, GA, NC, SC, VA): marshes, ditches, clay-based Carolina bays, swamps; common (rare in DE and VA). September-October. DE and MD south to FL, west to TX (Brown & Marcus 1998). [= FNA, K, Z; < *Erianthus brevibarbis* Michaux – RAB, C, G, GW, S; >< *Erianthus coarctatus* Fernald – F, HC; >< *Erianthus coarctatus* var. *coarctatus* – HC; >< *Erianthus coarctatus* var. *elliottianus* Fernald – HC; **= *Miscanthidium species 5***]

Saccharum giganteum (Walter) Persoon, Sugarcane Plume Grass, Giant Plume Grass. Cp (DE, FL, GA, NC, SC, VA), Pd (GA, NC, SC, VA), Mt (GA, NC, SC, VA): marshes, ditches; common (rare in Mountains). September-October. NY south to FL, west to se. TX and AR; inland in TN and KY. [= FNA, K, Z; = *Erianthus giganteus* (Walter) Palisot de Beauvois – RAB, C, G, GW, HC, W; > *Erianthus giganteus* var. *giganteus* – F; > *Erianthus giganteus* var. *compactus* (Nash) Fernald – F; = *Erianthus saccharoides* Michaux – S; **= *Miscanthidium species 6***]

Sacciolepis Nash 1901 (Cupscale)

A genus of about 30 species, primarily in the tropics and subtropics. References: Wipff in FNA (2003a).

1 Annual, cespitose; spikelets 2.5-3.5 mm long; [rare alien] ..... ***S. indica***
1 Perennial, from creeping stolons; spikelets (3-) 4-5 mm long; [common native] ..... ***S. striata***

* ***Sacciolepis indica*** (Linnaeus) Chase, Indian Cupscale. Cp (FL, GA, NC, SC): low fields, ditches; uncommon (rare north of FL); native of India. October. [= RAB, FNA, GW, HC, K]

Sacciolepis striata (Linnaeus) Nash, American Cupscale. Cp (DE, FL, GA, NC, SC, VA), Pd (GA, NC, SC, VA), Mt (GA, NC, SC): marshes, interdune swales, ditches, swamps; common (rare in Piedmont and Mountains, rare in DE). July-October. S. NJ south to FL, west to e. TX and OK, nearly limited to the Coastal Plain, but occasionally inland as in w. NC and TN; also native in the West Indies and n. South America. [= RAB, C, F, FNA, G, GW, HC, K, W]

Sasa Makino & Shibata 1901

* *Sasa palmata* E.G. Camus, Broadleaf Bamboo. Reported for TN (Kartesz 1999; USDA NRCS 2007). [= K]

Schedonorus Palisot de Beauvois 1812 (Meadow Fescue, Tall Fescue)

A genus of perennials, native of Eurasia. The correct generic placement of the introduced species *Schedonorus arundinaceus* (= *Festuca elatior; = Festuca arundinacea; = Lolium arundinaceum*) and *S. pratense* has been disputed. The traditional placement in *Festuca* has been defended by Aiken et al. (1997); Darbyshire (1993) transferred them to *Lolium;* and Soreng & Terrell (1998) place them in the genus *Schedonorus*. References: Darbyshire in FNA (2007a); Darbyshire (1993)=X; Aiken & Darbyshire (1990)=Y; Tucker (1996)=Z; Soreng & Terrell (1998)=V. Key based in part on C and Y.

1 Auricles ciliate (sometimes only very sparsely so – check several at 10-20× magnification); spikelets with 3-6 (-9) florets; old sheaths pale straw-colored, often remaining intact; internodes of the rachilla antrorsely scabrous ..... ***S. arundinaceus***
1 Auricles glabrous; spikelets with (2-) 4-10 (-12) florets; old sheaths brown, decaying to fibers; internodes of the rachilla glabrous (smooth) or nearly so ..... ***S. pratensis***

* ***Schedonorus arundinaceus*** (Schreber) Dumortier, Tall Fescue, Alta Fescue. Cp (FL, GA, NC, SC, VA), Pd (DE, GA, NC, SC, VA), Mt (GA, NC, SC, VA, WV): fields, roadsides, pastures, disturbed areas; common (uncommon in FL), native of Eurasia. May-July. [= FNA, V; < *Festuca elatior* Linnaeus – RAB, F, S, W, WV, misapplied; = *Festuca arundinacea* Schreber – HC, Y; = *Festuca elatior* Linnaeus – C; = *Festuca elatior* var. *arundinacea* (Schreber) Wimmer – G; < *Festuca pratensis* Hudson – GW; = *Lolium arundinaceum* (Schreber) Darbyshire – K, X, Z; *? Schedonorus phoenix* (Scopoli) Holub]

* ***Schedonorus pratensis*** (Hudson) Palisot de Beauvois, Meadow Fescue. Mt (VA, WV), Pd (DE), Cp (DE): fields, roadsides, pastures, disturbed areas; common (rare in VA), native of Eurasia. May-July. [= FNA, V; < *Festuca elatior* Linnaeus – F, S, W, WV, misapplied; = *Festuca pratensis* Hudson – C, Y; = *Festuca elatior* var. *pratensis* (Hudson) A. Gray – G; < *Festuca pratensis* Hudson – GW; = *Festuca elatior* – HC, misapplied; = *Lolium pratense* (Hudson) Darbyshire – K, X, Z]

Schizachne Hackel 1909 (False Melic)

A monotypic genus, circumboreal in Asia and North America. References: Cayouette & Darbyshire in FNA (2007a).

Schizachne purpurascens (Torrey) Swallen, Purple Oatgrass, False Melic. Mt (VA, WV): moist, rocky northern hardwood and spruce forests; rare. NL (Newfoundland) west to AK, south to MD, w. VA, WV, KY, IL, NM, and Mexico; also in ne. Asia. May-July. [= F, FNA, G, HC, K, WV; > *S. purpurascens* var. *purpurascens* – C]

Schizachyrium Nees 1829 (Little Bluestem)

A genus of about 60 species, widespread in tropical, subtropical, and warm temperate regions of the World. References: Wipff (1996a)=Z; Gandhi (1989)=Y; Wipff in FNA (2003a). Key based in part on Wipff in FNA (2003a).

1 Leaf blades 0.5-1.5 mm wide, with a lighter-colored zone in the center of the upper surface; sessile spikelet ca. 4 mm long.....***S. tenerum***
1 Leaf blades >1.5 mm wide, lacking a distinct lighter zone on the upper surface; sessile spikelet 5-11 mm long.
2 First glume of sessile spikelet pubescent.....***S. sanguineum*** *var.* ***hirtiflorum***
2 First glume of sessile spikelet glabrous.
3 Plants rhizomatous, with internodes 6 mm long or longer; sessile spikelet 5-7 mm long.....***S. scoparium*** *var.* ***stoloniferum***
3 Plants tufted, rhizome internodes absent or < 3 mm long, the stem sometimes decumbent at the base and rooting at the lower nodes (appearing nearly rhizomatous); sessile spikelet 6-10 mm long.
4 Leaf sheaths broad and strongly keeled, hairs of the raceme internodes 2.5-6 mm long; stems decumbent at base, rooting at the lower nodes
5 Ligules 1.5-2 mm long; pedicellate spikelets 1.5-5 mm long; [of the Atlantic Coast].....***S. littorale***
5 Ligules 0.5-1 mm long; pedicellate spikelets 4.5-8.5 mm long; [of the Gulf Coast].....***S. maritimum***
4 Leaf sheaths rounded or weakly keeled; hairs of the raceme internodes 1-3 (-4) mm long; stems erect, not rooting at the lower nodes.
6 Pedicellate spikelets of the proximal spikelet units on each rame staminate, 5-10 mm long, with a lemma, the pedicellate spikelets of the distal units usually smaller (1-4 mm long) and sterile; sheaths and blades densely tomentose to glabrate.....***S. scoparium*** *var.* ***divergens***
6 Most pedicellate spikelets sterile, 1-6 mm long, without a lemma; sheaths and blades usually glabrous, occasionally pubescent.....***S. scoparium*** *var.* ***scoparium***

Schizachyrium littorale (Nash) Bicknell, Seaside Little Bluestem. Coastal dunes and maritime dry grasslands, often with *Uniola paniculata*, *Panicum amarum*, and other dune plants. August-October. E. MA south to NC (or SC?), and inland on the shores of the Great Lakes. In NC, *S. littorale* is present and abundant on dunes of barrier islands from Shackleford Banks, Carteret County south to Brunswick County, near the SC border, and entirely absent from the Outer Banks (from Cape Lookout, Carteret County, north through Hyde County to Dare County). Reported for FL for ne. FL (Duval County) and Panhandle FL (Franklin County). [= FNA, GW, K; < *Andropogon scoparium* Michaux – RAB; = *S. scoparium* var. *littorale* (Nash) Gould – C, Z; = *Andropogon scoparius* Michaux var. *littoralis* (Nash) A.S. Hitchcock – F, G; = *Andropogon littoralis* Nash – HC, S; < *S. scoparium* (Michaux) Nash ssp. *littorale* (Nash) Gandhi & Smeins – Y]

Schizachyrium maritimum (Chapman) Nash. Coastal dunes and grasslands. AL, FL west to e. LA. [= FNA, GW, K; = *Andropogon maritimus* Chapman – HC, S] {add to synonymy}

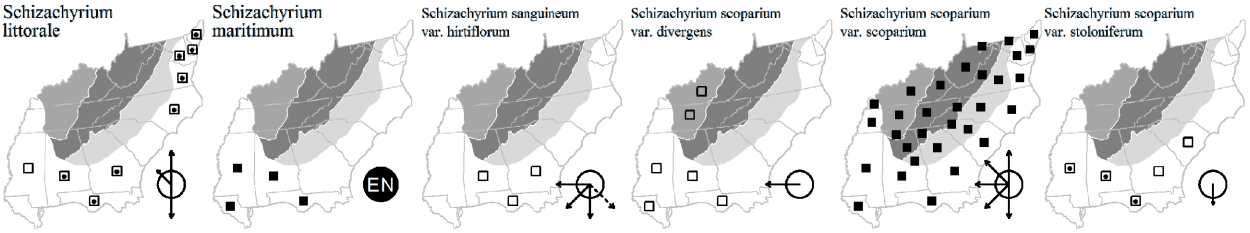
Schizachyrium niveum (Swallen) Gould, Pinescrub Bluestem, is reported for Lowndes Co. in sc. GA (Kral 1973), but the report has been discounted by later authors (Wipff in FNA 2003a). [= FNA, K; = *Andropogon niveus* Swallen – HC, S] {not keyed or mapped}

Schizachyrium sanguineum (Retzius) Alston *var.* ***hirtiflorum*** (Nees) Hatch, Hairy Crimson Bluestem. Pine flatwoods, sandhills, disturbed sandy sites. Sw. GA and FL west to AZ and south through Central America to South America; West Indies. [= FNA, K; = *Andropogon hirtiflorus* (Nees) Kunth – HC, S; *? S. sanguineum* var. *brevipedicellatum* (Beal) Hatch]

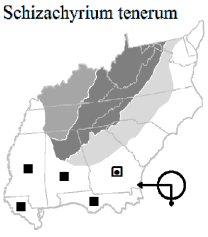
Schizachyrium scoparium (Michaux) Nash *var.* ***divergens*** (Hackel) Gould, Pinehill Bluestem. Various open habitats. KY, AR, and TX, south to Panhandle FL, AL, MS, and LA. [= FNA, K; = *Andropogon scoparius* Michaux var. *divergens* Hackel; = *Andropogon divergens* – HC; < *Andropogon scoparius* – S]

Schizachyrium scoparium (Michaux) Nash *var.* ***scoparium***, Common Little Bluestem. In a wide range of moist to dry habitats. (June-) August-October. NB west to AB, south to FL and Mexico. One of the most ubiquitous plants in the modern landscape of our area, occurring throughout in the majority of habitats. This species is extremely variable, some of the variability correlated with habitat and geography; the recognition of infraspecific taxa is warranted. [= C, FNA, Z; < *Andropogon scoparius* Michaux – RAB (also see *S. littorale*); = *S. scoparium* – GW; > *Andropogon scoparius* var. *scoparius* – F, G, HC; > *Andropogon praematurus* Fernald – F, G; > *Andropogon scoparius* var. *polycladus* Scribner & Ball – F; > *Andropogon scoparius* var. *frequens* F.T. Hubbard – F; = *S. scoparium* ssp. *scoparium* – K, Y; < *Andropogon scoparius* – S, W, WV]

Schizachyrium scoparium (Michaux) Nash *var.* ***stoloniferum*** (Nash) J. Wipff, Creeping Little Bluestem. Fall-line sandhills in the inner Coastal Plain, perhaps in other dry habitats, the habitat and range in our area requiring further study. August-October. SC and GA south to FL and west to MS. See Wipff (1996a) for additional discussion. [= FNA, K, Z; = *S. stoloniferum* Nash – GW; = *Andropogon stolonifer* (Nash) A.S. Hitchcock – HC, S; < *S. scoparium* ssp. *littorale* (Nash) Gandhi & Smeins – Y]



Schizachyrium tenerum Nees, Slender Bluestem. Longleaf pine savannas, sandhills, and flatwoods. Ne. FL, s. GA, and FL Panhandle west to e. TX. [= FNA, K; = *Andropogon tener* (Nees) Kunth – HC, S]



Sclerochloa Palisot de Beauvois 1812 (Hard Grass)

A genus of 2 species, annuals, native of s. Europe and w. Asia. References: Brandenburg in FNA (2007a); Tucker (1996)=Z; Brandenburg, Estes, & Thieret (1991).

* ***Sclerochloa dura*** (Linnaeus) Palisot de Beauvois, Hard Grass, Fairground Grass. Mt (VA, WV), {GA}: athletic fields, lawns; rare, native of Mediterranean Europe. In VA, known from a single site and doubtfully persisting (VBA 2007). Also reported from GA, MD, MS, and TN (Kartesz 1999). [= C, HC, K, Z]

Secale Linnaeus 1753 (Rye)

A genus of 3 species, native to western w. Asia and the Mediterranean. References: Barkworth in FNA (2007a); Tucker (1996)=Z.

* ***Secale cereale*** Linnaeus, Rye. Cp (FL, GA, NC, SC, VA), Pd (GA, NC, SC, VA), Mt (GA, NC, SC, VA, WV): fields; commonly cultivated, uncommonly persistent or volunteering after cultivation, native of Eurasia. May-June. An important crop, cultivated for at least 8000 years. The lemmas have awns 2-6 cm long. [= RAB, C, F, FNA, G, HC, K, Z]

Setaria Palisot de Beauvois 1807 (Foxtail Grass)

A genus of about 110-140 species, of tropical and warm temperate regions. Webster (1995) has merged *Paspalidium* into *Setaria*. References: Webster (1993)=Z; Webster (1995)=Y; Crins (1991)=X; Webster (1988); Rominger in FNA (2003a); Allen in FNA (2003a). Key adapted from FNA. [also see *Pennisetum*]

1 None of the spikelets subtended by a stiff bristle.
  2 Spikelets 2.2-2.4 mm long; glumes and sterile lemma not papery ..... ***S. geminata*** *var.* ***geminata***
  2 Spikelets 2.8-3.0 mm long; glumes and sterile lemma papery ..... ***S. geminata*** *var.* ***paludivaga***
1 Terminal spikelet on each branch subtended by a single bristle (other spikelets also sometimes so subtended)
  3 Most spikelets other than the terminal lacking a subtending bristle; leaves plicate; [rare aliens].
    4 Annual; leaves 10-25 mm wide..... ***S. barbata***
    4 Perennial; leaves 20-80 mm wide ..... ***S. palmifolia***
  3 All spikelets subtended by 1 or more bristles; leaves flat; [aliens and natives, collectively widespread and common].
    5 Bristles 4-12 below each spikelet.
      6 Annual, with fibrous roots ..... ***S. pumila*** *ssp.* ***pumila***
      6 Perennial, noticeably rhizomatous.
        7 Panicle 3-8 (10) cm long; plant from knotty rhizomes; [native, common (sometimes weedy)] ..... ***S. parviflora***
        7 Panicle 5-25 cm long; plant from thick rhizomes; [alien, rare]..... ***S. sphacelata***
    5 Bristles 1-3 (rarely 6) below each spikelet.
      8 Bristles retrorsely scabrous.
        9 Leaves strigose on the lower surface; sheath margins glabrous; panicles 2-6 cm long ..... ***S. adhaerans***
        9 Leaves scabrous on the lower surface; sheath margins ciliate; panicles 5-15 cm long ..... ***S. verticillata***
      8 Bristles antrorsely scabrous
        10 Perennial..... ***S. macrosperma***
        10 Annual.
          11 Upper lemmas smooth and shiny (occasionally with obscure rugosity)
            12 Culms to 1 m tall; spikelets ca. 3 mm long; [alien, of ruderal sites]..... ***S. italica***
            12 Culms to 6 m tall; spikelets ca. 2 mm long; [native, of marshes] ..... ***S. magna***
          11 Upper lemmas distinctly transversely rugose, dull.
            13 Upper lemmas coarsely rugose; leaves 4-7 mm wide; [native]..... ***S. corrugata***
            13 Upper lemmas finely rugose; leaves 4-25 mm wide; [aliens, generally of ruderal sites].
              14 Panicles verticillate; rachises visible, scabrous..... ***S. verticilliformis***
              14 Panicles densely spiciform; rachises not visible, villous.
                15 Leaves softly pilose on the upper surface; panicles arching and drooping from the base; spikelets 2.5-3.0 mm long..... ***S. faberi***
                15 Leaves scabrous on the upper surface; panicles nodding only at the tip; spikelets 1.8-2.2 mm long.
                  16 Panicles 10-20 cm long; culms 10-25 dm tall; leaves 10-25 mm wide..... ***S. viridis*** *var.* ***major***
                  16 Panicles 3-8 cm long; culms 2-10 dm tall; leaves 4-12 mm wide ..... ***S. viridis*** *var.* ***viridis***

* ***Setaria barbata*** (Lamarck) Kunth, Mary-grass. Cp (FL, MS): on ballast at Apalachicola (Franklin County, FL), other disturbed areas; rare, native of Africa. [= FNA, HC, K]

Setaria corrugata (Elliott) J.A. Schultes. Cp (FL, GA, NC, SC): pinelands, disturbed areas; common. From ne. NC south to s. FL, west to e. TX; Cuba; Dominican Republic. [= RAB, FNA, HC, K, Z; = *Chaetochloa corrugata* (Elliott) Lamson-Scribner – S]

* ***Setaria faberi*** R.A.W. Herrmann, Nodding Foxtail Grass, Giant Foxtail-grass. Mt (GA, NC, SC, VA, WV), Pd (DE, GA, NC, SC, VA), Cp (DE, FL, GA, NC, SC, VA): disturbed areas; common (uncommon south of VA), native of China. [= RAB, C, FNA, G, K, W; = *S. faberii* – F, HC, WV, Z, orthographic variant]

Setaria geminata (Forsskål) Veldkamp *var.* ***geminata***. Cp (AL, FL): in shallow water of swamps; uncommon. Pantropical and –subtropical. [= Y; < *Paspalidium geminatum* – FNA, GW, X; = *Panicum geminatum* Forsskål – HC, S; = *Paspalidium geminatum* (Forsskål) Stapf var. *geminatum* – K]

Setaria geminata (Forsskål) Veldkamp *var.* ***paludivaga*** (A.S. Hitchcock & Chase) R.D. Webster, Alligator Grass, Paspalidium. Cp (FL, GA, SC): in shallow water; rare. December. S. SC south to FL, west to TX; also in Central and South America. This taxon is sometimes considered an introduction from the Old World, but its occurrence in undisturbed wetlands remote from extensive human activity suggests that it is native. [= Y; = *Panicum paludivagum* A.S. Hitchcock & Chase – RAB, HC, S; < *Paspalidium geminatum* – FNA, GW, X; = *Paspalidium geminatum* (Forsskål) Stapf var. *paludivagum* (A.S. Hitchcock & Chase) Gould – K; = *Paspalidium paludivagum* (A.S. Hitchcock & Chase) Parodi]

* ***Setaria italica*** (Linnaeus) Palisot de Beauvois, Foxtail-millet, Italian-millet. Pd (DE, GA, NC, SC, VA), Cp (DE, VA), Mt (VA, WV): disturbed areas, rare (uncommon in VA Piedmont), native of Eurasia. Probably derived via cultivation from *S. viridis*, and cultivated as a food crop in China since at least 6000 BP and later in Europe (Hancock 2004). [= RAB, C, F, FNA, G, HC, K, W, WV, Z; = *Chaetochloa italica* (Linnaeus) Lamson-Scribner – S]

Setaria macrosperma (Lamson-Scribner & Merrill) K. Schumann, Coral Bristlegrass. Cp (FL, GA, SC): hammocks and maritime forests, also disturbed areas; rare. SC south to FL; Bahamas, Mexico. [= RAB, FNA, HC, K, Z; = *Chaetochloa macrosperma* Lamson-Scribner & Merrill – S]

Setaria magna Grisebach, Saltmarsh Foxtail-grass, Giant Foxtail-grass. Cp (DE, FL, GA, NC, SC, VA), Pd* (GA*): interdune swales, near-coastal marshes; common (uncommon south of DE). NJ south to s. FL, west to e. TX; disjunct inland in GA, AR, LA, TX, and NM; West Indies, Bermuda, Costa Rica. [= RAB, C, F, FNA, G, HC, K, Z; = *Chaetochloa magna* (Grisebach) Lamson-Scribner – S]

* ***Setaria palmifolia*** (J. König) Stapf, Palmgrass. Cp (FL, LA): disturbed areas; rare, native of Asia. [= FNA, HC, K]

Setaria parviflora (Poiret) Kerguélen, Knotroot Bristlegrass, Perennial Foxtail-grass. Cp (DE, FL, GA, NC, SC, VA), Pd (GA, NC, SC, VA), Mt (GA, NC, SC, VA, WV): marshes, ditches, moist disturbed areas; common (uncommon in DE and WV). MA to IA south to s. FL and s. TX, south through Mexico to Central America; CA and NV; West Indies. Gandhi & Barkworth (2003) provide a detailed discussion of the reasons for the nomenclatural change. [= FNA, K, Z; = *S. geniculata* Palisot de Beauvois – RAB, C, F, G, HC, W, WV; = *Chaetochloa geniculata* (Palisot de Beauvois) Millspaugh & Chase – S]

* ***Setaria pumila*** (Poiret) Roemer & Schultes *ssp.* ***pumila***, Yellow Foxtail. Mt (GA, NC, SC, VA), Pd (DE, GA, NC, SC, VA), Cp (DE, FL, GA, NC, SC, VA): disturbed areas, lawns, fields; common (rare in FL), native of Europe. [= FNA; = *Setaria glauca* (Linnaeus) Palisot de Beauvois – RAB, C, F, G, W, WV, misapplied; >< *Setaria lutescens* (Weigel) Hubb. – HC, misapplied; >< *S. pumila* ssp. *pallidifusca* – K, treatment apparently garbled; = *Chaetochloa lutescens* (Weigel) Stuntz – S]

* ***Setaria sphacelata*** (Schumacher) Stapf & C.E. Hubbard, African Bristlegrass. Cp (AL, FL, MS): disturbed areas; rare, native of Africa. [= FNA, K]

* ***Setaria verticillata*** (Linnaeus) Palisot de Beauvois, Hooked Bristlegrass. Mt (VA, WV), Pd (DE), Cp (DE): disturbed areas; common (uncommon in VA, rare in WV), native of Europe. [= FNA, G, K, WV; = *S. verticillata* var. *verticillata* – C, F, HC; = *Chaetochloa verticillata* (Linnaeus) Lamson-Scribner – S; < *S. verticillata* – Z]

* ***Setaria viridis*** (Linnaeus) Palisot de Beauvois *var.* ***viridis***, Green Bristlegrass. Cp (DE, FL, GA, NC, SC, VA), Pd (DE, GA, NC, SC, VA), Mt (GA, NC, SC, VA, WV): fields, disturbed areas; common, native of Eurasia. [= C, FNA, K, Z; < *S. viridis* – RAB, HC, W, WV; > *S. viridis* var. *viridis* – F, G; > *S. viridis* var. *weinmannii* (Roemer & J.A. Schultes) Bolbás – F; > *S. viridis* var. *breviseta* (Doell) A.S. Hitchcock – G; = *Chaetochloa viridis* (Linnaeus) Lamson-Scribner – S]

Setaria adhaerans (Forsskål) Chiovenda. Cp (AL): disturbed areas; rare. Distributed widely throughout the tropics and subtropics, in North America from s. AL west to CA (perhaps only adventive in portions of that distribution). [= FNA, K, Z] {synonymy incomplete}

* *Setaria verticilliformis* Dumortier. Reported for NJ, PA, MD, and AL (FNA 2003a, Kartesz 1999). [= FNA, K; = *S. verticillata* (Linnaeus) Palisot de Beauvois var. *ambigua* (Guss.) Parlatore – C, F, HC; = *S. viridis* (Linnaeus) Palisot de Beauvois var. *ambigua* (Guss.) Coss. & Durieu – G; = *Chaetochloa ambigua* Guss. – S; < *S. verticillata* – Z]

* *Setaria viridis* (Linnaeus) Palisot de Beauvois var. *major* (Gaudin) Pospichal, Giant Green Foxtail. Reported as introduced in TN, MD, and PA (Kartesz 1999). [= C, FNA, G, K, Z; < *S. viridis* – RAB, HC]

Sorghastrum Nash 1901 (Indiangrass)

A genus of about 18-20 species, of tropical and subtropical America and Africa, rarely extending into temperate areas. References: Hall (1982)=Z; Dávila Aranda & Hatch in FNA (2003a). Key adapted from Z.

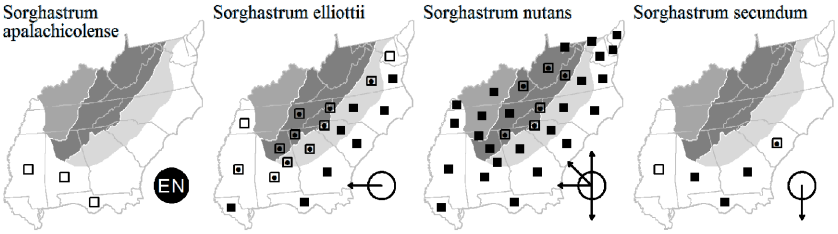
1 Awns 10-22 (-30) mm long, once-geniculate; plants rhizomatous; surfaces of the glumes tan to slightly brown basally; ligule 2-10 mm long, prominently auricled.....***S. nutans***
1 Awns 16-46 mm long, twice-geniculate; plants cespitose; surfaces of the glumes brown; ligule 1-5 mm long, truncate.
  2 Axis of the panicle straight, erect, the branchlets appressed to ascending, the spikelets drooping-secund; spikelets 0.8-1.2 mm wide .....***S. secundum***
  2 Axis of the panicle arching, usually strongly so, the branchlets ascending to spreading, the spikelets not drooping-secund; spikelets 1.1-1.8 mm wide.
    3 Axis of the panicle straight, with the branches distributed no more than 180 degrees around the axis (as viewed from above).....***S. apalachicolense***
    3 Axis of the panicle arching, with the branchlets distributed through 360 degrees around the axis (as viewed from above) .....***S. elliottii***

Sorghastrum apalachicolense D.W. Hall, Apalachicola Indiangrass, Open Indiangrass. Flatwoods and sandhills. July-August. Panhandle FL west to s. MS (Sorrie & Leonard 1999). It may well occur as well in GA. [= K, Z; < *S. elliottii* – FNA]

Sorghastrum elliottii (C. Mohr) Nash, Slender Indiangrass. Woodlands and forests, river-scour areas, including oak-hickory forests and woodlands over mafic rocks. September-October. MD south to FL and west to TX, inland to TN, AR, and OK, mainly on the Coastal Plain, but extending inland to other physiographic provinces. [= RAB, C, F, G, HC, K, S, W, Z; < *S. elliottii* – FNA (also see *S. apalachicolense*)]

Sorghastrum nutans (Linnaeus) Nash, Yellow Indiangrass. Xeric and mesic woodlands and forests of a, WV wide variety, powerline rights-of-way, roadbanks. September-October. ME and QC west to s. MB, south to c. peninsular FL, TX, UT, AZ, and Mexico. Along with *Andropogon gerardii*, *Schizachyrium scoparium*, and *Panicum virgatum*, *Sorghastrum nutans* is one of the dominant grasses of the tall-grass prairie. It is also common in a variety of open habitats (natural and altered) in the forested landscape of eastern North America. [= RAB, C, F, FNA, G, HC, K, S, W, WV, Z; = *S. avenaceum* (Michaux) Nash]

Sorghastrum secundum (Elliott) Nash, Lopsided Indiangrass. Sandhills. September-October. S. SC south to s. FL and west to s. AL (Sorrie & Leonard 1999). [= RAB, FNA, HC, K, S, Z]



Sorghum Moench 1794 (Sorghum, Milo, Johnson Grass)

A genus of about 25 species, of tropical and subtropical Old World (1 species in Mexico). References: Barkworth in FNA (2003a); de Wet (1978)=Z.

1 Rhizomatous perennial; leaves 1-2 cm wide..... ***S. halepense***
1 Fibrous-rooted annual; leaves (2-) 3-5 cm wide.
2 Inflorescence dense, compact; plants 0.5-1.3 m tall..... ***S. bicolor*** *var.* ***bicolor***
2 Inflorescence open, with spreading branches; plants 1.0-3.0 m tall ..... ***S. bicolor*** *var.* ***drummondii***

* ***Sorghum bicolor*** (Linnaeus) Moench *var.* ***bicolor***, Sorghum, Milo, Broomcorn, Sorgo. Cp (FL, GA, NC, SC, VA), Pd (GA, NC, SC, VA), Mt (VA): cultivated, rarely persistent; common in cultivation, rare as an escape. October. [= C; < *Sorghum vulgare* Persoon – RAB; < *Sorgum vulgare* – F, orthographic variant; = *S. vulgare* var. *vulgare* – HC; = *S. bicolor* ssp. *bicolor* – FNA, K; < *Holcus sorghum* Linnaeus – S]

* ***Sorghum bicolor*** (Linnaeus) Moench *var.* ***drummondii*** (Nees ex Steudel) Mohlenbrock, Shattercane. Cp, Pd (GA, NC, SC, VA): cultivated, rarely persistent; common in cultivation, rare as an escape. October. This is the taller variety with open inflorescences, usually sporadically present in sorghum fields. [= C; < *Sorghum vulgare* Persoon – RAB; < *Sorgum vulgare* – F, orthographic variant; = *Sorghum bicolor* ssp. ×*drummondii* (Nees ex Steudel) de Wet – FNA; = *Sorghum vulgare* Persoon var. *drummondii* (Nees ex Steudel) Hackel ex Chiovenda – HC; = *Sorghum bicolor* ssp. *drummondii* (Nees ex Steudel) de Wet & Harlan – K; < *Holcus sorghum* Linnaeus – S]

* ***Sorghum halepense*** (Linnaeus) Persoon, Johnson Grass. Cp (DE, FL, GA, NC, SC, VA), Pd (GA, NC, SC, VA), Mt (GA, NC, SC, VA, WV): roadsides, fields, waste places; common, native of Eurasia. A serious weed, difficult to eradicate. [= RAB, C, FNA, GW, HC, K, W, WV; = *Sorgum halepense* – F, G, orthographic variant; = *Holcus halepensis* Linnaeus – S]

Spartina Schreber 1789 (Cordgrass)

A genus of ca. 15 species, of temperate America, Europe, and Africa. References: Barkworth in FNA (2003a).

1 Leaves with smooth or slightly scabrous margins; spikelets glabrous or nearly so; [of salt to brackish coastal marshes]..... ***S. alterniflora***
1 Leaves with strongly scabrous margins; spikelets scabrous, at least on the keel; [of brackish to fresh marshes, or inland or upland].
2 Plants strongly cespitose, forming large clumps with numerous basal leaves and culms; leaves involute; culms 0.5-2 m tall; [of s. SC southward].
3 Spikes 3-16 per inflorescence, appressed to ascending; leaves 3-7 mm wide, involute or somewhat flat toward the bases..... ***S. bakeri***
3 Spikes (6-) 15-75 per inflorescence, tightly appressed; leaves 1.5-4.5 mm wide, strongly involute ..... ***S. spartinae***
2 Plants with elongate rhizomes, forming large clonal patches, the culms arising singly; leaves involute or flat; culms either 0.5-3.5 m tall; [collectively widespread in our area].
4 Spikes 1-9 per inflorescence; culms 0.5-1 m tall; leaves 0.5-4 (-7) mm wide, usually involute when fresh ..... ***S. patens***
4 Spikes 5-70 per inflorescence; culms 1-3.5 m tall; leaves 5-20 mm wide, usually flat when fresh.
5 Second glume acute, not awned; first glume averaging ca. 1/2 as long as the lemma; spikes (6-) 20-50 (-more) per inflorescence; [of fresh to brackish coastal marshes]..... ***S. cynosuroides***
5 Second glume with an awn 3-10 mm long; first glume averaging ca. 7/8 as long as the lemma; spikes (5-) 7-27 per inflorescence; [of fresh marshes, either inland or coastal]..... ***S. pectinata***

Spartina alterniflora Loiseleur, Saltmarsh Cordgrass, Smooth Cordgrass. Salt marshes. August-October. NL (Newfoundland) south to FL, west to TX; e. South America; introduced in n. Europe. *S. alterniflora* is the dominant plant (often essentially a monoculture) of intratidal salt marshes in our area. [= RAB, C, FNA, GW, K, WH; > *S. alterniflora* var. *alterniflora* – F, G, HC, S; > *S. alterniflora* var. *glabra* (Muhlenberg ex Bigelow) Fernald – F, G, HC, S; > *S. alterniflora* var. *pilosa* (Merrill) Fernald – F, G, HC]

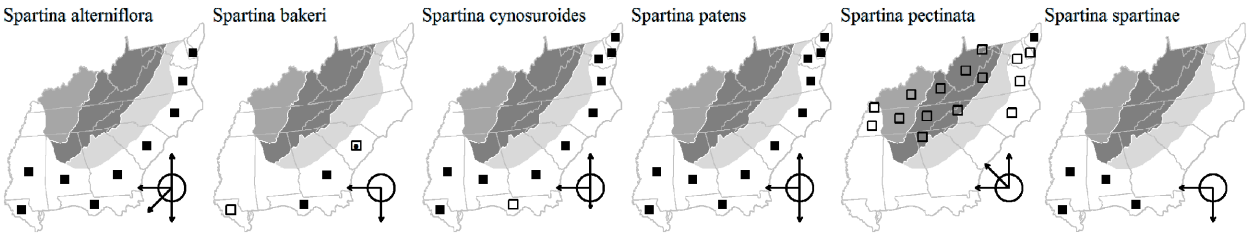
Spartina bakeri Merrill, Sand Cordgrass. Brackish marshes, marsh edges, wet coastal hammocks, under *Sabal palmetto*, *Quercus virginiana*, and *Juniperus virginiana* var. *silicicola*. June. Se. SC south to s. FL, west to Panhandle FL. Along with *S. spartinae*, distinctive among our species in its densely clumped growth form. [= FNA, GW, HC, K, S, WH]

Spartina cynosuroides (Linnaeus) Roth, Giant Cordgrass. Brackish and freshwater tidal marshes, especially along margins of tidal creeks. June-September. MA south to FL, west to e. TX. [= RAB, C, FNA, G, GW, HC, K, S, WH; > *S. cynosuroides* var. *cynosuroides* – F]

Spartina patens (Aiton) Muhlenberg, Small Saltmeadow Cordgrass, Salt Hay, Marsh-hay Cordgrass. Dunes, sand flats, upper edges of marshes, maritime wet grasslands, overwash flats. June-September. NL (Newfoundland) south to FL, west to TX. Var. *monogyna* has spikelets 7-10 mm long (vs. 9-13 mm); second glume acute to obtuse (rarely acuminate) (vs. acuminate); spikes (2-) 4-9 per inflorescence (vs. 1-4); second highest leaf blade on the stem (1-) avg. 2 (-5) dm long (vs. 0.5-2 dm); plants to 15 dm tall (vs. to 8 dm); culms to 6 mm in diameter at base (vs. to 3 mm). Whether var. *monogyna* is worthy of recognition is a matter of debate; there appear to be morphological differences correlated with geography and, according to some authors, habitat, but positive identification to variety is sometimes difficult. [= RAB, C, FNA, GW, K, S, WH; > *S. patens* var. *patens* – F, G, HC; > *S. patens* var. *monogyna* (M.A. Curtis) Fernald – F, G, HC]

Spartina pectinata Link, Prairie Cordgrass, Slough Grass. Banks of rivers and lakes, spray cliffs below waterfalls, rocky or sandy flood-scoured riverside grasslands, tidal freshwater (oligohaline) marshes, calcareous oak flatwoods and prairies. July-September. NL (Newfoundland) west to WA, south to ne. NC, sw. NC, AR, TX, and NM. [= RAB, C, F, FNA, G, GW, HC, K, W, WV; > *S. pectinata* var. *pectinata* – F; > *S. pectinata* var. *suttiei* (Farwell) Fernald – F; = *S. michauxiana* A.S. Hitchcock – S]

Spartina spartinae (Trinius) Merr. ex A.S. Hitchcock, Gulf Cordgrass. Brackish marshes and inland saline situations. AL and FL west to TX. [= FNA, GW, HC, K, S, WH]



Sphenopholis Scribner 1906 (Wedgegrass)

A genus of 6 species, North American. References: Daniel in FNA (2007a); Tucker (1996)=Z. Key based in part on C.

1 Spikelets 5-9.5 mm long; second lemma with an awn 3.5-7 mm long..... ***S. pensylvanica***
1 Spikelets 1.5-5 mm long; second lemma awnless, or with an awn up to 3.5 mm long.
2 Lower leaf blades mostly (10-) 15-45 cm long, usually involute, < 2 mm wide..... ***S. filiformis***
2 Lower leaf blades mostly < 10 cm long, flat, 2-8 mm wide.
3 First glume ⅓-⅔ as wide as the second glume; second lemma strongly scabrous..... ***S. nitida***
3 First glume less tha ⅓ as wide as the second glume; second lemma smooth to slightly scabrous.
4 First lemma with an awn up to 3.5 mm long..... ***S. ×pallens***
4 First lemma unawned.
5 Panicle open; second glume 3-6× as long as wide, acute at the tip; lowermost rachilla internode 0.8-1.0 mm long ..... ***S. intermedia***
5 Panicle densely cylindrical; second glume 2-3× as long as wide, rounded or truncate at the tip; lowermost rachilla internode 0.5-0.7 mm long..... ***S. obtusata***

Sphenopholis filiformis (Chapman) Scribner. Cp (FL, GA, NC, SC, VA), Pd (GA, NC, SC): pine savannas, sandy woodlands; common (uncommon north of FL, rare in VA). April-May. Se. VA south to n. peninsular FL, west to e. TX. [= RAB, C, F, FNA, K, S, WH, Z]

Sphenopholis intermedia (Rydberg) Rydberg, Slender Wedgegrass. Mt (GA, NC, SC, VA, WV), Pd (DE, GA, NC, SC, VA), Cp (DE, FL, GA, NC, SC, VA): moist nutrient-rich forests; uncommon (rare in DE, GA, NC, SC, and VA). May-June. NL (Newfoundland) west to c. AK, south to Panhandle FL, c. TX, and AZ. Perhaps better treated at the varietal level. [= RAB, F, FNA, K, S, WV; = *S. obtusata* (Michaux) Scribner var. *major* (Torrey) K.S. Erdman – C, Z; < *S. intermedia* – G (also see *S. ×pallens*); < *S. obtusata* – GW, W, WH]

Sphenopholis nitida (Biehler) Scribner. Cp (DE, FL, GA, NC, SC, VA), Pd (DE, GA, NC, SC, VA), Mt (GA, NC, SC, VA, WV): moist forests, bottomlands; common (uncommon in FL and WV). April-May. MA west to IL, south to n. peninsular FL and TX. [= RAB, C, F, FNA, K, W, S, WH, WV, Z; > *S. nitida* var. *glabra* (Nash) Scribner – G; > *S. nitida* var. *nitida* – G]

Sphenopholis obtusata (Michaux) Scribner, Prairie Wedgegrass. Cp (DE, FL, GA, NC, SC, VA), Pd (DE, GA, NC, SC, VA), Mt (GA, NC, SC, VA, WV): forests, roadsides, disturbed areas; common (uncommon in Mountains). April-May. ME west to MN and BC, south to s. FL, TX, c. Mexico, and s. CA. [= RAB, FNA, G, K, S, WV; = *S. obtusata* var. *obtusata* – C, Z; > *S. obtusata* var. *obtusata* – F; > *S. obtusata* var. *pubescens* (Lamson-Scribner & Merrill) Lamson-Scribner – F; < *S. obtusata* – GW, W, WH (also see *S. intermedia*)]

Sphenopholis ×pallens (Biehler) Scribner (pro sp.) [*S. obtusata* × *pensylvanica*]. Cp (NC, SC, VA): ditches, wet forests; rare. Seemingly not always with its parents. May. [= C, K; = *S. pallens* – RAB, F, S; < *S. intermedia* (Rydberg) Rydberg – G]

Sphenopholis pensylvanica (Linnaeus) A.S. Hitchcock, Swamp-oats. Mt (GA, NC, SC, VA, WV), Pd (DE, GA, NC, SC, VA), Cp (DE, FL, NC, SC, VA): bogs, ditches, wet forests; uncommon (rare in DE). April-June. MA west to OH and se. MO, south to n. peninsular FL and LA. [= C, FNA, K, WH, Z; = *Trisetum pensylvanicum* (Linnaeus) Palisot de Beauvois ex Roemer & J.A. Schultes – RAB, F, G, S, WV; = *S. pennsylvanica* – GW, orthographic variant]

Sporobolus R. Brown 1810 (Dropseed)

A genus of about 160 species, perennials and annuals, of tropical, subtropical, and warm-temperate parts of the New World and Old World. References: Riggins (1977)=Z; Weakley & Peterson (1998)=Y; Peterson, Hatch, & Weakley in FNA (2003a).

1 Inflorescence an open panicle, > 2 cm broad, the branches ascending to spreading.
2 Branches of the panicle verticillate, whorled; spikelets 2.5-4 mm long ..... ***S. junceus***
2 Branches of the panicle alternate (some occasionally rather randomly subopposite or opposite, but never regularly whorled); spikelets either 4-6.5 mm long, or 1.5-2.5 (2.7) mm long.
3 Spikelets 1.5-2.5 (-2.7) mm long.
4 Panicle branches bare of spikelets in the lower ¼-⅛ of their length ..... ***S. cryptandrus***
4 Panicle branches bearing spikelets to the base ..... ***S. domingensis***
3 Spikelets 4-6.5 mm long.
5 First glume scaberulous, acuminate or awn-like; spikelets dark gray; base of plant relatively fibrous; grain spherical; [of rocky barrens of the Mountains of NC and VA] ..... ***S. heterolepis***
5 First glume glabrous, acute to acuminate; spikelets purplish (fading tan); base of plant smooth and hard, made up of the indurated leaf bases; grain oblong (when present, usually abortive); [of pine savannas and seeps of the Coastal Plain of NC, SC, and southward].
6 Leaves terete or subterete (wiry), oval in cross-section, sometimes irregularly channelled for portions of their lengths (never with any portion above the sheath flat), < 1 mm wide, tending to senesce and turning tan in autumn, the margins generally smooth; culms (including the inflorescence) (2-) 4-7 (-10) dm tall; culms (from base to first inflorescence branch) 1.5-5 dm tall; first glume averaging about 0.7× as long as the second glume (though variable, ranging from 0.5-0.75×) ..... ***S. teretifolius***
6 Leaves flat (folded when dry), plane or V-shaped in cross-section, with free margins their entire length, 1.2-2 (-2.7) mm wide, tending to remain green into the winter (at least until December), the margins scabrous (except in *S. curtissii*); culms (including the inflorescence) 3-22 dm tall; culms (from base to first inflorescence branch) (4-) 6-10 dm tall; first glume averaging 0.75-1× as long as the second glume (though variable, collectively ranging from about 0.6-1.2×).
7 First glume averaging 0.95-1.1× as long as the second glume (though variable, ranging from 0.8-1.3×); pedicels mostly 1-3 mm long (a few sometimes as long as 10 mm long), appressed; culms (including the inflorescence) 3-7 dm tall; inflorescence branches stiffly ascending; leaves 0.5-1.5 mm wide (or to 2.0 mm wide when unburned), mostly 1.5-4 dm long (rarely to 5 dm long), smooth on the margins; [of e. SC southward] ..... ***S. curtissii***
7 First glume averaging 0.6-0.9× as long as the second glume (though variable, ranging from 0.6-0.95×); pedicels mostly 4-15 mm long, spreading; culms (including the inflorescence) (3-) 7-16 (-22) dm tall; inflorescence branches initially ascending, later loosely ascending to spreading; leaves 1.2-10.0 mm wide, mostly (3-) 4-8 dm long, upwardly scabrous on the margins; [of e. NC southward].
8 Leaves (2.0-) 3-10 mm wide, pale bluish-green (often with some yellowish leaves as well); first glume averaging 0.75-0.9× as long as the second glume (though variable, ranging from 0.6-0.95×); culms (including the inflorescence) usually 12-22 dm tall; inflorescence usually 3.5-5 dm long; [of se. SC southward] ..... ***S. floridanus***
8 Leaves 1.2-2.0 (-3.0) mm wide, dark green; first glume averaging 0.6-0.8× as long as the second glume (though variable, ranging from 0.6-0.8×); culms (including the inflorescence) usually 6-12 (-18) dm tall; inflorescence usually 2-3.5 dm long; [of e. NC south to e. GA] ..... ***S. pinetorum***

1 Inflorescence a contracted, spike-like panicle, < 2 cm broad, the branches appressed.
9 Plant a geniculate annual; most inflorescences enclosed by sheaths (or most or all exserted); inflorescence 2-5 cm long.
10 Spikelets (1.3-) 1.6-2.8 mm long; grain falling free of the lemma and palea; lemma glabrous ..... ***S. neglectus***
10 Spikelets 2.3-5 mm long; grain falling enclosed in the lemma and palea; lemma strigose (use 10× or more) or glabrous.
11 Lemma and palea shorter than the glumes; palea usually shorter than the lemma; lemma glabrous or strigose with hairs < 0.2 mm long; spikelets 2.3 -3.3 (-3.8) mm long; floret (lemma, palea and enclosed grain) 1.6-3.3 (-3.8)× as long as wide ..... ***S. ozarkanus***
11 Lemma and palea longer than the glumes; palea usually longer than the lemma; lemma strigose with hairs > 0.2 mm long; spikelets 2.8-5 mm long; floret (lemma, palea and enclosed grain) 2.2-5.7 (-7.5)× as long as wide ..... ***S. vaginiflorus***
9 Plant a rhizomatous or tufted perennial; most inflorescences exserted to partly enclosed; inflorescence 5-15 cm long.
12 Plant creeping extensively by slender rhizomes; leaf blades cauline, distichous, to 12 cm long ..... ***S. virginicus***
12 Plant loosely tufted, from short rhizomes; leaf blades basal or cauline, not distichous, 10-100 cm long.
13 Spikelets 1.5-2.2 mm long; first glume 0.5-0.8 mm long; leaves primarily basal.
14 Panicle branches appressed, 0.5-2 cm long in the middle of the inflorescence; second glume acute, > ½ as long as the spikelet ..... ***S. indicus***
14 Panicle branches ascending, 2-8 cm long in the middle of the inflorescence; second glume truncate or broadly obtuse, < ½ as long as the spikelet ..... ***S. pyramidalis***
13 Spikelets 4-8 mm long; first glume 2-5 mm long; leaves cauline and basal.
15 Lemma pubescent, usually conspicuously shorter than the palea; pericarp loose when moist ..... ***S. clandestinus***
15 Lemma glabrous, about as long as the palea; pericarp gelatinous when moist.
16 Culms (1.4-) 2.0-5.0 mm thick; terminal sheath (1.3-) 1.5-6.0 mm wide; panicles with 12-35 primary branches, crowded, dense ..... ***S. compositus*** *var.* ***compositus***
16 Culms 1.0-2.0 (-2.5) mm thick; terminal sheath 0.8-2.0 (-2.5) mm wide; panicles with 8-18 primary branches, lax, loosely flowered ..... ***S. compositus*** *var.* ***drummondii***

* ***Sporobolus airoides*** (Torrey) Torrey, Alkali Sacaton. Waste areas near wool-combing mills; intoduced from w. North America, not known to be established or persistent. [= FNA, HC, K] {not keyed}

Sporobolus clandestinus (Biehler) A.S. Hitchcock, Rough Dropseed. Glades, barrens, and thin soil of woodlands, also in dry sands. September-October. This species is widespread in e. United States. Wipff & Jones (1995) recommend reducing this taxon to a variety under *S. compositus*, because of its morphologic similarity. While *S. clandestinus* and *S. compositus* are undoubtedly closely related, I prefer to retain the two as species. [= RAB, C, FNA, F, G, HC, K, S, W, Z; = *S. compositus* (Poiret) Merrill var. *clandestinus* (Biehler) J. Wipff & S.D. Jones]

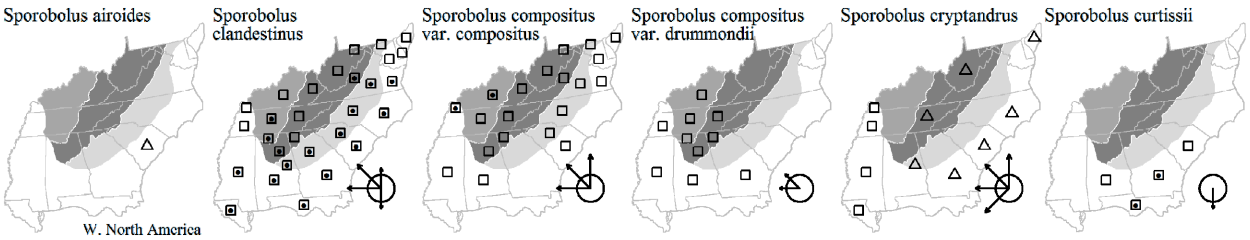
Sporobolus compositus (Poiret) Merrill *var.* ***compositus***, Tall Dropseed. Diabase glades and barrens, limestone glades and barrens, disturbed areas over diabase or calcareous rocks. September-November. This species and variety are reported for NC in

a recent revision of the *S. asper* group (Riggins 1977); little is known about the occurrence of this species in NC. The general range is centered in the Plains, but extending east into ne. United States. The name *S. compositus* has nomenclatural priority over the more familiar *S. asper* (Kartesz & Gandhi 1995). [= FNA, K; = *S. asper* (Michaux) Kunth var. *asper* – C, G, HC, Z; = *S. asper* – F, S, WV]

Sporobolus compositus (Poiret) Merrill *var.* ***drummondii*** (Trinius) Kartesz & Gandhi. Glades, barrens, roadsides, disturbed areas. East to the Ridge and Valley province of e. TN (Chester et al. 1993), occurring over limestone, and allegedly to GA (Kartesz 1999). It could very likely occur in sw. VA, as it is in Hawkins County, TN, immediately adjacent to VA (Chester et al. 1993). [= FNA, K; = *S. asper* (Michaux) Kunth var. *drummondii* (Trinius) Vasey – C, Z; = *S. drummondii* (Trinius) Vasey – F, S; = *S. asper* var. *hookeri* (Trinius) Vasey – G, HC, misapplied]

Sporobolus cryptandrus (Torrey) A. Gray, Sand Dropseed. Floodplains, shores, disturbed areas; native west of the Appalachians, introduced eastward. C. and w. North America. This species is reported for NC by HC, F, and S. [= C, FNA, G, K, HC, S, WV, Z; > *S. cryptandrus* var. *cryptandrus* – F]

Sporobolus curtissii (Vasey ex Beal) Small ex Scribner, Curtiss's Dropseed. Moist, gummy-clay flatwoods. September-November. E. SC south to c. FL. First positively documented for our area in 1993. Earlier attributions of *S. curtissii* to NC and SC were apparently based on misapplication or confusion with *S. teretifolius* and/or *Sporobolus pinetorum*. *S. curtissii* differs from other "bunchgrass" *Sporobolus* of our area in having the spikelets short-pedicelled and appressed against the panicle branches (as opposed to long-pedicelled and spreading in *S. teretifolius* and *Sporobolus pinetorum*). [= FNA, HC, K, S, Y]



*? ***Sporobolus domingensis*** (Trinius) Kunth, Coral Dropseed. Cp (GA): coastal sands?; rare, uncertain whether native or introduced. Se. GA south to s. FL; West Indies, Mexico. The e. GA record (Glynn County) is at Univ. of Georgia (Sorrie, pers. comm.). [= FNA, HC, K, S]

Sporobolus floridanus Chapman, Florida Dropseed. Cp (FL, GA, SC): wet savannas; uncommon (rare in SC). June-September. Se. SC south to ne. FL, west to Panhandle FL. First positively documented for SC in 1995. Earlier attributions of *S. floridanus* to NC and SC were apparently based on misapplication or confusion with *Sporobolus pinetorum*. [= FNA, K, Y; < *S. floridanus* – GW, HC, S (also see *S. pinetorum*); the inclusion of *S. floridanus* in RAB was based on a misidentification of *S. pinetorum*]

Sporobolus heterolepis (A. Gray) A. Gray, Prairie Dropseed. Mt (GA, NC, VA), Ip (KY): barrens, glades, and prairies over mafic, ultramafic, and calcareous rocks (olivine, serpentine, limestone); rare. August-September. The primary distribution of *S. heterolepis* is in the Plains, with outliers east to nw. GA (Jones & Coile 1988), c. TN (Estes & Beck 2005), w. NC, w. VA, se. PA, ne. United States, and adjacent Canada. [= RAB, C, F, FNA, G, HC, K, W, Y]

Sporobolus indicus (Linnaeus) R. Brown, Smut Grass, Blackseed. Cp (FL, GA, NC, SC, VA), Pd (GA, NC, SC, VA), Mt (GA, KY, NC, SC, VA), Ip (KY): roadsides, lawns, disturbed situations; common (rare in KY, rare in VA Mountains). Pantropical and subtropical, its original distribution obscured by its weedy capabilities and sometimes considered introduced in whole or in part. July-October. [= C, FNA, GW, W; > *S. poiretii* (Roemer & J.A. Schultes) A.S. Hitchcock – RAB, F, G, HC; > *S. indicus* – HC, S; > *S. berteroanus* (Trinius) A.S. Hitchcock & Chase – S; = *S. indicus* var. *indicus* – K]

Sporobolus junceus (Palisot de Beauvois) Kunth, Sandhills Dropseed. Cp (FL, GA, NC, SC), Pd (GA, NC, SC, VA): sandhills, other dry, open areas; common (uncommon in Piedmont, rare in VA). September-October. Se. VA south to FL and west to se. TX. [= RAB, C, F, FNA, G, HC, K, Y; = *S. gracilis* (Trinius) Merrill – S]

Sporobolus neglectus Nash, Barrens Dropseed. Ip (KY), Mt (VA, WV): dry rocky barrens and outcrops, over calcareous rocks (such as limestone or dolomite); uncommon (rare in VA and WV). August-September. ME west to ND, south to NJ, w. VA, TN, LA, and TX; apparently disjunct in WA and AZ. *S. ozarkanus, S. neglectus,* and *S. vaginiflorus* form a still very poorly understood complex. [= C, F, FNA, G, HC, K, S, W]

Sporobolus ozarkanus Fernald, Ozark Dropseed. Ip (KY), Pd (NC), Mt (VA): limestone glades, diabase glades; rare. September-October. KY west to KS, south to e. TN, AR, and TX; disjunct in c. NC. In Granville County, NC, it is associated (on glades of diabase, a mafic rock) with other taxa with affinities to midwestern glades and prairies: *Solidago rigida, Solidago ptarmicoides, Baptisia australis var. aberrans, Symphyotrichum depauperatum, Silphium terebinthinaceum, Parthenium auriculatum, Ruellia humilis*, and others. *S. ozarkanus, S. neglectus,* and *S. vaginiflorus* form a still very poorly understood complex. [= C, F, G, HC, K; = *S. vaginiflorus* (Torrey ex A. Gray) Wood var. *ozarkanus* (Fernald) Shinners – FNA, K]

Sporobolus pinetorum Weakley & P.M. Peterson, Carolina Dropseed, Savanna Dropseed. Cp (GA, NC, SC): wet savannas, savanna-pocosin ecotones, sandhill-pocosin ecotones, and extending upslope into mesic flatwoods or loamy or clayey shelves in the fall-line sandhills; uncommon (rare in GA and SC). June-September (and into December in response to growing-season fire). The identity of this taxon has been obscure; it is now clear that it is a previously unrecognized species, endemic to NC, SC, and adjacent e. GA. RAB included it in their concept of *S. teretifolius*, though it does not key well (keying imperfectly to either *S. floridanus* or *S. heterolepis*); in S and HC, it will key to *S. floridanus*, but the leaves are much narrower. Additionally, *S. floridanus* is a taller and coarser plant, the culms often averaging about 1.5 meters in height and 2-3 mm in diameter basally (vs. 1 meter high and 1 mm in diameter for *Sporobolus pinetorum*). In wet savannas of Columbus County, NC, *S. species 1* occurs with true *S. teretifolius* (the two codominant over many hectares!), and the two taxa are manifestly distinct. The leaves of *S. pinetorum* are not terete; after lengthy drought in the field (or dry on an herbarium sheet), the leaves become tightly folded to involute and can appear wiry. Like many Southeastern pineland grasses, *S. pinetorum* flowers only following

fire. In vegetative condition it may be distinguished from *Aristida stricta and A. beyrichiana*, with which it often grows, by the leaf pubescence (*S. pinetorum* with scaberulous margins, best felt by running a finger along the margin near the base, from apex toward base, *A. stricta* and *A. beyrichiana* not scaberulous, and with a sparse line of pilose hairs running more or less the length of the leaf in *A. stricta* and sometimes in *A. beyrichiana*) and base (much more indurated and polished in *Sporobolus* than in *Aristida*). [= FNA, K, Y; >< *S. teretifolius* – RAB, misapplied; > *S. floridanus* – RAB, misapplied; < *S. floridanus* Chapman – HC, S]

Sporobolus pyramidalis Palisot de Beauvois, West Indian Dropseed. Cp (FL): pine flatwoods, beaches; rare. FL Panhandle (Wakulla County), FL peninsula; West Indies. The original distribution disputed, possible introduced. [< *S. jacquemontii* Kunth – FNA; = *S. indicus* var. *pyramidalis* (Palisot de Beauvois) Veldkamp – K; ? *S. berteroanus* (Trinius) A.S. Hitchcock & Chase – S]

Sporobolus teretifolius R.M. Harper, Wireleaf Dropseed. Cp (AL, GA, NC, SC): wet savannas, pitcherplant bogs; rare. July-September (and later in response to growing-season fire). Very similar vegetatively to *Aristida stricta*, *S. teretifolius* can be distinguished by its tuft of hairs at the base of the otherwise glabrous blade (as opposed to line of pilose hairs the length of the blade in *A. stricta*). This very rare species is known only from se. NC, ne. SC, s. GA, and se. AL (Houston County). Many of the counties reported for this species in RAB actually are based on misidentified specimens of *S. pinetorum*. In a few very wet savannas of Columbus and Brunswick counties, NC, *S. teretifolius* is dominant or codominant over many hectares. Like many savanna grasses, *S. teretifolius* generally flowers only following fire. [= FNA, HC, K, S, Y; < *S. teretifolius* – RAB (also see *S. pinetorum*)]

Sporobolus vaginiflorus (Torrey ex A. Gray) Wood, Poverty Dropseed. Pd (GA, NC, SC, VA), Mt (GA, KY, NC, SC, VA, WV), Cp (FL, KY, VA), Ip (KY): glades, barrens, open disturbed sites; common (uncommon in FL, GA, KY, NC, SC, VA, rare in KY and WV Mountains). September-October. The species occurs nearly throughout e. United States. *S. ozarkanus, S. neglectus,* and *S. vaginiflorus* form a still very poorly understood complex. [= RAB, C, G, HC, W, WV; = *S. vaginiflorus* var. *vaginiflorus* – F, FNA, K; = *S. vaginaeflorus* – S, orthographic variant]

Sporobolus virginicus (Linnaeus) Kunth, Seashore Dropseed, Coastal Dropseed. Cp (FL, GA, NC, SC): salt marshes, tidal mud flats, and low dunes in the outer Coastal Plain; common (rare north of FL). September-October. Se. NC along the coast to TX, in the West Indies and into n. South America (its alleged occurrence in se. VA is apparently incorrect). *Sporobolus virginicus* is similar in aspect and growth form to *Distichlis spicata*, with which it occurs in tidal flats. *Sporobolus virginicus* is more delicate, and typically has long hairs on either side of the collar of the sheath; *Distichlis spicata* is generally a coarser plant, and lacks long hairs around the collar of the sheath. [= RAB, C, F, FNA, G, GW, HC, K, S]

Sporobolus compositus (Poiret) Merritt *var.* ***macer*** (Trinius) Kartesz & Gandhi. [= FNA] {not yet keyed}

* ***Sporobolus diandrus*** (Retzius) Palisot de Beauvois. [= FNA] {not yet keyed}

* ***Sporobolus fimbriatus*** (Trinius) Nees. Cp (SC): waste areas near wool-combing mills; rare, perhaps only a waif, intoduced from Africa. [= FNA, HC, K] {not keyed}

* ***Sporobolus flexuosus*** (Thurb. ex Vasey) Rydberg. Cp (SC): waste areas near wool-combing mills; rare, perhaps only a waif, intoduced from sw. United States and n. Mexico. [= FNA, HC, K] {not keyed}

* ***Sporobolus tenuissimus*** (Martius ex Schrank) Kuntze. Cp (SC): waste areas near wool-combing mills; rare, perhaps only a waif, native of the tropical Old World and New World. [= FNA, K] {not keyed}

* ***Sporobolus wrightii*** Munro ex Scribner, Giant Sacaton. Cp (SC): waste areas near wool-combing mills; rare, perhaps only a waif, intoduced from sw. United States. [= FNA, HC, K] {not keyed}

Steinchisma Rafinesque 1830 (Gaping Panic Grass)

A genus of about 6 species, perennial herbs, of s. North America, Central America, and South America. See discussion following *Panicum* regarding generic concepts. References: Zuloaga et al. (1998)=Z; Freckmann & Lelong in FNA (2003a).

Steinchisma hians (Elliott) Nash, Gaping Panic Grass. Cp (FL, GA, NC, SC, VA), Pd (GA, NC, SC), Mt (GA, WV*): stream, pond, and lake shores, low woods, cypress-gum ponds, floodplains, marshes, ditches, seepage slopes; common (uncommon in Coastal Plain, rare in Mountains). May-October. Se. VA south to FL, west to TX and OK, and south through Mexico and Central America to Colombia; also in s. South America. The large, thickened, pale sterile palea of this species is unique among panicoids of our region; it is one of several characters that has led to the segregation of *Steinchisma* as a genus, or as a subgenus of *Panicum*. The enlargement of the sterile palea causes the spikelet to spread open, or "gape." [= FNA, K, Z; = *Panicum hians* Elliott – RAB, C, F, G, GW, HC, S, W]

Stenotaphrum Trinius 1820 (St. Augustine Grass)

A genus of about 7 species, tropical and subtropical. References: Allred in FNA (2003a); Sauer (1972)=Z.

Stenotaphrum secundatum (Walter) Kuntze, St. Augustine Grass, Carpet Grass. Cp (FL, GA, NC, SC, VA*): brackish marshes, roadsides, lawns; common. July-October. A pioneer species of beaches and shores, *S. secundatum* was known from the Carolinas prior to 1800. It has been interpreted as native or introduced in our area; its original range is probably now impossible to determine. Sauer (1972) maps it as widespread along the coasts of s. North America, Central America, South America, the West Indies, Africa, Australia, and sw. Pacific Islands. In our area it is certainly now more frequently encountered as a lawn or roadside grass than in anything that could be construed as a natural habitat. The other 6 species in the genus are Asian, or on islands of the sw. Pacific or Indian Oceans. [= RAB, FNA, HC, K, S, WH, Z]

Thinopyrum (Prat) Á. Löve 1980

A genus of about 10 species, perennials, native of w. Asia and the Mediterranean region. References: Barkworth in FNA (2007a); Tucker (1996)=Z; Barkworth (1997)=Y.

1 Plants rhizomatous; lemmas 7.5-10 mm long; lateral veins slightly shorter than and less prominent than the midvein ..... ***Th. intermedium***
1 Plants cespitose; lemmas 9-12 mm long; lateral veins of the glumes about as long as and as prominent as the midvein ..... ***Th. ponticum***

* ***Thinopyrum intermedium*** (Host) Barkworth & D.R. Dewey. Pd (GA): waif in railroad yards; rare, native of Europe and w. Asia. Tucker (1996) states that the record is as a waif in railroad yards. [= K, Z; > *Th. intermedium* spp. *intermedium* – FNA; = *Elytrigia intermedia* (Host) Nevski; = *Agropyron intermedium* (Host) Palisot de Beauvois – HC] {add to synonymy}

* ***Thinopyrum ponticum*** (Podpěra) Barkworth & D.R. Dewey, Tall Wheatgrass. Cp (SC): waste areas near wool-combing mills; rare, native of Europe and w. Asia, not known to be established or persistent. [= FNA, K; *? Agropyron elongatum* (Host) Palisot de Beauvois] {add to synonymy}

Torreyochloa G.L. Church 1949 (Pale Mannagrass)

A genus of 4 species, with a classic Tertiary moist temperate disjunct pattern; *Torreyochloa* is distributed in e. North America and e. Asia. References: Davis in FNA (2007a); Davis (1991)=Y; Tucker (1996)=Z.

1 Leaf blades 1-3 mm wide; anthers 0.2-0.5 mm long ..... ***T. pallida*** *var.* ***fernaldii***
1 Leaf blades 4-8 mm wide; anthers ca. 1 mm long ..... ***T. pallida*** *var.* ***pallida***

Torreyochloa pallida (Torrey) Church *var.* ***fernaldii*** (A.S. Hitchcock) Dore ex Koyama & Koyama. Mt (WV): beaver ponds, swamps; rare. NL (Newfoundland) west to MN, south to ne. WV and TN. [= FNA, K, Y, Z; < *Glyceria pallida* (Torrey) Trinius – RAB, GW, HC, W; < *Puccinellia pallida* (Torrey) Clausen – C; = *G. fernaldii* (A.S. Hitchcock) St. John – F, WV; = *G. pallida* var. *fernaldii* A.S. Hitchcock – G]

Torreyochloa pallida (Torrey) Church *var.* ***pallida***, Pale Mannagrass. Mt (GA, NC, VA, WV), Cp (DE, NC, VA), Pd (SC, VA): bogs, mucky wetlands such as old beaver-ponds, pools in cypress swamps, drawdown shores of natural ponds; common (rare in GA, NC, SC, VA, and WV). June-July. The species as a whole is widespread in e. North America. Var. *pallida* ranges from NS west to MN, south to e. VA, se. NC (Columbus County), nw. NC (Avery County), and nw. GA (Jones & Coile 1988). Var. *pauciflora* (J. Presl) J.J. Davis is distributed in w. North America. Intermediates occur between the varieties. [= FNA, K, Y, Z; < *Glyceria pallida* (Torrey) Trinius – RAB, GW, HC, W; < *Puccinellia pallida* (Torrey) Clausen – C; = *G. pallida* – F, WV; = *G. pallida* var. *pallida* – G; = *Panicularia pallida* (Torrey) Kuntze – S]

Tragus Haller 1768 (Burgrass)

A genus of 7 species, annuals and perennials, of tropical and subtropical Eurasia and Africa. References: Wipff in FNA (2007a).

* ***Tragus racemosus*** (Linnaeus) Allioni, Stalked Burgrass, Texas Burgrass. Mt (VA), Cp (NC): roadsides, disturbed areas, on ballast near old seaports; rare, native of Mediterranean Europe and w. Asia. [= HC, C, F, FNA, G, K; = *Nazia racemosa* (Linnaeus) Kuntze – S]

* *Tragus australianus* S.T. Blake, Australian Burgrass. Cp (SC): waste areas around wool-combing mills; rare, perhaps only a waif, native of Australia. [= FNA, K] {not keyed}

* *Tragus berteronianus* J.A. Schultes, Spiked Burgrass. Cp (SC): waste areas around wool-combing mills; rare, perhaps only a waif, native of Africa and Asia. Also reported from chrome ore piles at Newport News, VA. [= FNA, K] {not keyed}

* *Tragus heptaneuron* W.D. Clayton. Cp (SC): waste areas around wool-combing mills; rare, perhaps only a waif, native of tropical Africa. [= FNA, K] {not keyed}

Tridens Roemer & J.A. Schultes 1817 (Triodia, Redtop, Tridens, Fluffgrass)

A genus of about 14 species, native to the Western Hemisphere. References: Valdés-Reyna in FNA (2003a).

1 Panicle dense and spike-like, > 4× as long as wide, the branches ascending to appressed.
  2 Plants from elongate rhizomes; lemma 4-5 mm long; spikelet 7-9 mm long ..... ***T. carolinianus***
  2 Plants cespitose; lemma 2.5-3 mm long; spikelet 4-6 mm long ..... ***T. strictus***
1 Panicle open and spreading, < 4× as long as wide, the branches well-developed and spreading-ascending to reflexed.
  3 Spikelets 4-5 mm long, 2.5-3.5 mm wide ..... ***T. ambiguus***
  3 Spikelets 6-8 mm long, 1.5-2.2 mm wide.
    4 Primary pulvini densely pubescent, the hairs encircling the base of the panicle branch; secondary pulvini pubescent; spikelets mostly on pedicels 3-20 mm long; main branches of the inflorescence stiffly spreading ..... ***T. chapmanii***
    4 Primary pulvini glabrous to sparsely pubescent, tufted only in the axil (the upper surface of the panicle branch); secondary pulvini glabrous; spikelets on pedicels mostly < 3 mm long; main branches of the inflorescence spreading, ascending or drooping..... ***T. flavus***

Tridens ambiguus (Elliott) J.A. Schultes, Pineland Triodia, Flatwoods Fluffgrass. Cp (FL, GA, NC, SC): wet savannas, clay-based Carolina bays; uncommon (rare north of GA). August-October. S. NC south to FL, west to e. TX. [= RAB, FNA, GW, HC, K; = *Triodia elliottii* Bush – S]

Tridens carolinianus (Steudel) Henrard, Carolina Triodia, Carolina Fluffgrass. Cp (FL, GA, NC, SC): mesic swales in sandhills; uncommon (rare north of FL). August-October. S. NC south to FL, west to LA. [= RAB, FNA, HC, K; = *Triodia drummondii* Scribner & Kearney – S]

Tridens chapmanii (Small) Chase, Chapman's Triodia. Cp (DE, FL, GA, NC, SC, VA): loamy sands of disturbed longleaf pine woodlands, roadsides; rare. August-October. NJ south to FL, west to TX and OK. [= HC; = *Tridens flavus* (Linnaeus) A.S. Hitchcock var. *chapmanii* (Small) Shinners – RAB, C, FNA, K; = *Triodia chapmanii* (Small) Bush – F, G; < *Triodia flava* (Linnaeus) Smyth – S]

Tridens flavus (Linnaeus) A.S. Hitchcock, Redtop, Tall Redtop, Purpletop Tridens, Greasy Grass. Cp (DE, FL, GA, NC, SC, VA), Pd (DE, GA, NC, SC, VA), Mt (GA, NC, SC, VA, WV): roadsides, disturbed areas, glades; common. July-October. NH west to NE, south to FL and TX. [= HC; = *Tridens flavus* var. *flavus* – RAB, C, FNA, K; = *Triodia flava* (Linnaeus) Smyth – F, G, WV; < *Triodia flava* (Linnaeus) Smyth – S (also see *Tridens chapmanii*); < *Tridens flavus* – W]

Tridens strictus (Nuttall) Nash, Spike Triodia, Longspike Fluffgrass, Longspike Tridens. Cp (FL, GA, NC, SC, VA), Pd (GA, SC, VA): sandhills, moist pine savannas, roadsides; rare. August-October. S. VA south to AL, west to TX, north in the interior to IL and KS. It is possible that this grass is introduced only north and east of GA. Rhoads & Klein (1993) report an old specimen from w. PA. [= RAB, FNA, GW, HC, K; = *Triodia stricta* (Nuttall) Bentham ex Vasey – F, G, S]

Triplasis Palisot de Beauvois 1812 (Sandgrass)

A genus of 2 species, of eastern and central North America south through Mexico to Costa Rica. References: Hatch in FNA (2003a).

Identification notes: The foliage of both of our species has a sour taste.

1 Lemma awn 4.5-8 mm long; culm internodes appressed pilose or puberulent; perennial ..... ***T. americana***
1 Lemma awn 0.5-1.5 mm long; culm internodes glabrous to minutely scaberulous; annual (or rarely perennial) ..... ***T. purpurea*** *var.* ***purpurea***

Triplasis americana Palisot de Beauvois, Southern Sandgrass. Cp (FL, GA, NC, SC): open sandy areas; common. August-October. A Southeastern Coastal Plain endemic: NC south to s. FL, west to e. LA. [= RAB, FNA, HC, K, S]

Triplasis purpurea (Walter) Chapman *var.* ***purpurea***, Purple Sandgrass. Cp (DE, FL, GA, NC, SC, VA): dunes, maritime dry grasslands, open sandy areas; common. September-October. NH south to s. FL, and west to TX, along the coast; also around the Great Lakes, and in central United States. Var. *caribensis* R.W. Pohl is in the New World tropics. [= FNA; < *T. purpurea* – RAB, C, F, G, HC, K; > *T. intermedia* Nash – S; > *T. purpurea* – S]

Tripsacum Linnaeus 1759 (Gama Grass)

A genus of about 12 species, tropical and subtropical American. References: Barkworth in FNA (2003a); DeWet, Harlan, & Brink (1982)=Z.

Tripsacum dactyloides (Linnaeus) Linnaeus *var.* ***dactyloides***, Gama Grass. Pd (GA, NC, SC, VA), Mt (GA, NC, SC, VA< WV), Cp (DE, FL, GA, NC, SC, VA): roadsides, moist areas, disturbed areas, moist riverbanks; common (uncommon in VA, rare in WV). Late May-November. *T. dactyloides* is widespread in e. North America north to MA, MI, IA, and NE, ranging south into tropical Central and South America; var. *dactyloides* is North American. This important species of moist and wetland areas in the Great Plains is generally seen in disturbed habitats in our area; its original habitats in our area (if indeed it was native in the flora area) are poorly understood. [= FNA, Z; < *T. dactyloides* – RAB, C, G, HC, K, S, W, WV; > *T. dactyloides* var. *dactyloides* – F; > *T. dactyloides* var. *occidentale* Cutler & Anderson – F]

Trisetum Persoon 1805 (Oat-grass)

A genus of about 75-85 species, north and south temperate. References: Rumely in FNA (2007a); Randall & Hilu (1986)=Z; Tucker (1996)=Y. [also see *Sphenopholis*]

Trisetum spicatum (Linnaeus) K. Richter, Alpine Oat-grass, Spike Trisetum. Mt (NC, VA): mountain cliffs at high elevations on metabasalt; rare. June-August. A circumboreal species, widespread and common in arctic and alpine areas, south in e. North America to New England, NY, and, rarely, PA, and disjunct to Hawksbill Mountain, Page County, VA (where extant) and Roan Mountain, Mitchell County, NC (where not seen since the nineteenth century). The species is also known from the West Indies, Mexico, and s. South America. *T. spicatum*, as broadly treated here, following Randall & Hilu (1986), is polymorphic and consists of several ploidies. [= C, FNA, HC, K, S, Y, Z; > *T. spicatum* var. *molle* (Michaux) Beal – RAB, F, G; > *T. triflorum* (Bigelow) Löve & Löve ssp. *molle* (Michaux) Löve & Löve – W; > *T. spicatum* var. *maidenii* (Gandoger) Fernald – F]

Triticum Linnaeus 1753 (Wheat)

A genus of about 25 species (the taxonomy complicated by extensive and ancient cultivation), native of w. and c. Asia. References: Morrison in FNA (2007a); Tucker (1996)=Z; Zohary & Hopf (1994).

* ***Triticum aestivum*** Linnaeus, Bread Wheat. Cp (FL, GA, NC, SC, VA), Pd (GA, NC, SC, VA), Mt (GA, NC, SC, VA, WV): fields; frequently cultivated, rarely persistent or volunteering following cultivation, native of Eurasia. May-June. One of the most important crops in the world. The lemmas can either be awnless or with long awns (to 8 cm long). [= RAB, C, F, FNA, G, HC, K, WH, Z]

Uniola Linnaeus 1753 (Sea Oats)

A genus of 2 species. The only other species of the genus ranges from Baja California south along the Pacific Ocean to Ecuador; other species previously treated in *Uniola* have been shown to be only distantly related and are now treated as *Chasmanthium*. References: Yates in FNA (2003a); Yates (1966a, 1966b)=Z. [also see *Chasmanthium*]

Uniola paniculata Linnaeus, Sea Oats. Cp (DE*, FL, GA, NC, SC, VA): abundant on unforested primary and secondary dunes on barrier islands, and on dry to mesic sand flats and interdune swales; common (rare in DE and VA). June-November. Se. VA south to FL and west to TX and Mexico; West Indies. This is the most important sand-binding grass on ocean dunes from NC south, playing a critical role in primary succession on dunes. It is against the law in NC to pick or destroy *Uniola paniculata*. [= RAB, C, F, FNA, G, HC, K, S, WH, Z]

Urochloa Palisot de Beauvois 1812 (Para-grass, Signal-grass)

A genus of about 100 species, pantropical and subtropical. References: Crins (1991)=Z; Webster (1988)=Y; Wipff & Thompson in FNA (2003a). Key adapted in part from GW. [also see *Megathyrsus*]

1 Spikelets suffused with purple, borne in pairs (or threes) in each row ..... ***U. mutica***
1 Spikelets green, borne singly in each row.
  2 Upper half of second glume and first lemma with evident transverse veins connecting the longitudinal veins; spikelets 3.5-4.7 mm long ..... ***U. platyphylla***
  2 Upper half of second glume and first lemma without evident transverse veins, or with very obscure cross-veins; spikelets either 2-4 mm or 5-6 mm long.
    3 Spikelets 2-4 mm long..... ***U. ramosa***
    3 Spikelets 5-6 mm long..... ***U. texana***

* ***Urochloa mutica*** (Forskål) Nguyen, Para-grass. Cp (SC): margin of pond; rare, native of Africa. August. [= FNA, K, Z; *? Panicum purpurascens* Raddi – RAB, HC; *? B. purpurascens* (Raddi) Henrard – GW; = *Brachiaria mutica* (Forskål) Stapf]

* ***Urochloa platyphylla*** (Munro ex Wright) R. Webster, Broadleaf Signal-grass. Cp (FL, GA, NC, SC, VA), Pd (GA, SC, NC, VA), Mt (VA): disturbed wet or seasonally moist areas; rare, apparently native of South America. E. NC south to FL, west to TX, north in the interior to AR, OK, and se. MO; also in MD (Terrell & Reveal 1996). [= FNA, K, Y, Z; = *Brachiaria platyphylla* (Munro ex Wright) Nash – RAB, GW, HC; *? B. extensa* Chase – S]

* ***Urochloa ramosa*** (Linnaeus) Nguyen, Browntop Millet, Dixie Signalgrass. Pd (GA, NC, SC, VA), Cp (FL, GA, NC, SC, VA): disturbed areas; rare, native of tropical Africa and Asia. This species has apparently been widely planted for wildlife food and erosion control in southeastern states. [= FNA, K, Z; = *Panicum ramosum* Linnaeus – HC; = *Brachiaria ramosa* (Linnaeus) Stapf]

* ***Urochloa texana*** (Buckley) R. Webster, Texas Millet, Texas Signalgrass. Cp (FL, GA, NC, SC, VA), Pd (GA, SC): disturbed areas, fields, gardens; uncommon (rare in VA), native of TX. First reported for South Carolina by Hill & Horn (1997). [= K, Y, Z; = *Panicum texanum* Buckley – RAB, C, HC, S; = *Brachiaria texana* (Buckley) S.T. Blake]

* ***Urochloa adspersa*** (Trinius) R. Webster. Cp (FL): moist, sunny, disturbed areas; rare, apparently native of s. FL, the West Indies, and Argentina. Reported from AL, FL peninsula and Panhandle (FNA), and chrome ore piles in Newport News, VA (Reed 1964). [= FNA, K] {not keyed; add to synonymy}

Urochloa fusca (Swartz) B.F. Hansen & Wunderlin *var.* ***reticulata*** (Torrey) B.F. Hansen & Wunderlin, east to GA (Kartesz 1999). [< *Urochloa fusca* – FNA; *? Urochloa fasciculata* (Sw.) R. Webster – K; *? Panicum fasciculatum* Swartz – HC] {not yet keyed; synonymy incomplete}

Urochloa piligera (Muell. ex Bentham) R.D. Webster. Cp (FL): roadsides; rare, native of Australia. Reported for Escambia County in the FL Panhandle (Kunzer et al. 2009). [= WH] {not yet keyed; synonymy incomplete}

* ***Urochloa plantaginea*** (Link) R. Webster. Cp (FL, GA): Reported for s. GA (Jones & Coile 1988), as *Brachiaria plantaginea*, and for Escambia County in the FL Panhandle (Kunzer et al. 2009). [= FNA, K, Y, Z; = *Brachiaria plantaginea* (Link) A.S. Hitchcock] {not yet keyed; synonymy incomplete}

Urochloa reptans (Linnaeus) Stapf. Cp (GA): [= FNA, K] {not yet keyed; synonymy incomplete}

* *Urochloa villosa* (Lamarck) Nguyen, Hairy Signalgrass. Reported from chrome ore piles in Newport News, VA (Reed 1964); native of tropical Asia and Africa. [= FNA, K] {not keyed; add to synonymy}

Vulpia C.C. Gmelin 1805 (Annual Fescue)

A genus of about 30 species, north and south temperate. References: Lonard in FNA (2007a); Tucker (1996)=Z. Key based in part on C.

1 First glume < ½ as long as the second glume ..... ***V. myuros***
1 First glume > ½ as long as the second glume.
2 Lemma pubescent; lowest lemma 2.5-3.5 mm long; grains 1.5-2 mm long ..... ***V. sciurea***
2 Lemma glabrous or scabrous; lowest lemma 2.7-7 mm long; grains 1.7-3.3 mm long.
3 First glume 1.7-4.5 mm long; lemma awns 3-12 mm long; spikelets with 4-7 loosely imbricate florets; rachilla internodes mostly 0.9-1.1 mm long ..... ***V. bromoides***
3 First glume 3.5-5 mm long; lemma awns 0.3-6 (-9) mm long; spikelets with 5-11 (-more) closely imbricate florets; rachilla internodes mostly 0.5-0.7 mm long.
4 Spikelets 4-5.5 (-6.5) mm long; awn of the lowest lemma 0.3-3 mm long ..... ***V. octoflora*** *var.* ***glauca***
4 Spikelets 5.5-10 (-13) mm long; awn of the lowest lemma 3-9 mm long ..... ***V. octoflora*** *var.* ***octoflora***

* ***Vulpia bromoides*** (Linnaeus) S.F. Gray, European Squirreltail Fescue, Brome Fescue. Cp (FL, VA): sandy disturbed areas; rare, native of Eurasia. [= C, FNA, K, Z; = *Festuca dertonensis* (Allioni) Ascherson & Graebner – G, HC]

* ***Vulpia myuros*** (Linnaeus) K.C. Gmelin, Rat-tail Fescue. Cp (FL, NC, SC, VA), Pd (DE, GA, NC, SC, VA), Mt (GA, NC, SC, WV): roadsides, fields, disturbed areas; common (rare in FL and WV), native of Eurasia. May-June. [= C, F, FNA, K, Z; = *Festuca myuros* Linnaeus – RAB, G, HC, S, W, WV]

Vulpia octoflora (Walter) Rydberg *var.* ***glauca*** (Nuttall) Fernald, Northern Six-weeks Fescue. Mt (WV), Cp (DE), Pd (DE), {Cp (FL, GA, NC, SC, VA), Pd (GA, NC, SC, VA), Mt (GA, NC, SC, VA)}: fields, roadsides, disturbed areas; common (rare in WV). April-June. S. ME west to BC, south to GA, AR, TX, and CA. [= C, FNA, K; < *Festuca octoflora* Walter – RAB, GW, S, W, WV; = *Vulpia octoflora* var. *tenella* (Willdenow) Fernald – F; = *Festuca octoflora* Walter var. *tenella* (Willdenow) Fernald – G, HC; < *Vulpia octoflora* – Z]

Vulpia octoflora (Walter) Rydberg *var.* ***octoflora***, Southern Six-weeks Fescue. Mt (WV), Cp (DE), {Cp (FL, GA, NC, SC, VA), Pd (GA, NC, SC, VA), Mt (GA, NC, SC, VA)} fields, roadsides, disturbed areas; common (uncommon in WV). April-June. S. NJ south to FL, west to TX, north in the interior to MO and OK. [= C, F, FNA, K; < *Festuca octoflora* Walter – RAB, GW, S, W, WV; > *Festuca octoflora* var. *aristulata* Torrey ex L.H. Dewey – G; = *Festuca octoflora* var. *octoflora* – HC; < *Vulpia octoflora* – Z]

Vulpia sciurea (Nuttall) Henrard, Squirreltail Fescue. Cp (DE, FL, GA, NC, SC, VA), Pd (GA): sandy roadsides, fields, disturbed areas; common (uncommon in DE and VA). April-May. S. NJ south to n. peninsular FL, west to TX, and north in the interior to MO. [= FNA, Z; = *Vulpia elliotea* (Rafinesque) Fernald – C, F, K; = *Festuca sciurea* Nuttall – RAB, G, HC, S]

Zea Linnaeus 1753 (Corn, Maize)

A genus of about 5 species, native of Mexico and Central America. References: Iltis in FNA (2003a).

1 Pistillate spikelets (kernels) borne on a spongy rachis (cob) in rows ..... ***Z. mays*** *spp.* ***mays***
1 Pistillate spikelets embedded in a hardened rachis.
2 Annual ..... ***[Z. mays*** *ssp.* ***mexicana]***
2 Perennial from creeping rhizomes ..... ***Z. perennis***

* ***Zea mays*** Linnaeus *ssp.* ***mays***, Corn, Maize. Cp (FL, GA, NC, SC, VA), Pd (GA, NC, SC, VA), Mt (GA, NC, SC, VA, WV): very commonly cultivated, rarely volunteering in old fields or around trashpiles; common in cultivation, rare as a short-lived escape. June-October. *Zea* is one of the most important cultivated plants in the world, originating in Mexico, probably from *Zea mays* ssp. *parviglumis* Iltis & Doebley. It was initially cultivated in sw. Mexico (before 8000 BP), spreading to the sw. United States before 5000 BP, and to the e. United States by 2000 years BP. At the time of European contact, *Zea mays* ssp. *mays* was an important staple crop from s. Canada south to s, South America (Hancock 2004). [= FNA, K; < *Z. mays* – RAB, F, HC, S]

* ***Zea perennis*** (A.S. Hitchcock) Reeves & Manglesdorf, Mexican Teosinte. Cp (SC): disturbed areas; rare, apparently established at least formerly. *Z. perennis* was considered by HC to be "established on James Island, S.C." [= K; = *Euchlaena perennis* A.S. Hitchcock – HC]

* *Zea mays* (Schrader) Kuntze ssp. *mexicana* (Schrader) H.H. Iltis, Chalco Teosinte, Nobogame Teosinte. Reported for AL (Kartesz 1999) and FL (Hansen & Wunderlin 2006). HC state that this taxon is "occasionally cultivated in the Southern States for green forage" and is similar to *Z. perennis*, except in being, like *Z. mays* ssp. *mays*, a coarse annual. It is considered to be an ancestor of *Zea mays*. [= FNA; = *Z. mexicana* (Schrader) Kuntze – K; = *Euchlaena mexicana* Schrader – HC, S]

Zizania Linnaeus 1753 (Wild-rice)

A genus of 4 species (and 6 taxa) of northern and eastern North America. References: Terrell in FNA (2007a); Terrell et al. (1997)=Y; Tucker (1988)=Z; Judziewicz et al. (2000)=X. Key based on Terrell in FNA (2007a).

1 Lemmas of the pistillate spikelets flexible and chartaceous, dull, bearing short scattered hairs, these not or only slightly more dense toward the tip ..... ***Z. aquatica*** *var.* ***aquatica***
1 Lemmas of the pistillate spikelets stiff and coriaceous, lustrous, glabrousor with lines of short hairs, the tips usually more hairy ..... ***Z. palustris*** *var.* ***palustris***

Zizania aquatica Linnaeus *var.* ***aquatica***, Southern Wild-rice. Cp (DE, FL, GA, NC, SC, VA), Pd (DE): freshwater marshes, usually tidal; common (uncommon in NC, rare in Piedmont). May-October. Var. *aquatica* ranges from ME west to WI, south to FL and LA; var. *brevis* Fassett is restricted to the St. Lawrence River in QC. *Zizania* was formerly an important food for Amerindians; it is now gathered as a specialty grain, commanding high prices. [= C, F, FNA, G, HC, K, X, Y, Z; < *Z. aquatica* – RAB, GW, S]

* ***Zizania palustris*** Linnaeus *var.* ***palustris***, Northern Wild-rice. Mt (WV): lake shore; rare, native of n. North America. Reported for a single county in WV, where apparently introduced. [= C, FNA; = *Z. aquatica* Linnaeus var. *angustifolia* Hitchcock – F, G, HC; < *Z. aquatica* – WV] {add synonymy: X, Y, Z}

Zizaniopsis Döll & Ascherson 1871 (Giant Cutgrass)

A genus of about 5 species, of tropical and subtropical America. References: Terrell in FNA (2007a); Tucker (1988)=Z; Judziewicz et al. (2000)=Y.

Identification notes: Superficially similar to *Zizania* in its habitat and large size, *Zizaniopsis* may be distinguished by its very different inflorescence and by its stout horizontal rhizomes (*Zizania* is annual or perennial, but not rhizomatous).

Zizaniopsis miliacea (Michaux) Döll & Ascherson, Giant Cutgrass, Southern Wild-rice, Water-millet. Cp: brackish and freshwater marshes; common. May-July. MD south to FL, west to TX, north in the interior to MO, and disjunct in w. Mexico. The other species of the genus are South American. [= RAB, C, F, FNA, G, GW, HC, K, S, Y, Z; = *Zizania miliacea* Michaux]

Zoysia Willdenow 1801 (Zoysia, Temple-grass)

A genus of about 11 species, perennials, of tropical, subtropical, and temperate Asia. References: Anderson in FNA (2003a). Key closely following FNA.

1 Leaves < 0.5 mm wide; racemes with 3-12 spikelets; peduncles included to extending < 1 cm beyond the sheaths of the flag leaves ..... ***Z. pacifica***

1 Leaves 0.5-5 mm wide; racemes with 10-50 spikelets; peduncles extending (0.3-) 1-6.5 cm beyond the shetahs of the flag leaves.

2 Pedicels 1.6-3.5 mm long; spikelets ovate, 1.1.4 mm wide; culm internodes 2-10 mm long; blades ascending..... ***Z. japonica***

2 Pedicels 0.6-1.6 mm long; spikelets lanceolate, 0.6-1.0 mm wide; culm internodes 5-40 mm long, all plants with at least some internodes > 14 mm long; blades spreading at nearly 90 degree angles..... ***Z. matrella***

* ***Zoysia japonica*** Steudel, Japanese Lawngrass, Korean Lawngrass, Zoysia. Cp (AL, LA), Mt (WV): used as a lawngrass, persisting or spreading; rare, native of Japan. Reported for VA (Kartesz 1999). [= C, FNA, HC, K]

* ***Zoysia matrella*** (Linnaeus) Merrill, Zoysia, Manila Temple-grass. Cp (AL, FL), Pd (GA): used as a lawngrass, persisting or spreading; rare, native of the Philippines. [= FNA, HC, K; = *Z. matrella* var. *matrella* – K]

* ***Zoysia pacifica*** (Goudswaard) M. Hotta & Kuroki, Mascarene-grass, Korean Velvetgrass. Cp (LA), Mt (WV): used as a lawngrass, persisting or spreading; rare, native of e. Asia. [= FNA; ? *Z. tenuifolia* Willdenow – HC; > *Z. tenuifolia* Willdenow – K; > *Z. matrella* var. *pacifica* Goudswaard – K]

SECTION 6: EUDICOTYLEDONAE (EUDICOTS)

107. CERATOPHYLLACEAE S.F. Gray 1821 (Hornwort Family) [in CERATOPHYLLALES]

A peculiar and apparently very primitive family, of a single genus and about 6 species, aquatic herbs, of cosmopolitan distribution. References: Les in FNA (1997); Les (1985, 1986, 1988a,1988b, 1988c, 1989)=Z; Les in Kubitzki, Rohwer, & Bittrich (1993). Key adapted from Les.

Ceratophyllum Linnaeus 1753 (Hornwort, Coontail)

A genus of about 6 species, aquatic herbs, of cosmopolitan distribution. References: Les in FNA (1997); Les (1985, 1986, 1988a, 1988b, 1988c, 1989)=Z; Les in Kubitzki, Rohwer, & Bittrich (1993). Key adapted from Les.

Identification notes: *Ceratophyllum* is sometimes mistaken for other, superficially somewhat similar aquatics, such as *Cabomba* (Cabombaceae), *Utricularia* (Lentibulariaceae), and *Myriophyllum* (Haloragaceae). *Cabomba* has the leaves opposite (rather than whorled), dichotomously divided (like *Ceratophyllum*), but the divisions lacking the marginal denticles of *Ceratophyllum*, and on a 1-3 cm long petiole (vs. sessile or on a petiole 0-2 mm long). *Utricularia* has the leaves sometimes dichotomously divided, but the divisions are usually irregular, the leaves are alternate (in most species), and bladder traps are present. *Myriophyllum* has the leaves pectinately rather than dichotomously divided.

1 Largest leaves forking 1-2× (count branching-nodes from the base of the leaf to the tip of the most-forked division); leaves coarse-textured, stiff, the marginal denticles usually strongly raised on a broad base of green tissue; achene margin wingless, with 2 basal spines or tubercles (these rarely absent), otherwise entire (lacking marginal spines)..... ***C. demersum***
1 Largest leaves forking 3-4× (count branching nodes from the base of the leaf to the tip of the most-forked division); leaves fine-textured, flaccid, the marginal denticles not raised on a broad base of green tissue, sometimes obscure or obsolete; achene margin winged, with 2-20 lateral spines 0.1-6.5 mm long (occasionally spineless), with 2 basal spines (these rarely absent).
  2 Achene body (excluding the spines) 3-4.5 mm long; first leaves of the plumule simple; [Coastal Plain, NC southward]..... ***C. australe***
  2 Achene body (excluding the spines) 4.5-6 mm long; first leaves of the plumule forked; [widespread]..... ***C. echinatum***

Ceratophyllum australe Grisebach. Ponds, pools, slow-moving streams. May-September. Se. NC south to s. FL and Panhandle FL, and in the West Indies; also in s. Mexico, Central America, n. South America, with apparent disjunctions in c. South America and the Galapagos Islands. Les treats this taxon as a subspecies of the Old World *C. muricatum*. Because of their allopatric distribution on separate continents and relative morphological distinctiveness (as shown by Les), I prefer to recognize them at the species level. [= *Ceratophyllum muricatum* Chamisso ssp. *australe* (Grisebach) Les – FNA, K, Z; < *C. muricatum* Chamisso – GW (also see *C. echinatum*)]

Ceratophyllum demersum Linnaeus, Coontail. Ponds, pools, slow-moving streams. May-September. NL (Newfoundland) west to AK, south to s. FL, TX, CA, and south through the West Indies and Central America to South America. [= RAB, C, F, FNA, G, GW, K, W, S, Z]

Ceratophyllum echinatum A. Gray in Torrey & A. Gray. Ponds, pools, slow-moving streams. May-September. NL (Newfoundland) west to ON and n. MN, south to c. peninsular FL and e. TX; also in BC, WA, and OR. [= RAB, C, F, FNA, G, K, S, Z; < *C. muricatum* Chamisso – GW (also see *C. australe*); = *C. submersum* Linnaeus var. *echinatum* (A. Gray) Wilmot-Dear]

109a. FUMARIACEAE A.P. de Candolle 1821 (Fumitory Family) [in RANUNCULALES]

This family includes 15-20 genera and 500-600 species, herbs, mostly north temperate. The Fumariaceae are often now subsumed into the Papaveraceae (Lidén 1981, 1986; Lidén et al. 1997; Judd, Sanders, & Donoghue 1994), but the option remains to recognize the two monophyletic clades as families: Papaveracaeae s.s. and Fumariaceae (including *Pteridophyllum* and *Hypecoum*). References: Wang et al. (2009); Stern in FNA (1997); Hill (1992); Lidén (1986, 1981); Lidén et al. (1997); Lidén in Kubitzki, Rohwer, & Bittrich (1993).

1 Corolla with the 2 outer petals spurred or saccate at their bases; [tribe *Corydaleae*].
  2 Ultimate leaf segments 1-4 mm wide; plants with basal leaves only ..... ***Dicentra***
  2 Ultimate leaf segments 5-70 mm wide; plants of reproductive age with cauline leaves.
    3 Ultimate leaf segments 5-10 mm wide; herbaceous vine with cauline leaves (acaulescent in its first year, and appearing to be an herb); [native]..... ***Adlumia***
    3 Ultimate leaf segments 20-70 mm wide; herb with basal and cauline leaves; [alien, cultivated and rarely persistent or naturalized] ..... ***[Lamprocapnos]***
1 Corolla with only 1 outer petal spurred or saccate at its base.
  4 Ovary and fruit subglobose, with 1 seed; [tribe *Fumarieae*] ..... ***Fumaria***
  4 Ovary and fruit elongate, with several to many seeds; [tribe *Corydaleae*].
    5 Flowers pink, the petals tipped with yellow; biennial; stem erect, 3-8 (-10) dm tall; capsules erect, 25-35 mm long ..... ***Capnoides***
    5 Flowers yellow; annual; stem erect, decumbent, or prostrate, 1-3 (-4) dm tall; capsules erect, ascending, divergent, or pendent, 10-20 (-25) mm long ..... ***Corydalis***

Adlumia Rafinesque ex A.P. de Candolle 1821 (Climbing Fumitory)

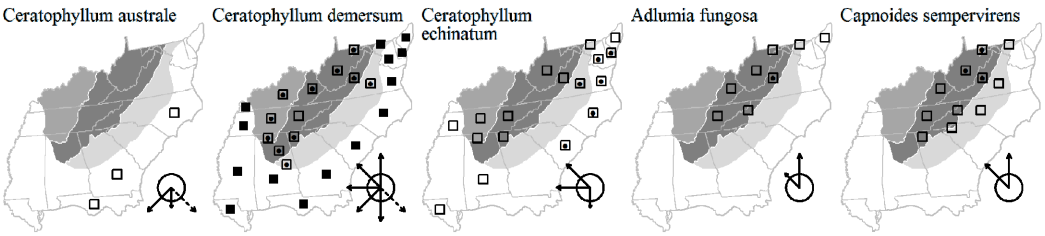
A genus of 2 species, herbs, of e. North America, Korea, and Manchuria. References: Boufford in FNA (1997); Lidén in Kubitzki, Rohwer, & Bittrich (1993).

Adlumia fungosa (Aiton) Greene ex Britton, Sterns, & Poggenburg, Alleghany-vine, Cliff-Harlequin, Climbing Fumitory. Cliffs, talus, rocky slopes, rich stream-bottom forests, cool rocky forests. June-September. QC west to WI and MN, south to n. DE, w. NC, TN, and IN. [= RAB, C, F, FNA, G, K, S, W]

Capnoides P. Miller 1754 (Rock Harlequin)

The genus is monotypic, an herb, of n. North America. Recent studies have emphasized its distinction from *Corydalis*, and its closer relationship to *Adlumia* and *Dicentra* than to *Corydalis* (Lidén 1981, 1986; Lidén et al. 1997). References: Stern in FNA (1997); Ownbey (1947)=Z; Lidén (1981, 1986); Lidén et al. (1997); Lidén in Kubitzki, Rohwer, & Bittrich (1993).

Capnoides sempervirens (Linnaeus) Borkhausen, Rock Harlequin, Tall Corydalis, Pink Corydalis, Pale Corydalis. Rock outcrops, especially granitic exfoliation domes, but also quartzite, greenstone, and sandstone. April-August; May-July. NL (Newfoundland) west to AK, south to NJ, PA, in and near the mountains to ne. GA, n. OH, n. IN, MN, MT, and BC. [= S; = *Corydalis sempervirens* (Linnaeus) Persoon – RAB, C, F, FNA, G, K, W, WV, Z]



Corydalis A.P. de Candolle 1805 (Corydalis)

A genus of about 400 species, herbs, of temperate regions of the Northern Hemisphere (especially China and the Himalayas). References: Stern in FNA (1997); Ownbey (1947)=Z; Lidén in Kubitzki, Rohwer, & Bittrich (1993). [also see *Capnoides*]

1 Fruits pendent or divergent; spurred petal 7-9 mm long; pedicels 6-15 mm long; seeds 2-2.5 mm wide, with a narrow, acute ring-margin ..... ***C. flavula***

1 Fruits erect or ascending; spurred petal 10-15 mm long; pedicels 1-6 mm long (5-10 mm long in *C. aurea*); seeds 1.0-2.0 mm wide, without a narrow, acute ring-margin.

2 Capsules mostly 15-20 mm long, ca. 1.0 mm in diameter, strongly constricted between the seeds at maturity; inflorescence long, usually far exceeding the poorly-developed upper leaves; ultimate leaf segments 0.5-1.5 (-3.0) mm wide; seeds < 1.5 mm wide; plant slightly to strongly glaucous; [of sandy soils of the outer Coastal Plain] ..... ***C. halei***

2 Capsules mostly 10-15 mm long, 1.5-2.0 mm in diameter, slightly or not at all constricted between the seeds at maturity; inflorescence relatively short, barely (if at all) overtopping the upper leaves; ultimate leaf segments 1.0-2.0 (-4.0) mm wide; seeds > 1.5 mm wide; plant green to slightly glaucous; [of circumneutral rock outcrops of the upper Piedmont and Mountains] ..... ***C. micrantha***

Corydalis aurea Willdenow. Reported as occurring as far south and east as MD, WV (?), and PA (Kartesz 1999, Kartesz 2010). No definite documentation is known for this species in our area. [= G, K; = *Corydalis aurea* var. *aurea* – C, F; = *Corydalis aurea* ssp. *aurea* – FNA; = *Capnoides aureum* (Willdenow) Kuntze – S] {not keyed; not mapped; rejected as a component of our flora}

Corydalis crystallina Engelmann. A species of the sc. United States, *C. crystallina* was collected in 1930 from an oat field at the Georgia Experiment Station in Laurens County. Presumably it was a one-time contaminant in seed and is a waif. Not considered a component of the flora of our area. [= FNA, F, G, K] {not keyed; not mapped; rejected as a component of our flora}

Corydalis flavula (Rafinesque) A.P. de Candolle, Short-spurred Corydalis. Rich moist forests, especially alluvial forests, glades and outcrops over mafic rocks (such as greenstone). March-April; May-June. S. CT, NY, and s. ON west to SD, south to NC, AL, LA, and OK. [= RAB, C, F, FNA, G, K, W, WV, Z; = *Capnoides flavulum* (Rafinesque) Kuntze – S]

Corydalis halei (Small) Fernald & Schubert, Southern Corydalis. Sandy roadsides and disturbed areas. March-April; May-June. E. NC south to FL, west to TX, and inland north to MO and OK. F and S recognized it as a species distinct from *C. micrantha*; Ownbey reduced it to a subspecies, citing inadequate morphological differences and some alleged intermediates in OK and MO. The two taxa appear readily separable on morphological, ecological, and geographical grounds; species status seems warranted. [= F; = *Corydalis micrantha* (Engelmann ex A. Gray) A. Gray ssp. *australis* (Chapman) G.B. Ownbey – RAB, FNA, K, Z; = *Corydalis micrantha* (Engelmann ex A. Gray) A. Gray var. *australis* (Chapman) Shinners – C; < *Corydalis micrantha* – G; = *Capnoides halei* Small – S]

Corydalis micrantha (Engelmann ex A. Gray) A. Gray, Slender Corydalis. Circumneutral rock outcrops and adjacent glades and woodlands. April; June. *C. micrantha* (in the narrow sense) is primarily midwestern, ranging from IL, WI, MN, and SD south to AR, TX, and OK, with disjunct outliers in e. TN and w. NC. Ownbey (1947) had no records of Southern Appalachian populations of *C. micrantha*, and considered "ssp. *micrantha*" to range no further east than IL and MO; RAB included montane populations in ssp. *australis*, stating "this is the only [subspecies] in our range." Morphologically, however, these populations closely resemble *C. micrantha*; their association in the Brushy Mountains with other species disjunct from western or prairie ranges (*Anemone berlandieri, Arabis pycnocarpa, Pellaea wrightiana*) provides phytogeographic corroboration. [= F; = *Corydalis micrantha* ssp. *micrantha* – FNA, K, Z; = *Corydalis micrantha* var. *micrantha* – C; < *Corydalis micrantha* – G; = *Capnoides micranthum* (Engelmann ex A. Gray) Britton – S]

Dicentra Bernhardi 1833

A genus of about 12 species, perennial herbs, with a relictual north temperate distribution: e. North America, w. North America, and e. Asia. References: Stern in FNA (1997); Stern (1961)=Z; Lidén in Kubitzki, Rohwer, & Bittrich (1993).

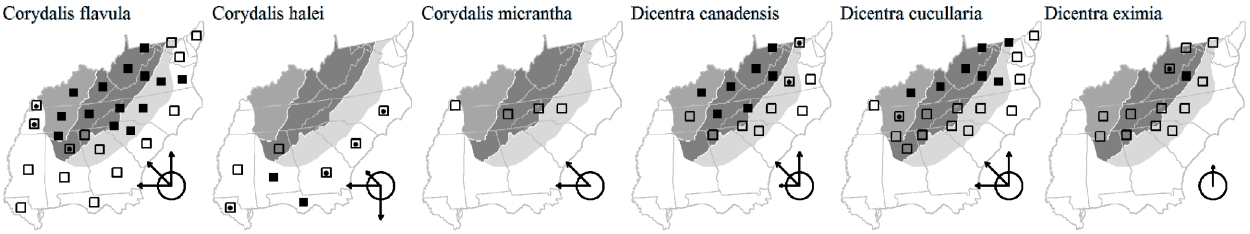
1 Flowers pink, in panicles; rootstock lacking bulblets; ultimate leaf segments generally 3-parted, each part 2-5 mm wide at base, gradually tapering to the tip.
  2 Reflexed portions of the outer sepals 4-8 mm long; [native and cultivated] ..... ***D. eximia***
  2 Reflexed portions of the outer sepals 2-5 mm long; [cultivated] ..... ***[D. formosa*** *ssp.* ***formosa]***
1 Flowers white or yellowish (very rarely pinkish), in racemes; rootstock with bulblets; ultimate leaf segments not generally 3-parted, about 1 (-3) mm wide, with parallel sides for most of their length, then tapering suddenly to the tip.
  3 Spurs of the corolla rounded, incurved, 2-5 mm long; bulblets yellow, spherical ..... ***D. canadensis***
  3 Spurs of the corolla elongate, divergent, 7-9 mm longl bulblets white to pink, tear-shaped (narrowed upward) ..... ***D. cucullaria***

Dicentra canadensis (Goldie) Walpers, Squirrel Corn. Rich, moist forests, especially rich cove forests in the mountains. April-May; June. S. ME west to s. MN, south to w. NC, n. GA, TN, and MO. [= RAB, C, F, FNA, G, K, W, WV; = *Bicuculla canadensis* (Goldie) Millspaugh – S]

Dicentra cucullaria (Linnaeus) Bernhardi, Dutchman's Britches. Rich, moist forests, especially rich cove forests in the mountains. March-April; May-June. NS west to n. MN, south to GA, AR, and KS; disjunct in WA, OR, and ID. [= RAB, C, F, FNA, G, K, W, WV; = *Bicuculla cucullaria* (Linnaeus) Millspaugh – S]

Dicentra eximia (Ker-Gawler) Torrey, Wild Bleeding Heart. Cliffs, talus slopes, rocky slopes, rock outcrops, shale slopes. April-June; July-August. An Appalachian endemic: NY and NJ south to NC and TN. [= RAB, C, F, FNA, G, K, W, WV; = *Bicuculla eximia* (Ker-Gawler) Millspaugh – S]

* *Dicentra formosa* (Haworth) Walpers ssp. *formosa*, native from s. BC south to c. CA, is frequently cultivated and resembles our native *D. eximia*. A variety of cultivars, some apparently derived from hybrids between the two subspecies, make identification uncertain in some cases. [= FNA, Z] {not mapped; rejected as a component of our flora}



Fumaria Linnaeus 1753 (Fumitory)

A genus of about 50 species, annual herbs, primarily Eurasian. References: Boufford in FNA (1997); Stace (2010)=Z; Lidén in Kubitzki, Rohwer, & Bittrich (1993).

1 Corolla (9-) 10-14 mm long, creamy white (to reddish); fruiting pedicels deflexed downwards; fruit smooth when dry ..... ***F. capreolata***
1 Corolla 4-8 (-9) mm long, white to pink or purple; fruiting pedicels ascending; fruit rugose or verrucose when dry.
  2 Corolla (6-) 7-8 (-9) mm long, dark pink to purple; raceme borne on a peduncle ..... ***F. officinalis***
  2 Corolla 4-6 mm long, white (rarely very pale pink); raceme sessile or subsessile ..... ***F. parviflora***

* ***Fumaria capreolata*** Linnaeus, White Ramping-fumitory. Cp (FL): ditches, fields, disturbed areas; rare, native of sw. Europe. [= FNA, WH, Z]

* ***Fumaria officinalis*** Linnaeus, Fumitory, Earthsmoke. Cp (DE, GA, NC, SC, VA), Pd (NC, SC, VA), Mt (TN, VA, WV): sandy fields, disturbed places, escaped from gardens; uncommon (rare in GA, NC, SC, TN, VA, and WV), native of Europe. March-May. [= RAB, C, F, FNA, G, K, S, WH, WV; > *F. officinalis* ssp. *officinalis* – K, Z; > *F. officinalis* ssp. *wirtgenii* (W.D.J. Koch) Arcangeli – K, Z]

* ***Fumaria parviflora*** Lamarck, Smallflower Fumitory, Fineleaf Fumitory. Cp (FL, GA): abandoned woodlots, other disturbed areas; rare, native of Eurasia. Reported for Lowndes County, GA (Carter, Baker, & Morris 2009). [= FNA, K, WH, Z]

Lamprocapnos Endlicher 1850 (Asian Bleeding Heart)

A monotypic genus, a perennial herb of e. Asia. References: Lidén et al. (1997); Stern (1961)=Z.

Identification notes: *Lamprocapnos* differs from other "bleeding hearts" (the native *Dicentra eximia* and the western American *Dicentra formosa* ssp. *formosa*) in its leafy stem, the inflorescence borne terminally or opposite a leaf, the leaves much less finely divided, and the flowers about as broad as long (vs. much longer than broad in *Dicentra eximia* and *Dicentra formosa*).

* *Lamprocapnos spectabilis* (Linnaeus) Fukuhara, Bleeding Heart, native to e. Siberia, Korea, and n. China, is frequently cultivated and may persist or weakly naturalize. It is reported for KY (Kartesz 1999, Kartesz 2010) and various ne. United States. [= K; = *Dicentra spectabilis* (Linnaeus) Lemaire – Z] {not mapped; rejected as a component of our flora}

109b. PAPAVERACEAE A.L. de Jussieu 1789 (Poppy Family) [in RANUNCULALES]

A family of 23 genera and about 230 species, mainly herbs (some shrubs and small trees), largely north temperate in distribution. References: Kiger in FNA (1997); Wang et al. (2009); Kadereit in Kubitzki, Rohwer, & Bittrich (1993).

1 Flowering stem scapose, leaves basal only; petals 8-16, white; [subfamily *Chelidonioideae*] ..... ***5. Sanguinaria***
1 Flowering stem with leaves at least low on the stem; petals 0-6, purple, red, orange-red, orange, yellow, cream.
2 Inflorescence a panicle; petals absent; [subfamily *Chelidonioideae*] ..... ***4. Macleaya***
2 Inflorescence not a panicle; petals present, 4-6.
3 Leaves and fruits prickly; [subfamily *Papaveroideae*] ..... ***1. Argemone***
3 Leaves and fruits not prickly.
4 Sepals connate; leaves ternately dissected into linear segments; sap watery; [subfamily *Eschscholzioideae*] ..... ***8. Eschscholzia***
4 Sepals separate; leaves pinnately lobed; sap yellow, orange, or milky.
5 Flowers several in a terminal umbel; [subfamily *Chelidonioideae*].
6 Stigma lobes, placentae, and capsule valves 2; style very short; fruit linear, glabrous ..... ***6. Chelidonium***
6 Stigma lobes, placentae, and capsule valves (2-) 3-4; style ca. 1 cm long; fruit ellipsoid, pubescent with long white hairs ..... ***7. Stylophorum***
5 Flowers solitary, terminal.
7 Fruit 15-30 cm long, 2-locular (the partitions complete), dehiscent by elongate valves; stigmatic lobes 2; [subfamily *Chelidonioideae*] ..... ***3. Glaucium***
7 Fruit 1-8 cm long, 4-20-locular (the partitions incomplete), dehiscent by small valves beneath the stigmatic disc; stigmatic lobes 4-20; [subfamily *Papaveroideae*] ..... ***2. Papaver***

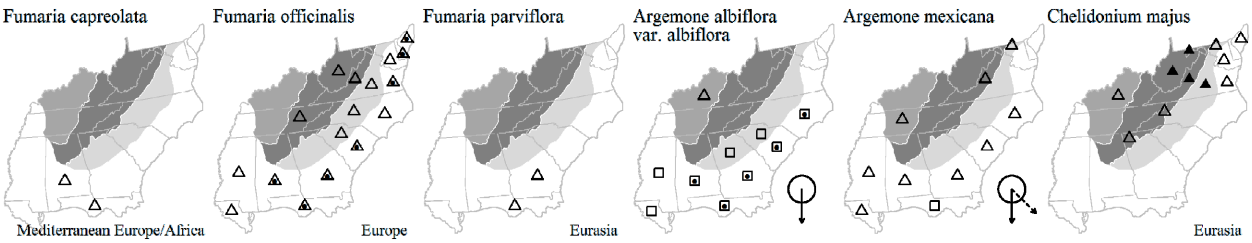
1. Argemone Linnaeus 1753 (Prickly-poppy)

A genus of about 32 species, annual and perennial herbs, of North America, West Indies, Central America, South America, and Hawaii. References: Ownbey in FNA (1997); Kadereit in Kubitzki, Rohwer, & Bittrich (1993).

1 Flowers white to pink; latex white or nearly clear ..... ***A. albiflora*** *ssp.* ***albiflora***
1 Flowers yellow to cream; latex yellow ..... ***A. mexicana***

Argemone albiflora Hornemann *var.* ***albiflora***, Carolina-poppy, White Prickly-poppy. Sandy roadsides and disturbed areas. April-May (sporadically later). This species is apparently native to the southeastern United States, presumably including portions of our area, south to s. FL, but the native range is unclear. Var. *texana* (G.B. Ownbey) Shinners occurs in TX, AR, and LA. The species' weediness suggests, however, that it may be merely adventive in our area. [= *A. albiflora* ssp. *albiflora* – FNA, K; < *A. albiflora* – RAB, C, WH; < *A. alba* Lestib. f. – G, S, misapplied]

* ***Argemone mexicana*** Linnaeus, Mexican-poppy, Mexican Prickly-poppy. Sandy roadsides and disturbed areas; native of peninsular FL, West Indies, and maybe Mexico and Central America. April-May (sporadically later). [= RAB, C, FNA, G, K, WH]



2. Papaver Linnaeus 1753 (Poppy)

A genus of about 80 species, annual and perennial herbs, of temperate Northern Hemisphere. References: Kiger & Murray in FNA (1997); Kiger (1975)=Z; Kadereit in Kubitzki, Rohwer, & Bittrich (1993).

Identification notes: Other species are cultivated and may be found in our area persistent, escaped, as waifs, or as naturalized populations.

1 Upper cauline leaves clasping the stem; [section *Papaver*] ..... ***P. somniferum***
1 Upper cauline leaves not clasping the stem.
2 Ovaries and capsules sparsely to densely setose-pubescent; [section *Argemonidium*].
3 Capsules oblong to clavate, sparsely setose with weak hairs ..... ***P. argemone***
3 Capsules obovoid-ellipsoid to subglobose, densely setose with strong hairs ..... ***P. hybridum***
2 Ovaries and capsules glabrous.
4 Flowers > 10 cm across; perennial; [section *Macrantha*] ..... ***P. orientale***
4 Flowers < 10 cm across; annual; [section *Rhoeadium*].
5 Capsule 2-3× as long as broad; stigmatic lobes 5-9 ..... ***P. dubium***
5 Capsule 1-1.5× as long as broad; stigmatic lobes 8-15 ..... ***P. rhoeas***

* ***Papaver argemone*** Linnaeus, Prickly Poppy. Disturbed areas; native of Europe and sw. Asia. Reported from PA (Rhoads & Klein 1993, Kiger & Murray in FNA 1997), VA (probably only from cultivation), and MD (Kiger & Murray in FNA 1997). [= FNA]

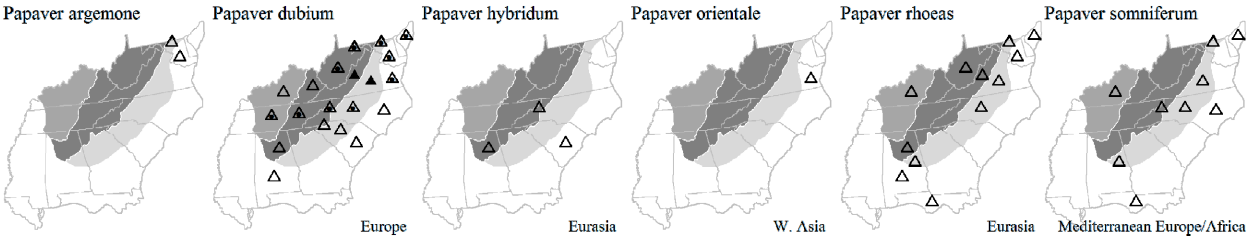
* ***Papaver dubium*** Linnaeus, Long-headed Poppy. Roadsides, fields, disturbed areas; native of Europe. April-July. [= RAB, C, F, FNA, G, K, S, W, WV, Z]

* ***Papaver hybridum*** Linnaeus, Rough Poppy. Disturbed areas; native of Eurasia. May-June. [= RAB, FNA, K, Z]

* ***Papaver orientale*** Linnaeus, Oriental Poppy. Disturbed areas; native of sw. Asia. [= FNA, G, K, Z]

* ***Papaver rhoeas*** Linnaeus, Corn Poppy, Field Poppy, Red Poppy, Shirley Poppy, Common Poppy. Disturbed areas; native of Eurasia and n. Africa. May. [= RAB, C, F, FNA, G, K, WH, WV, Z]

* ***Papaver somniferum*** Linnaeus, Opium Poppy, Common Poppy. Disturbed areas; native of Mediterranean Europe and Asia Minor. May-June. [= RAB, C, F, FNA, G, K, S, WH, Z]



3. Glaucium P. Miller 1754 (Horned-poppy)

A genus of about 23 species, annual and perennial herbs, of temperate Europe and w. Asia. References: Kiger in FNA (1997); Kadereit in Kubitzki, Rohwer, & Bittrich (1993). Key based on FNA.

1 Basal leaves few, glabrate to moderately pubescent; blades of distal leaves not distinctly clasping stem; petals orange to reddish orange, usually with blackish basal spot; capsules straight to slightly curved, pubescent or glabrate ..... ***G. corniculatum***

1 Basal leaves numerous, densely pubescent; distal blades of distal leaves distinctly clasping stem; petals yellow or orange-yellow, sometimes with reddish to violet basal spot; capsules mostly distinctly curved, glabrous, tuberculate, or scabrous ..... ***G. flavum***

* ***Glaucium corniculatum*** (Linnaeus) J.H. Rudolph, Red Horned-poppy, Blackspotted Horned-poppy. Pasture; native of Europe and sw. Asia. April-May. [= FNA, K]

* ***Glaucium flavum*** Crantz, Yellow Horned-poppy, Sea-poppy. Disturbed areas; native of Mediterranean Europe. June. [= C, F, FNA, G, K]

4. Macleaya R. Brown 1826 (Plume-poppy)

A genus of 2 species, perennial herbs, of e. Asia. References: Kiger in FNA (1997); Kadereit in Kubitzki, Rohwer, & Bittrich (1993).

* ***Macleaya cordata*** (Willdenow) R. Brown, Plume-poppy, Tree-celandine. Moist streambanks, persistent or escaped from cultivation; native of e. Asia. Reported as naturalized in TN by Kral (1981). [= C, F, FNA, G, K]

5. Sanguinaria Linnaeus 1753 (Bloodroot)

A monotypic genus, a perennial herb, of e. North America. References: Kiger in FNA (1997); Kadereit in Kubitzki, Rohwer, & Bittrich (1993).

Sanguinaria canadensis Linnaeus, Bloodroot, Red Puccoon. Moist nutrient-rich forests. March-April; April-May. NS west to MN and MB, south to Panhandle FL and OK. Fernald recognizes two varieties – var. *rotundifolia*, more southern and the primary form in our area, is considered to have leaves less lobed than the more northern var. *canadensis*; leaf shape variability within populations makes it impractical to recognize infraspecific taxa. [= RAB, C, FNA, G, K, S, W, WH; > *S. canadensis* var. *canadensis* – F; > *S. canadensis* var. *rotundifolia* (Greene) Fedde – F]

6. Chelidonium Linnaeus 1753 (Greater-celandine)

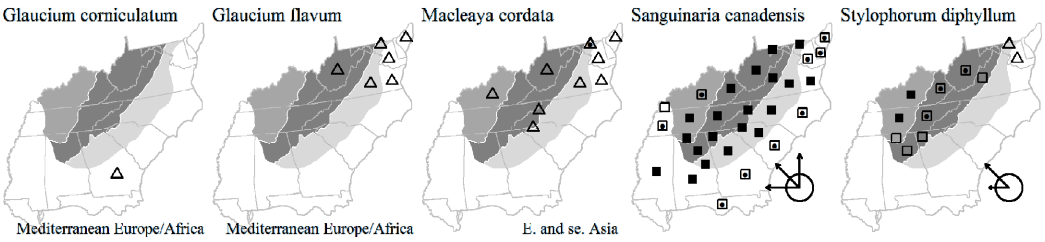
A monotypic genus, a perennial herb, of temperate Eurasia. References: Kiger in FNA (1997); Kadereit in Kubitzki, Rohwer, & Bittrich (1993).

* ***Chelidonium majus*** Linnaeus, Greater-celandine, Rock-poppy, Swallow-wort. Moist slopes, shaded roadsides, rocky forests; native of Eurasia. April-July. First reported for GA (Rabun County) by Stiles & Howel (1998). [= RAB, C, F, FNA, G, S, W; > *C. majus* var. *majus* – K]

7. Stylophorum Nuttall 1818 (Celandine-poppy)

A genus of 2-5 species, perennial herbs, of e. North America and e. Asia. References: Kiger in FNA (1997); Kadereit in Kubitzki, Rohwer, & Bittrich (1993).

Stylophorum diphyllum (Michaux) Nuttall, Celandine-poppy, Woods-poppy. Moist forests over calcareous rocks (such as limestone). March-April. S. QU, w. PA, s. MI, and WI, south to sw. VA, e. TN, nw. GA, sc. TN, and AR; introduced elsewhere from horticultural use. [= C, F, FNA, G, K, S, W, WV]



8. Eschscholzia Chamisso 1820 (California-poppy)

A genus of about 12 species, annual and perennial herbs, of sw. North America and n. Mexico. References: Clark in FNA (1997); Kadereit in Kubitzki, Rohwer, & Bittrich (1993).

* ***Eschscholzia californica*** Chamisso *ssp.* ***californica***, California-poppy. Roadsides, disturbed areas; native of w. North America. May-August. [= FNA, K; < *Eschscholtzia californica* – RAB, F, orthographic variant]

111. LARDIZABALACEAE Decaisne 1839 (Lardizabala Family) [in RANUNCULALES]

A family of about 8 genera and 35 species, shrubs and vines, primarily Asian, but also in s. South America. References: Thieret & Kartesz in FNA (1997); Wang et al. (2009); Cheng-Yih & Kubitzki in Kubitzki, Rohwer, & Bittrich (1993).

Akebia Decaisne 1837 (Akebia)

A genus of 5 species, vines, of temperate e. Asia. References: Cheng-Yih & Kubitzki in Kubitzki, Rohwer, & Bittrich (1993).

* ***Akebia quinata*** (Houttuyn) Decaisne, Five-leaf, Five-leaf Akebia, Chocolate-vine. Escaped from cultivation to roadbanks, suburban woodlands, and floodplains; native of Japan, China, and Korea, potentially invasive and difficult to eradicate. April-June; June-July. [= RAB, C, F, FNA, K]

112. MENISPERMACEAE A.L. de Jussieu 1789 (Moonseed Family) [in RANUNCULALES]

A family of about 72 genera and 450 species, vines, shrubs, trees, and herbs, ot tropical, subtropical, and warm temperate areas. References: Rhodes in FNA (1997); Wang et al. (2009); Hoot et al. (2009); Kessler in Kubitzki, Rohwer, & Bittrich (1993).

1 Leaves asymmetrically peltate (the stem attached 1-5 mm in from the leaf margin); stamens 12-24; petals 6-9; fruit bluish-black; [tribe *Menispermeae*] ..... ***Menispermum***
1 Leaves not peltate, usually cordate (the stem attached at the leaf margin); stamens 6 or 12; petals 6 or 0; fruit red or bluish-black.
  2 Leaves 3-7-lobed, the sinuses usually deep, the lobes acute; stamens 12; petals 0; fruit bluish-black, 13-25 mm long; [tribe *Tinosporeae*] ... . ***Calycocarpum***
  2 Leaves entire to 3-lobed, the sinuses always shallow, the lobes (if present) broadly rounded; stamens 6; petals 6; fruit red, 5-8 mm long; [tribe *Tiliacoreae*] ..... ***Cocculus***

Calycocarpum Nuttall ex Torrey & A. Gray 1838 (Cupseed)

A monotypic genus, a woody vine, of e. North America. References: Kessler in Kubitzki, Rohwer, & Bittrich (1993).

Calycocarpum lyonii (Pursh) A. Gray, Cupseed, Lyonia-vine. Floodplain forests, wet hammocks. May-June. Se. SC, e. TN, sc. KY, s. IN, s. IL, MO, and e. KS, south to se. GA, Panhandle FL, s. AL, s. MS, s. LA, and e. TX. [= C, F, FNA, G, K, S, WH]

Cocculus A.P. de Candolle 1817 (Coralbeads, Snailseed)

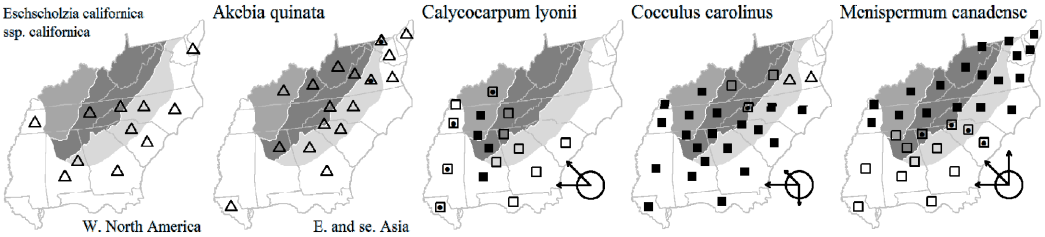
A genus of 8 species, woody vines, shrubs, and trees, of tropical, subtropical, and warm temperate regions of North America, Central America, Africa, Madagascar, India, Malaysia, and the Philippines. References: Kessler in Kubitzki, Rohwer, & Bittrich (1993).

Cocculus carolinus (Linnaeus) A.P. deCandolle, Coralbeads, Carolina Moonseed, Snailseed, Red Moonseed. Moist to dry forests and thickets, especially where calcareous, also weedy in landscaping. June-August. VA south to FL, west to TX, north in the interior to s. IN and MO. Its occurrences in VA may be primarily adventive. [= RAB, C, F, FNA, G, K, W, WH; = *Epibaterium carolinum* (Linnaeus) Britton – S]

Menispermum Linnaeus 1753 (Moonseed)

A genus of 2-4 species, vines, of temperate e. North America and temperate e. Asia. References: Kessler in Kubitzki, Rohwer, & Bittrich (1993).

Menispermum canadense Linnaeus, Moonseed, Yellow Parilla. Moist nutrient-rich forests, especially on floodplains or lower slopes. June-August. QC west to MB, south to GA and OK. [= RAB, C, F, FNA, G, K, S, W, WH, WV]



113. BERBERIDACEAE A.L. de Jussieu 1789 (Barberry Family) [in RANUNCULALES]

As broadly defined here, a family of about 15 genera and 650 species, herbs and shrubs, of the temperate Northern Hemisphere and Andean South America. There has been much debate and study of whether the Berberidaceae shold be recognized as a broadly defined unit, or split into a variety of segregate families (such as Podophyllaceae, Epimediaceae, Nandinaceae, Leonticaceae). Based on molecular studies, Kim & Jansen (1996, 1998) conclude that division of the Berberidaceae into segregate families is not warranted. References: Whetstone, Atkinson, & Spaulding in FNA (1997); Wang et al. (2009); Stearn (2002); Kim & Jansen (1996, 1998); Ahrendt (1961); Loconte & Estes (1989b); Meacham (1980); Loconte in Kubitzki, Rohwer, & Bittrich (1993).

1 Leaves ternately compound; [subfamily *Nandinoideae*].
  2 Plant a shrub, with multiple leaves; flowers white.....***1. Nandina***
  2 Plant an herb, with 2 leaves; flowers greenish or maroonish.....***2. Caulophyllum***
1 Leaves simple (though sometimes variously lobed or divided into segments).
  3 Plant a shrub; leaves not peltate, simple or 1-pinnately compound; flowers yellow; [subfamily *Berberidoideae*] .....***3. Berberis***
  3 Plant an herb; leaves peltate, 2-parted or radially lobed; flowers white; .[subfamily *Podophylloideae*].
    4 Plant acaulescent; flower solitary and scapose; leaf segments 2; fruit a capsule.....***4. Jeffersonia***
    4 Plant caulescent; flower solitary, or cymose to umbellate, borne on a stem with leaves; leaf segments several; fruit a berry.
      5 Flowers cymose or umbellate; stamens 6; berry globose, 8-12 mm long, 2-4 seeded; larger leaves with only 2 clefts that extend > halfway to the peltate center of the leaf (thus the leaf divided into 2 halves, the other sinuses shallow).....***5. Diphylleia***
      5 Flower solitary; stamens 12-18; berry ovoid, 25-70 mm long, many-seeded; larger leaves with 5 or more clefts that extend > halfway to the peltate center of the leaf (thus the leaf fairly evenly divided into multiple lobes) .....***6. Podophyllum***

1. Nandina Thunberg 1781 (Nandina, Sacred-bamboo)

A monotypic genus, a shrub, native of Japan, China, and India. Here treated as a monotypic genus in the Berberidaceae, *Nandina* seems to have only a general kinship to the Berberidaceae (see Ehdaie & Russell 1984, Loconte & Estes 1989b, Meacham 1980) and should perhaps be placed in its own monotypic family. References: Whetstone, Atkinson, & Spaulding in FNA (1997); Ehdaie & Russell (1984); Loconte in Kubitzki, Rohwer, & Bittrich (1993).

* ***Nandina domestica*** Thunberg, Nandina, Sacred-bamboo. Forests and woodlands in suburban areas, commonly planted, increasingly escaping and naturalizing; native of China. May-June; October-November. *Nandina* has numerous cultivated forms, and is widely planted in the Piedmont and Coastal Plain of our area, especially southward. Leaflet shape varies in cultivated forms from broadly ovate to linear. [= RAB, FNA, K]

2. Caulophyllum Michaux 1803 (Blue Cohosh)

A genus of 3 species, herbs, with a relictual north temperate distribution (e. North America, e. Asia). The only other species of the genus is *C. robustum* Maximowicz, of e. Asia. References: Loconte in FNA (1997); Stearn (2002)=Y; Loconte & Blackwell (1981, 1984, 1985)=Z; Uttal (1985); Brett (1981); Loconte in Kubitzki, Rohwer, & Bittrich (1993).

1 Carpels (in flower) 3.5-5 mm long, averaging 4 mm; style 0.8-1.5 mm long; sepals 6-9 mm long, usually purple; terminal leaflets (5-) 7-9 (-10) cm long, (4-) 5-7.5 (-8) cm wide; main inflorescence with 4-18 flowers; first leaf 2-ternate or 3-ternate ..... ***C. giganteum***
1 Carpels (in flower) 1.3-2.8 mm long, averaging 2 mm; style 0.3-1.0 mm long; sepals 3-6.5 mm long, yellow, yellow-purple, or green; terminal leaflets (3-) 5-7 (-8) cm long, (2-) 3.5-6.5 (-10) cm wide; main inflorescence with 5-70 flowers; first leaf 3-ternate or 4-ternate..... ***C. thalictroides***

Caulophyllum giganteum (Farwell) Loconte & Blackwell, Northern Blue Cohosh. Rich forests. April-May; July-August. *C. giganteum* is more northern in distribution than C. *thalictroides*, ranging south to VA, nw. NC, ne. and nc. TN (Chester, Wofford, & Kral 1997), and c. KY. This species blooms about 2 weeks earlier than *C. thalictroides* where they grow together. The combination of sympatry, morphologic distinctness, and phenologic separation of the two taxa argues for recognition at the species level. [= FNA, K, W, Y, Z; < *C. thalictroides* – RAB, F, G, S; = *C. thalictroides* var. *giganteum* Farwell – C]

Caulophyllum thalictroides (Linnaeus) Michaux, Common Blue Cohosh, Green Vivian. Rich forests. April-May; July-August. NS, QC, ON, and MB, south to GA, AL, AR, and OK. [= FNA, K, W, Y, Z; < *C. thalictroides* – RAB, F, G, S (also see *C. giganteum*); = *C. thalictroides* var. *thalictroides* – C]

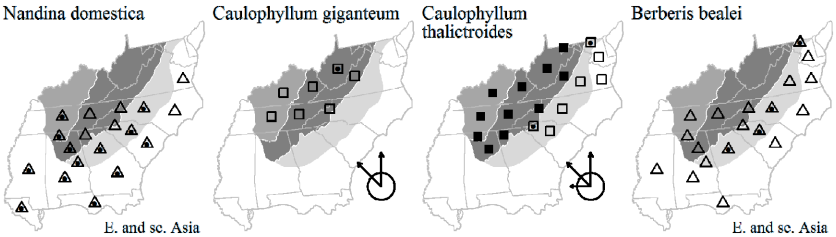
3. Berberis Linnaeus 1753 (Barberry)

A genus of 400-600 species, shrubs, of North America, South America, Asia, Europe, and n. Africa. Many authors favor the inclusion of *Mahonia* in *Berberis*. It appears that *Mahonia* is a paraphyletic grade basal to *Berberis* (in the narrow sense) (Kim, Kim, & Landrum 2004). References: Whittemore in FNA (1997); Loconte in Kubitzki, Rohwer, & Bittrich (1993); Kim, Kim, & Landrum (2004).

Identification notes: Other species of *Berberis* are used horticulturally in our area. Though none appear to be established at this time, the possibility of encountering species other than the three treated above should be kept in mind. *B. julianiae* Schneider is especially commonly planted in hedges and landscaping.

1 Leaves 1-pinnately compound, > 10 cm long, not fascicled on short spur shoots; stems not spiny; leaves evergreen.
  2 Bud scales deciduous, 3-8 mm long; leaflet blades 1-3-veined from base ..... ***B. repens***
  2 Bud scales evergreen, 11-44 mm long; leaflet blades 4-6-veined from base.
    3 Leaflet blades with 2-7 teeth per side, each tooth 3-8 mm long; leaflets very thick and stiff ..... ***B. bealei***
    3 Leaflet blades with 6-13 teeth per side, each tooth 1-2 (-3) mm long; leaflets thickish, but flexible when fresh..... ***B. nervosa***
1 Leaves simple, < 6 cm long, fascicled on short spur shoots; stems spiny; leaves deciduous or evergreen.
  4 Leaves entire; flowers solitary or 2-4 in umbels; spines mostly simple; [section *Tschonoskyanae*] ..... ***B. thunbergii***
  4 Leaves bristly-serrate; flowers 5-many in racemes (sometimes the racemes umbelliform); spines mostly trifurcate (some simple or bifurcate).
    5 Leaves evergreen, coriaceous; leaf teeth tipped with firm prickles; fruits blue-black, pruinose; [section *Wallichianae*] ..... ***B. julianiae***
    5 Leaves deciduous, herbaceous; leaf teeth tipped with weak bristles; fruits red, not pruinose.
      6 Leaves with 1-9 (20) bristles on each margin, the bristles 3-6 mm apart; berries ovoid (6-9 mm long, 6-7 mm broad), 5-10 (rarely more) in an often umbellate raceme; petals notched at apex; [section *Canadenses*] ..... ***B. canadensis***
      6 Leaves with 18-36 bristles on each margin, ca. 2 mm apart; berries ellipsoid (8-10 mm long, 4-5 mm broad), 10-20 in a raceme; petals obtuse at apex; [section *Vulgares*] ..... ***B. vulgaris***

* ***Berberis bealei*** Fortune, Leatherleaf Mahonia, Chinese Mahonia, Holly-grape. In deciduous forests in suburban areas, spread from plantings; native of China. December-March; May-July. Naturalizing widely in the southeastern United States, including (at least) AL, DE, GA, FL, NC, and SC. [= FNA, WH; = *Mahonia bealei* (Fortune) Carrière – RAB, K]



Berberis canadensis P. Miller, American Barberry, Allegheny Barberry. Rocky woods, forest openings, glades, usually over mafic rocks (such as diabase) or calcareous rocks (such as limestone), sometimes along fence-rows in sw. VA (presumably spread by birds). April-May; September-October. A broad Southern Appalachian-Ozarkian endemic, not occurring in Canada (the epithet a misnomer): scattered and local in VA, WV, KY, TN, NC, SC, AL, GA, MO, IL, IN, and sc. PA (where apparently now extirpated). Along with *B. vulgaris*, *B. canadensis* has been subjected to organized eradication programs because of its serving as an alternate host for wheat rust (*Puccinia graminis*). [= RAB, C, F, FNA, G, K, S, W]

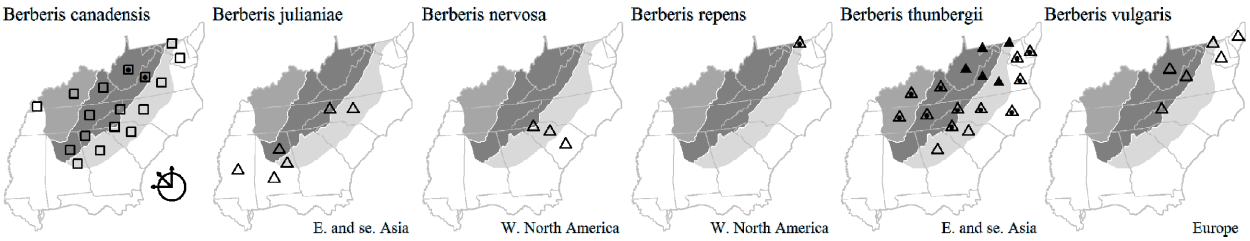
* ***Berberis julianiae*** Schneider, Evergreen Barberry. Seeding down and escaping locally near horticultural plantings; native of China. First reported for NC by Pittillo & Brown (1988). [= K; = *B. julianae*, orthographic variant]

* ***Berberis nervosa*** Pursh. Disturbed areas; native of w. North America. Introduced in SC (Hill & Horn 1997). [= FNA; = *Mahonia nervosa* (Pursh) Nuttall – K]

* ***Berberis repens*** Lindley, Creeping Oregon Grape. Suburban woodlands; native of nw. North America. [= FNA; = *Mahonia repens* (Lindley) G. Don – K] {add to synonymy}

* ***Berberis thunbergii*** A.P. de Candolle, Japanese Barberry. Rich forests, old fields; native of Japan. March-April; May-September. This species is immune to wheat rust; it is probably now the most commonly encountered barberry in our area. [= RAB, C, F, FNA, G, K, S, W]

* ***Berberis vulgaris*** Linnaeus, European Barberry, Common Barberry. Disturbed areas; native of Europe. April; September. This species, once widely cultivated and established in North America, serves as an alternate host to wheat rust and has been subjected to eradication programs for over half a century. It may no longer occur in our area. [= C, F, FNA, G, K]



4. Jeffersonia W. Barton 1793 (Twinleaf)

A genus of 2 species, the only other species of the genus is native to e. Asia (eastern Russia, Korea, Manchuria). The closest North American relatives of *Jeffersonia* are *Achlys* and *Vancouveria* of the Pacific Northwest. References: George in FNA (1997); Stearn (2002)=Y; Loconte & Estes (1989b); Loconte in Kubitzki, Rohwer, & Bittrich (1993).

Jeffersonia diphylla (Linnaeus) Persoon, Twinleaf. Moist and extremely nutrient-rich forests, generally over calcareous or mafic rocks (including limestone, dolostone, amphibolite, greenstone, etc.) or very rich alluvium. March-April; May. The species is widepread in ne. United States, south to MD, NC, and AL. It is somewhat suggestive of *Sanguinaria* in both foliage and flower. [= RAB, C, F, FNA, G, K, S, W, WV, Y]

5. Diphylleia Michaux 1803 (Umbrella-leaf)

A genus of 3 species, herbs, with a relictual north temperate distribution. The other two species in the genus are east Asian – *D. grayi* F. Schmidt of Japan and Sakhalin, and *D. sinensis* H.L. Li of the Hubei, Shaanxi, Gansu, Sichuan, and Yunnan provinces of China. References: George in FNA (1997); Ying, Terabayashi, & Boufford (1984)=Z; Stearn (2002)=Y; Loconte in Kubitzki, Rohwer, & Bittrich (1993).

Diphylleia cymosa Michaux, Umbrella-leaf, Pixie-parasol. Seepages and brook-banks, sometimes away from brooks or seeps in northern hardwood or cove hardwood forests (but then usually in subterranean seepage), primarily at moderate to high elevations. May-June; July-August. A narrow Southern Appalachian endemic: high mountains of w. NC and e. TN, extending a short distance into ne. GA, nw. SC, and sw. VA. [= RAB, C, F, FNA, G, K, S, W, Y, Z]

6. Podophyllum Linnaeus 1753 (May-apple)

A genus of 2 species (or ca. 14 if *Dysosma* is included), herbs, one in e. North America, the other in e. Asia. The obvious morphological kinship of *Podophyllum*, *Diphylleia*, and *Hydrastis* is corroborated by alkaloid chemistry. References: George in FNA (1997); Shaw (2000, 2002)=Z; Loconte in Kubitzki, Rohwer, & Bittrich (1993).

Podophyllum peltatum Linnaeus, May-apple, American Mandrake. Rich forests, bottomlands, slopes, pastures. March-April; May-June. NS west to MN, south to Panhandle FL and TX. The ripe fruits are edible; the rest of the plant contains a variety of alkaloids, and is poisonous-medicinal. Compounds from *Podophyllum* are used in wart removal, and show anti-viral and anti-cancer promise. [= RAB, C, F, FNA, G, K, S, W, WV; > *P. peltatum* var. *peltatum* – Z; > *P. peltatum* var. *annulare* J.M.H. Shaw – Z]

114a. HYDRASTIDACEAE Martinov 1820 (Golden-seal Family) [in RANUNCULALES]

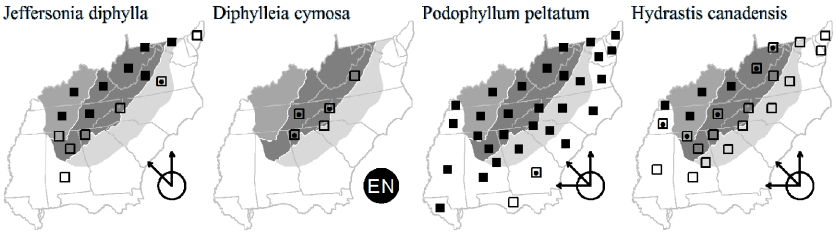
A family of 2 genera and 2 species, perennial herbs, of temperate e. North America and Japan. In chemistry, morphology, and anatomy, *Hydrastis* shows some relationship to *Podophyllum* and *Diphylleia* of the Podophyllaceae (often included in the Berberidaceae). Though usually placed in the Ranunculaceae, Tobe & Keating (1985) present evidence from morphology, anatomy, embryology, palynology, chemistry, and cytology that suggests that *Hydrastis* is best recognized as a monotypic family. They contend that "*Hydrastis* represents a relictual primitive group which very early diverged from a common ancestral stock of the Ranunculaceae, Berberidaceae and probably of Circaeasteraceae, and that *Hydrastis* has evolved in its own evolutionary line parallel with other lines leading to the modern representatives of these families." In recent papers on

classification of the flowering plants, Thorne (1992) and Reveal (1993a) have also accepted Hydrastidaceae as a distinct family. Tobe in Kubitzki & Bayer places *Hydrastis* with *Glaucidium* Siebold & Zuccarini in a bigeneric Hydrastidaceae. References: Tamura in Kubitzki, Rohwer, & Bittrich (1993); Wang et al. (2009); Tobe in Kubitzki & Bayer (2002).

1. Hydrastis Linnaeus 1759 (Golden-seal)

A monotypic genus, an herb, endemic to e. North America. References: Ford in FNA (1997); Tamura in Kubitzki, Rohwer, & Bittrich (1993).

Hydrastis canadensis Linnaeus, Golden-seal. Mesic, very nutrient-rich forests, with circumneutral soils, over calcareous or mafic rocks such as limestone, amphibolite, and dolostone, sometimes forming large colonies after canopy disturbance such as logging. April; May-June. VT and MN south to w. and c. NC, n. GA, TN, and AR. Exploited for the herbal trade (and still often used as a home remedy in more remote parts of the mountains), though too rare in our area to support economically significant wild collection. The root is bitter in taste and contains several alkaloids. Reported for SC (P. McMillan, pers.comm. 2002). [= RAB, C, F, FNA, G, K, S, W, WV]



114b. RANUNCULACEAE A.L. de Jussieu 1789 (Buttercup Family) [in RANUNCULALES]

A family of about 62 genera and 2450 species, herbs, shrubs, and vines, primarily of temperate and boreal regions. Classsification of subfamilies and tribes follows Wang et al. (2009). References: Whittemore & Parfitt in FNA (1997); Wang et al. (2009); Keener (1977); Tamura in Kubitzki, Rohwer, & Bittrich (1993). [also see *HYDRASTIDACEAE*]

1 Shrub or vine; leaves compound (or sometimes some to most of them simple in *Clematis*).
  2 Leaves opposite, distributed along the usually branched, clambering stem; sepals 4, white to blue or purplish, 10-50 mm long; wood not yellow; [subfamily *Ranunculoideae*, tribe *Anemoneae*] ..... ***16. Clematis***
  2 Leaves alternate, clustered together at the top of the usually unbranched, erect stem; sepals 5, maroon, 2-5 mm long; wood yellow; [subfamily *Coptidoideae*] ..... ***1. Xanthorhiza***
1 Herb; leaves compound or simple.
  3 Leaves simple, sometimes deeply cleft or lobed into rounded or elongate segments; [subfamily *Ranunculoideae*].
    4 Plants in flower..... **Key A**
    4 Plants in fruit ..... **Key B**
  3 Leaves compound, the leaflets either linear or more-or-less petiolulate.
    4 Plants in flower..... **Key C**
    4 Plants in fruit ..... **Key D**

Key A

1 Flowers bilaterally symmetrical, the upper sepal hooded or spurred; [tribe *Delphinieae*].
  2 Upper sepal hooded or helmet-shaped; petals hidden by the sepals; perianth blue or creamy white; stems weak, clambering, reclining, vining, or ascending in a curve ..... ***7. Aconitum***
  2 Upper sepal spurred; petals at least partly exserted from the sepals; perianth blue, pink, white, or greenish; stems strong, erect, normally straight
    3 Annual; pistil 1; petals 2, connate; leaf lobes < 1.5 mm wide..... ***8. Consolida***
    3 Perennial; pistil 3 (-5); petals 4, separate; leaf lobes > 2 mm wide..... ***9. Delphinium***
1 Flowers radially symmetrical, no perianth parts spurred or hooded (except the 5 sepals spurred in *Myosurus*).
  3 Petals present, white or yellow, larger and more conspicuous than the sepals; sepals present, green; [in other words, **with** a second, green, less conspicuous perianth whorl below the largest and colored perianth whorl; note that some *Anemone* have a calyx-like involucre of 3 bracts subtending each flower]; [tribe *Ranunculeae*].
    4 Basal leaves linear to linear-spatulate, mostly 4-8 cm long, 1-3 mm wide; receptacle elongate, 1-6 cm long (superficially resembling a *Plantago* inflorescence)..... ***19. Myosurus***
    4 Basal leaves various, but not as above; receptacle globose to sub-cylindric, mostly < 1 cm long
      5 Sepals 3 (-4); petals 7-12; achenes pubescent, beakless; leaves simple, cordate, unlobed; [introduced garden plants]..... ***18. Ficaria***
      5 Sepals (3-) 5 (-6); petals typically 5-9 (10 in some "doubled" forms); achenes smooth or variously ornamented with spines, papillae, or tubercles, sometimes also pubescent; leaves various, usually not at once simple, cordate, and unlobed; [native or introduced] ..... ***20. Ranunculus***
  3 Petals absent (or modified into relatively inconspicuous nectaries or staminodia); sepals present and petaloid (white, yellow, yellow-green, cream, or blue).
    6 Sepals 3-5 mm long, caducous; stamens white and showy; [tribe *Ranunculeae*]..... ***17. Trautvetteria***
    6 Sepals 6-40 mm long, not caducous; stamens not notably white and showy.
      7 Leaves opposite, distributed along the stem; style plumose; [tribe *Anemoneae*] ..... ***16. Clematis***

7 Leaves all basal, or with a few alternate or whorled involucrate leaves on the stem; style not plumose.
8 Sepals white, bluish, or blue; basal leaves 3-5 (-7)-lobed; [tribe *Anemoneae*] ..... ***15. Anemone***
8 Sepals yellow, green, or whitish (sometimes marked with purple); basal leaves unlobed, or palmately cleft into 5-11 (-many) segments.
9 Leaves cordate-reniform, unlobed; sepals bright yellow; petals absent; [native, of bogs and marshes]; [tribe *Caltheae*] ..... ***14. Caltha***
9 Leaves palmately or pedately lobed or divided; sepals green, greenish, dull yellow, or whitish; petals modified into tubular nectaries; [introduced, rarely persistent or escaped from cultivation].
10 Sepals 5-8, much longer than wide, yellow; cauline leaves absent, except for the involucre which immediately subtends the flower; [tribe *Cimicifugeae*] ..... ***12. Eranthis***
10 Sepals 5, nearly as wide as long, green or maroon; cauline leaves present; [tribe *Helleboreae*] ..... ***11. Helleborus***

Key B

1 Fruit a follicle, each carpel with 2 or more ovules.
2 Leaves cordate-reniform, toothed, not lobed or divided; [tribe *Caltheae*] ..... ***14. Caltha***
2 Leaves variously palmately or pedately lobed or divided.
3 Carpels 1-3; plants 3-30 dm tall; [native, except *Consolida*]; [tribe *Delphinieae*].
4 Stems weak, clambering, reclining, or vining ..... ***7. Aconitum***
4 Stems strong, erect
5 Annual; leaf lobes < 1.5 mm wide; [exotic] ..... ***8. Consolida***
5 Perennial; leaf lobes > 2 mm wide; [native] ..... ***9. Delphinium***
3 Carpels 3-6; plants 1-5 dm tall; [introduced, rarely persistent or escaping].
6 Cauline leaves absent, except for the involucre which immediately subtends the fruit; [tribe *Cimicifugeae*] ..... ***12. Eranthis***
6 Cauline leaves present; [tribe *Helleboreae*]. ..... ***11. Helleborus***
1 Fruit an achene (or dehiscent utricle in *Trautvetteria*), each carpel with 1 ovule.
7 Leaves opposite, distributed along the stem; style plumose; [tribe *Anemoneae*] ..... ***16. Clematis***
7 Leaves all basal, or with a few alternate or whorled involucrate leaves on the stem; style not plumose.
8 Basal leaves linear to linear-spatulate, mostly 4-8 cm long, 1-3 mm wide; receptacle elongate, 1-6 cm long (superficially resembling a *Plantago* inflorescence); [tribe *Ranunculeae*] ..... ***19. Myosurus***
8 Basal leaves various, but not as above, generally long-petiolate, with an expanded, cordate, 3-lobed, or palmately-lobed blade; receptacle globose to sub-cylindric, mostly < 1 cm long.
9 Fruit a dehiscent utricle; cauline leaves alternate; [tribe *Ranunculeae*] ..... ***17. Trautvetteria***
9 Fruit an achene; cauline leaves opposite or whorled (or alternate in *Ranunculus*).
10 Cauline leaves opposite or whorled, or reduced to 3 sepal-like involucral bracts immediately subtending the flower; sepals absent (but in *"Hepatica"* mimicked by the bracts); [tribe *Anemoneae*] ..... ***15. Anemone***
10 Cauline leaves alternate; sepals present; [tribe *Ranunculeae*]
11 Achenes pubescent, beakless; leaves simple, cordate, unlobed; [introduced garden plants] ..... ***18. Ficaria***
11 Achenes smooth or variously ornamented with spines, papillae, or tubercles, sometimes also pubescent; leaves various, usually not at once simple, cordate, and unlobed; [native or introduced] ..... ***20. Ranunculus***

Key C

1 Leaflets linear, < 1.5 mm wide.
2 Flowers bilaterally symmetrical; [subfamily *Ranunculoideae*, tribe *Delphineae*] ..... ***8. Consolida***
2 Flowers radially symmetrical.
3 Aquatic; [native]; [subfamily *Ranunculoideae*, tribe *Ranunculeae*] ..... ***20. Ranunculus***
3 Terrestrial; [alien].
4 Flower lacking involucre; pistils simple; [subfamily *Ranunculoideae*, tribe *Adonideae*] ..... ***6. Adonis***
4 Flower closely subtended by a finely dissected involucre; pistils compound; [subfamily *Ranunculoideae*, tribe *Nigelleae*] ..... ***10. Nigella***
1 Leaflets broader, rounded, lobed, or toothed.
5 Leaves all cauline, opposite; stems somewhat woody at base; [subfamily *Ranunculoideae*, tribe *Anemoneae*] ..... ***16. Clematis***
5 Leaves basal and cauline, the cauline alternate (or with opposite or whorled involucral bracts).
6 Petals present, conspicuous
7 Flowers dangling; petals red, orange with yellow, or blue, spurred; [subfamily *Thalictroideae*] ..... ***3. Aquilegia***
7 Flowers not dangling; petals yellow, not spurred; [subfamily *Ranunculoideae*, tribe *Ranunculeae*] ..... ***20. Ranunculus***
6 Petals absent or inconspicuous (soon deciduous or altered into a nectary-bearing clavate structure); sepals sometimes petaloid and conspicuous.
8 Sepals petaloid, conspicuous, white (or tinged with pink or green).
9 Involucre absent, all leaves on the stem alternate; petaloid sepals 5-10, white; [subfamily *Thalictroideae*] ..... ***4. Enemion***
9 Involucre of opposite or whorled, leaflike bracts present; peatloid sepals (4-) 5-20 (-30), white, cream, rose, or green.
10 Basal leaves with 3-5 leaflets, these toothed or incised; petaloid sepals white, cream, rose, or green; [subfamily *Ranunculoideae*, tribe *Anemoneae*] ..... ***15. Anemone***
10 Basal leaves with > 5 leaflets; these with 0-3 rounded lobes at the tip; petaloid sepals white to pale pink; [subfamily *Thalictroideae*] ..... ***5. Thalictrum thalictroides***
8 Sepals absent, or inconspicuous in comparison to the stamens or pistils.
11 Leaflets 3; flower solitary; [subfamily *Coptidoideae*] ..... ***2. Coptis***
11 Leaflets many; flowers many, in a panicle or raceme.
12 Inflorescence a raceme; [subfamily *Ranunculoideae*, tribe *Cimicifugeae*] ..... ***13. Actaea***
12 Inflorescence a panicle; [subfamily *Thalictroideae*] ..... ***5. Thalictrum***

Key D

1 Fruit a follicle or capsular (or fleshy and berrylike in some *Actaea*).
2 Mature leaves > 4 dm wide; [subfamily *Ranunculoideae*, tribe *Cimicifugeae*] ..... ***13. Actaea***
2 Mature leaves < 3 dm wide.
3 Leaflets linear; [aliens].
4 Flowers in a raceme, not subtended by an involucre; fruit follicular, each with a 1-2 mm long beak; [subfamily *Ranunculoideae*, tribe *Delphineae*] ..... ***8. Consolida***
4 Flower solitary, subtended by a finely divided involucre; fruit a spherical capsule-like structure composed of 5 or 10 partially connate follicles, each follicle terminated by a linear beak 13-20 mm long; [subfamily *Ranunculoideae*, tribe *Nigelleae*] ... ***10. Nigella***
3 Leaflets broad, rounded; [mostly natives].
5 Follicles borne on stipes, forming an umbel-like cluster; rhizomes yellow or orange; [subfamily *Coptidoideae*] ..... ***2. Coptis***
5 Follicles sessile; rhizomes brown or tan; [subfamily *Thalictroideae*].
6 Follicles 15-31 mm long, with beaks 7-18 mm long ..... ***3. Aquilegia***
6 Follicles 3.5-6.5 mm long, with beaks 1.5-3 mm long ..... ***4. Enemion***
1 Fruit an achene.
7 Leaves divided into numerous linear segments, all of which are < 1 mm wide.
8 Plant terrestrial; [subfamily *Ranunculoideae*, tribe *Adonideae*] ..... ***6. Adonis***
8 Plant aquatic (if leaves divided into numerous linear segments); [subfamily *Ranunculoideae*, tribe *Ranunculeae*] ..... ***20. Ranunculus***
7 Leaf segments rounded or cleft, > 1 mm wide.
9 Leaves cauline, opposite; [subfamily *Ranunculoideae*, tribe *Anemoneae*] ..... ***16. Clematis***
9 Leaves basal and/or cauline, cauline leaves (if present) alternate (leaflike involucral bracts sometimes present and opposite or whorled).
10 Leaflike involucral bracts present, opposite or whorled.
11 Achenes not ribbed or veined on lateral surfaces; leaf texture moderate to distinctly thick and leathery; [subfamily *Ranunculoideae*, tribe *Anemoneae*] ..... ***15. Anemone***
11 Achenes conspicuously ribbed or veined on lateral surfaces; leaf texture thin, delicate; [subfamily *Thalictroideae*] ..... ***5. Thalictrum thalictroides***
10 Leaflike involucral bracts not present.
12 Leaflets 3-many, if many the leaflets typically with teeth, or sharp lobes; [subfamily *Ranunculoideae*, tribe *Ranunculeae*] ..... ***20. Ranunculus***
12 Leaflets many, unlobed or typically with 3-9 rounded lobes; [subfamily *Thalictroideae*] ..... ***5. Thalictrum***

1. Xanthorhiza Marshall 1785 (Yellowroot)

A monotypic genus, a shrub, of temperate e. North America. References: Parfitt in FNA (1997); Tamura in Kubitzki, Rohwer, & Bittrich (1993).

Identification notes: An unmistakable plant, the woody stems usually about knee-high and unbranched, bearing a cluster of pinnate leaves near the tip, and the rhizomes with a bright yellow, staining, bitter-tasting alkaloid.

Xanthorhiza simplicissima Marshall, Yellowroot, Brook-feather. Streambanks and riverbanks. March-May; May-June. NY and se. PA (where only naturalized, according to Rhoads & Klein 1993), south to SC, sw. GA, w. FL, and AL. [= RAB, C, F, FNA, G, GW, K, W, WV; = *Xanthorrhiza simplicissima* – S, orthographic variant]

2. Coptis Salisbury 1807 (Goldthread)

A genus of about 15 species, perennial herbs, of boreal to temperate e. Asia and North America. References: Ford in FNA (1997); Tamura in Kubitzki, Rohwer, & Bittrich (1993).

Coptis trifolia (Linnaeus) Salisbury *var.* ***groenlandica*** (Oeder) Fassett, Goldthread, Goldenroot. Bogs. May-June. The species ranges from Greenland west to AK, south to NJ, nw. NC, n. IN, IA, and BC; and in e. Asia. Var. *groenlandica* is the variety in e. North America, northeast to Greenland, and in southern parts of nw. North America; var. *trifolia* is Alaskan and e. Asian. Whether the varieties are worth recognition is somewhat questionable. *Coptis* had been reported for NC by many floras (for instance, C, F, G, and S), but the documentation was unknown; its presence in NC has now been confirmed by P. McMillan. The species is distinctive, with neatly trifoliolate leaves, small white flowers on scapes, and yellow roots. [= C; = *C. groenlandica* (Oeder) Fernald – F, WV; = *C. trifolia* ssp. *groenlandica* (Oeder) Hultén – G; < *C. trifolia* – FNA, K, S]

3. Aquilegia Linnaeus 1753 (Columbine)

A genus of about 80 species, perennial herbs, of the Northern Hemisphere. References: Whittemore in FNA (1997); Munz (1946)=Z; Tamura in Kubitzki, Rohwer, & Bittrich (1993).

Identification notes: When in leaf, somewhat easily mistaken for *Thalictrum* or *Enemion*; look for old fruits.

1 Flowers red and yellow; {add other characters}; spurs straight; [native, common] ..... ***A. canadensis***
1 Flowers blue, purple, mauve, pink, white, or red and yellow; spurs hooked; [alien, rare] ..... ***A. vulgaris***

Aquilegia canadensis Linnaeus, Canada Columbine, Eastern Columbine. Forests, woodlands, rock outcrops, especially (though by no means entirely) on calcareous or mafic substrates. March-May. NS, QC, ON, MB, and SK south to Panhandle FL, s. AL, w. TN, c. AR, and se. OK; disjunct in Edwards Plateau, TX. One of our most familiar wildflowers. Disjunct populations in the deep South, on limestone in sw. GA and FL Panhandle, have been described as *A. australis* or *A. canadensis* var. *australis*; they need additional study. [= RAB, C, FNA, G, K, S, W; > *A. canadensis* var. *canadensis* – F, Z; > *A. canadensis* var. *coccinea* (Small) Munz – F, Z; > *A. canadensis* – S; > *A. australis* Small – S; > *A. coccinea* Small – S; > *A. canadensis* var. *australis* (Small) Munz – Z]

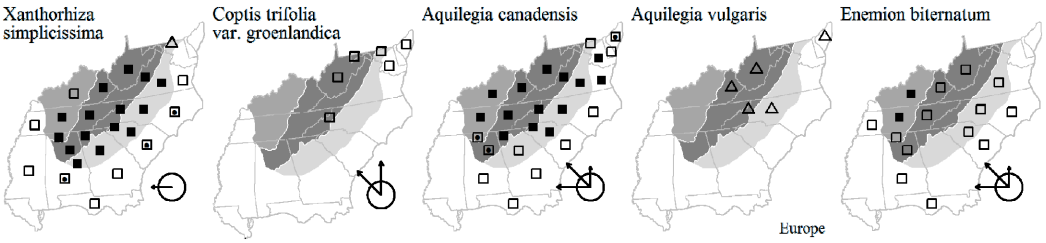
* ***Aquilegia vulgaris*** Linnaeus, European Columbine. Disturbed areas; native of Europe. Many varieties have been named; there seems little utility in trying to apply these names to the cultivated plants rarely persistent in our area. [= RAB, C, FNA, G, K; > *A. vulgaris* varieties – Z]

4. Enemion Rafinesque 1820 (Isopyrum)

A genus of about 6 species, perennial herbs, of temperate North America and e. Asia. The issue of the separation of the genus *Enemion* from *Isopyrum* remains somewhat controversial; I here follow Keener (1977), Tamura (1993), and Ford (1997). References: Ford in FNA (1997); Tamura in Kubitzki, Rohwer, & Bittrich (1993); Keener (1977).

Identification notes: *Enemion* is somewhat superficially similar to the much more common *Thalictrum thalictroides*, with which it sometimes grows, but can be distinguished by the following characters: fruit a follicle (vs. fruit an achene), petaloid sepals 5 (vs. 5-10, usually some at least of the flowers on a plant with 6 or more).

Enemion biternatum Rafinesque, Isopyrum, False Rue-anemone. Rich forests, either on natural levees with very nutrient rich sediments or on slopes with underlying mafic rocks. March-April; May. Mainly west of the Appalachians, W. NY, s. ON and MN south to TN and AR; disjunct in the Piedmont and Coastal Plain of VA, NC, and SC, and the FL Panhandle. [= FNA, K; = *Isopyrum biternatum* (Rafinesque) Torrey & Gray – RAB, C, F, G, S]



5. Thalictrum Linnaeus 1753 (Meadow-rue)

A genus of about 330 species, perennial herbs, of Eurasia, North America, South America, and Africa. Ro & McPheron (1997) corroborate via molecular phylogeny that *Anemonella* should be included in *Thalictrum*; in fact, *Th. thalictroides* appears to form a basal subclade in *Thalictrum* with *Th. clavatum* (and presumably *Th. mirabile*). References: Park & Festerling in FNA (1997); Park (1992)=Z; Ro & McPheron (1997); Tamura in Kubitzki, Rohwer, & Bittrich (1993).

Identification notes: *Thalictrum thalictroides* is superficially similar to *Enemion biternatum*, but can be distinguished by the following characters: fruit an achene (vs. fruit a follicle), petaloid sepals 5-10 (vs. 5).

1 Sepals petaloid, conspicuous, white (or tinged with pink or green); leaflike involucral bracts present, opposite or whorled; inflorescence an umbel; [section *Anemonella*] ..... ***T. thalictroides***
1 Sepals absent, or inconspicuous in comparison to the stamens or pistils; leaflike involucral bracts not present; inflorescence a panicle, corymb or raceme.
  2 Fruit (achene) scimitar-shaped, borne on a stipe 1.5-4 mm long; flowers perfect; [section *Physocarpum*].
    3 Achene concave or straight on the upper surface, 4-5.5 mm long, borne on a stipe 1.5-3 mm long; inflorescence branches stiff and diverge at acute angles; [fairly widespread in our area, on a wide variety of moist substrates, especially in the Mountains] ..... ***T. clavatum***
    3 Achene straight on the upper surface, 2.5-4 mm long, borne on a stipe 2.5-4 mm long; inflorescence branches flexuous and divergent; [of sandstone rockhouses of Cumberland Plateau of AL, TN, and KY] ..... ***T. mirabile***
  2 Fruit (achene) not scimitar-shaped, not borne on a stipe; flowers unisexual (or sometimes a few or more bisexual).
    4 Leaflets of the stem leaves linear to narrowly lanceolate, oblanceolate or elliptic, (3-) 5-10 (-25)× as long as wide; [section *Leucocoma*] ..... ***T. cooleyi***
    4 Leaflets of the stem leaves ovate, obovate, or suborbicular, 0.7-3 (-5)× as long as wide.
      5 Most of the leaflets with (3-) 4-6 (-9) lobes or teeth; [section *Heterogamia*].
        6 Cauline leaf subtending the lowest flowering branch sessile; plant flowering May-July; achenes borne on a 0.7-2.5 mm long stipe. ..... ***T. coriaceum***
        6 Cauline leaf subtending the lowest flowering branch with a petiole 3-7 cm long; plant flowering March-April; achenes nearly sessile, the stipe nonexistent or <0.3 mm long.
          7 Largest leaflets < 15 mm wide; stems 10-40 cm tall, reclining ..... ***T. debile***
          7 Largest leaflets > 15 mm long; stems 30-80 cm tall, erect ..... ***T. dioicum***
      5 Most of the leaflets with 1-3 (-5) lobes or teeth; [section *Leucocoma*].
        8 Leaflet undersurfaces, peduncles, and achenes with stipitate glands or papillae.
          9 Anthers 1-3.6 (-4) mm long; stigmas 1.5-4.7 (-6) mm long ..... ***T. dasycarpum***

9 Anthers 0.5-2.8 mm long; stigmas 0.6-3.5 mm long.
10 Anthers 0.5-1.2 mm long; stigmas 0.6-2.2 mm long ..... ***T. hepaticum***
10 Anthers 1.5-2.8 mm long; stigmas (1.5-) 2.0-3.5 mm long ..... ***T. revolutum***
8 Leaflet undersurfaces, peduncles, and achenes glabrous or pubescent, lacking both stipitate glands and papillae.
11 Leaflet undersurfaces, peduncles, and achenes finely pubescent ..... ***T. pubescens***
11 Leaflet undersurfaces, peduncles, and achenes glabrous.
12 Leaflets entire to 3-lobed, averaging about 10 mm wide, the broadest usually < 20 mm wide; filaments (2-) 3-4.5 (-6.5) mm long (averaging 3.6 mm) ..... ***T. macrostylum***
12 Leaflets 3-lobed (rarely entire), averaging 15-23 mm wide, the broadest usually 15-60 mm wide; filaments (2-) 4-5 (-8) mm long (averaging 4-5 mm).
13 Anthers 1-3.6 (-4) mm long; stigmas 1.5-4.7 (-6) mm long ..... ***T. dasycarpum***
13 Anthers 0.5-2.8 mm long; stigmas 0.6-3.5 mm long.
14 Anthers 0.5-1.2 mm long; stigmas 0.6-2.2 mm long ..... ***T. hepaticum***
14 Anthers 1.5-2.8 mm long; stigmas (1.5-) 2.0-3.5 mm long ..... ***T. revolutum***

Thalictrum clavatum A.P. de Candolle, Lady-rue, Mountain Meadowrue. Seepages, moist forests, spray cliffs at waterfalls, brookbanks. May-July. A Southern Appalachian endemic: VA, WV, e. KY south through w. NC and e. TN to nw. SC and n. GA. [= RAB, C, F, FNA, G, GW, K, S, W, WV]

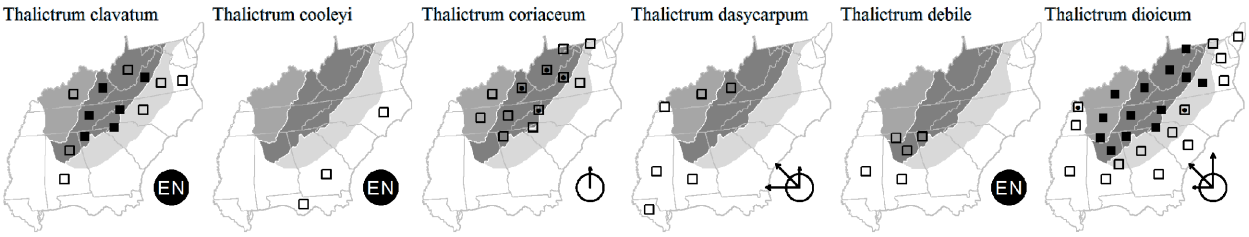
Thalictrum cooleyi Ahles, Cooley's Meadowrue, Savanna Meadowrue. Ecotones between calcareous savannas and adjacent swamp forests, shallowly underlain by coquina limestone ("marl"), generally within a few meters of *Taxodium ascendens* and *Liriodendron tulipifera*. Late June-early July; August-October. The species is endemic to two small areas, centered around Maple Hill (Pender and Onslow counties, NC) and Old Dock (Columbus and Brunswick counties, NC), with a small disjunct population in Panhandle FL (Walton County), and a small number of ambiguous populations in sw. GA (Dougherty and Worth counties); the GA populations are assigned here for now but may well represent a new taxon. It is associated with a number of other narrow endemic species. The leaflets of basal leaves (winter rosettes) are much broader, resembling the leaflets of other *Thalictrum* species in length/width ratio. Leaves produced from May on have the very narrow leaves typical of the species. Park (1992) found that *Th. cooleyi* has the highest chromosome number known in the genus, 2n = 210, a ploidy level of 30× compared to the base chromosome level of 7 in *Thalictrum*. [= RAB, FNA, GW, K, WH, Z]

Thalictrum coriaceum (Britton) Small, Appalachian Meadowrue, Maid of the Mist. Rich forests. May-July. A Southern and Central Appalachian endemic: MD, VA, and WV south through w. KY and e. TN to w. NC and ne. GA. The roots are bright yellow. A preliminary study concluded that *Th. steeleanum* B. Boivin is not distinct from *Th. coriaceum* (Park 1988); further study is needed. *Th. steeleanum* is alleged to differ in the following ways (and others): plant with long, cordlike rhizomes (vs. stout caudex), terminal leaflets mostly wider than long (vs. mostly longer than wide), achenes curved, 4-6 mm long (vs. less curved, 2.5-4 mm long). Park found these characters (and others) to be variable and to occur together within populations. It ranges from s. PA south through MD, e. WV, w. VA to nw. NC. [= RAB, FNA, K; > *T. coriaceum* – C, F, G, W, WV; > *T. steeleanum* B. Boivin – C, F, G, W, WV; > *T. coriaceum* – S; > *T. caulophylloides* Small – S]

Thalictrum dasycarpum Fischer & Avé-Lallemant, Purple Meadowrue. Forest, woodlands, and prairies. June-July. QC and YT south to PA, KY, TN, AL, MS, LA, TX, NM, AZ, and WA. It has been reported for scattered localities in VA (Harvill et al. 1992). Park (1992) and FNA do not document the occurrence of *Th. dasycarpum* in VA; substantiation is needed. [= FNA, K] {synonymy incomplete}

Thalictrum debile Buckley, Trailing Meadowrue. Moist to wet forests over limestone. Nw. GA west to e. MS. [= FNA, GW, K, S]

Thalictrum dioicum Linnaeus, Early Meadowrue. Seepages, moist forests. ME, QC, and MN south to SC, c. GA, AL, and MO. [= RAB, C, F, FNA, G, GW, K, S, W, WV]



Thalictrum hepaticum Greene, Appalachian Tall Meadowrue. Seepage areas. May-July. PA south to n. GA and se. TN, strictly or primarily in the Appalachians. Plants tentatively placed here have been problematic. Keener (1981) reduced *Th. hepaticum* Greene to a variety of *Th. pubescens*, and discussed their distinction. Park (1992) contends that these plants are, indeed, glandular puberulent, and should therefore be reduced to synonymy under *Th. revolutum*, stating "these are not given varietal status [under *Th. revolutum*] since this morphological variation in anthers is not correlated with a continuous geographic range. As indicated above, I have located specimens from Georgia, North Carolina, Tennessee, and Pennsylvania which fit the description." As mapped by Keener (1981) *Th. pubescens* var. *hepaticum* (Greene) Keener appears as an endemic to the Southern Appalachians; if extended to Pennsylvania, the distribution is still very restricted (and in a phytogeographically plausible manner) compared to either *Th. revolutum* or *Th. pubescens*. This entity appears to be closer to *Th. pubescens* in leaflet shape, sepal length, anther length, and stigma length, and to *Th. revolutum* in leaflet and petiolule vestiture. More study is needed; the taxon is here provisionally accepted in order to draw attention to the problem. [= *T. pubescens* var. *hepaticum* (Greene) Keener – W; < *T. polygamum* Muhlenberg ex Sprengel – RAB, F, G, S, nomen nudum; < *T. pubescens* – C, GW, K, WV; < *T. revolutum* – FNA]

Thalictrum macrostylum Small & Heller, Small-leaved Meadowrue. Moist places, perhaps associated with circumneutral soils, moist to dry ultramafic outcrop barrens (over olivine), tidal freshwater marshes. May-August. Se. VA south and west

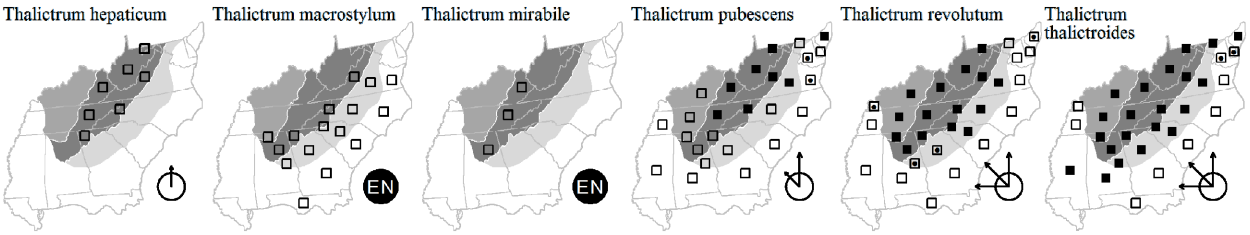
through NC, SC, sc. GA, FL, and AL to MS. [= C, F, FNA, G, GW, K, S, WH, Z; > *T. macrostylum* – RAB; > *T. subrotundum* B. Boivin – RAB]

Thalictrum mirabile Small, Rockhouse Meadowrue. Wet sandstone cliffs, primarily in the Cumberland Plateau (and especially associated with sandstone rockhouses). KY south through TN to n. AL and nw. GA (and additionally cited in FNA as occurring in w. NC). A delicate relative of *T. clavatum*, the inflorescence appears sparser because of the shorter and narrower achenes borne on longer stipes. [= FNA, GW, K, S]

Thalictrum pubescens Pursh, Common Tall Meadowrue, Late Meadowrue, King-of-the-meadow. Bogs, marshes, wet forests. May-July. NL (Labrador), NL (Newfoundland), and ON south to GA, SC and MS. [= *T. pubescens* var. *pubescens* – W; < *Th. polygamum* Muhlenberg ex Sprengel – RAB, F, G, S, nomen nudum; < *T. pubescens* – C, GW, K, WV, Z; < *T. pubescens* – FNA]

Thalictrum revolutum DC, Skunk Meadowrue. Mesic to dry forests, woodlands, and barrens, over hornblende, greenstone, dolostone, and serpentinized olivine. May-July. QC and ON south to n. FL, LA, and TX, and scattered southwest to CO, NV, and AZ. The species is normally stipitate-glandular or papillose, but can be glabrous, as accounted for in the key. [= RAB, C, F, G, GW, K, S, W, WH, WV; < *T. revolutum* – FNA]

Thalictrum thalictroides (Linnaeus) Eames & Boivin, Rue-anemone, Windflower. Moist forests. March-May. ME, MN, and KS, south to Panhandle FL, MS, AR, and OK. [= RAB, FNA, K, W, WH, WV; = *Anemonella thalictroides* (Linnaeus) Spach – C, F, G; = *Syndesmon thalictroides* (Linnaeus) Hoffmannsegg ex Britton – S]



6. Adonis Linnaeus 1753 (Adonis)

A genus of about 26 species, annual and perennial herbs, of Eurasia. References: Tamura in Kubitzki, Rohwer, & Bittrich (1993).

* ***Adonis annua*** Linnaeus, Autumn Adonis, Bird's-eye. Disturbed areas; native of Eurasia. April-June. Naturalized in n. AL and sc. TN (Parfitt in FNA 1997). [= C, FNA, G, K]

7. Aconitum Linnaeus 1753 (Monkshood, Aconite)

A genus of about 300 species, herbs, of Eurasia, n. Africa, and North America. References: Brink & Woods in FNA (1997); Hardin (1964b)=Z; Tamura in Kubitzki, Rohwer, & Bittrich (1993).

1 Flowers white, creamy white, or yellowish; basal leaves numerous, large, usually 10-20 cm across, on long, stout petioles; roots fascicled; [section *Lycoctonum*] ..... ***A. reclinatum***
1 Flowers pale to medium blue (rarely white); basal leaves fewer, smaller, rarely over 10 cm across, on shorter and wirier petioles; root thickened, tuberous ..... ***A. uncinatum***

Aconitum reclinatum A. Gray, White Monkshood, Trailing Wolfsbane, White Aconite. Rich cove forests, particularly along brookbanks, in seepages, and in periglacial boulderfields with seepage, primarily over mafic rocks (such as amphibolite, metagabbro, or greenstone), rarely over sandstone or granitic rocks. June-September. A Southern and Central Appalachian endemic: sw. PA, w. VA and e. WV south to w. NC and ne. TN. It is more restricted in distribution and habitat than *A. uncinatum*, but the two species sometimes occur together, even intertwined! [= RAB, C, F, FNA, G, K, S, W, Z; *A. vaccarum* Rydberg]

Aconitum uncinatum Linnaeus, Eastern Blue Monkshood, Appalachian Blue Monkshood. Seepages, cove forests, other moist forests. August-September. C. MD and sw. PA south to e. VA, e. NC, wc. GA, and c. TN. Two varieties or subspecies have sometimes been recognized, but characters seem ambiguous, poorly crrelated with one another, and geographically incoherent. [= RAB, FNA, S, W; > *A. uncinatum* var. *muticum* Alphonse de Candolle – C; > *A. uncinatum* var. *uncinatum* – C, F; > *A. uncinatum* var. *acutidens* Fernald – F; > *A. uncinatum* Linnaeus ssp. *muticum* (A.P. de Candolle) Hardin = K, Z; > *A. uncinatum* ssp. *uncinatum* – K, Z]

8. Consolida (A.P. de Candolle) S.F. Gray 1821 (Annual Larkspur)

A genus of about 43 species, annual herbs, of Eurasia. References: Warnock in FNA (1997); Tamura in Kubitzki, Rohwer, & Bittrich (1993).

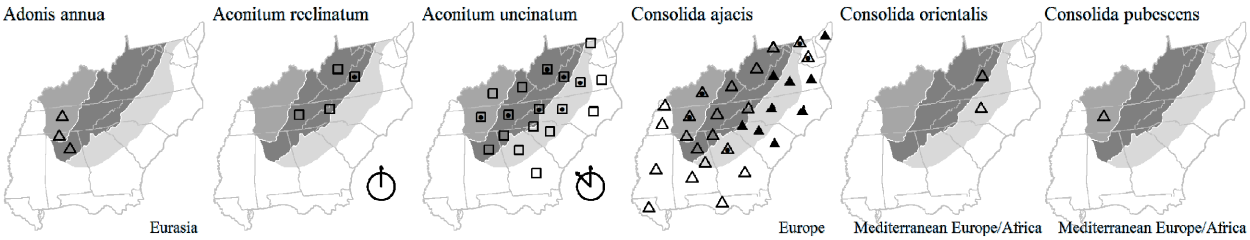
1 Lower bracts of the inflorescence unlobed or the single lowermost bract with 3 lobes; pistil glabrous; follicle 8-17 mm long.
  2 Terminal lobe of petal< 2 mm wide; follicles pubescent ..... ***C. pubescens***
  2 Terminal lobe opf petal > 2 mm wide; follicles glabrous or pubescent ..... ***C. regalis***
1 Lower bracts of the inflorescence (at least 2 of them) with 3 or more lobes; pistil densely pubescent; follicle 12-25 mm long.
  3 Spur < 12 mm long; upper bracteoles overlapping the flower, attached 1-4 mm below the flower ..... ***C. orientalis***

3 Spur > 12 mm long; upper bracteoles not overlapping the flower, attached 4-20 mm from the flower.
4 Inflorescence with 3 or fewer branches; stems glabrous to sparsely puberulent; follicles 12-25 mm long ..... ***C. ajacis***
4 Inflorescence with 3 or more branches; stems pubescent; follicles 10-15 mm long..... ***C. pubescens***

* ***Consolida ajacis*** (Linnaeus) Schur, Rocket Larkspur. Roadsides, fields, waste places, disturbed ground; native of Europe. [= FNA, K2; = *Delphinium ajacis* Linnaeus – RAB, F, G, S, WV; = *Delphinium ambiguum* Linnaeus – C; = *Consolida ambigua* (Linnaeus) P.W. Ball & Heywood in Heywood & P.W. Ball – W]

* ***Consolida orientalis*** (Gay) Schrödinger, Oriental Larkspur. Disturbed areas, perhaps only a waif after cultivation; native of s. Europe, n. Africa, and w. Asia. [= FNA, K2; ? *C. hispanica* (Willk. ex Costa) Greuter & Burdet]

* ***Consolida pubescens*** (de Candolle) Soó, Hairy Larkspur. Disturbed areas, perhaps only a waif after cultivation; native of sw. Europe and nw. Africa. Naturalized in s. TN (Warnock in FNA 1997). [= FNA, K2] {not yet keyed}



* ***Consolida regalis*** S.F. Gray, Royal Larkspur, Forking Larkspur. Disturbed areas; native of Europe. Also known from DC and to be expected in VA. [= FNA, K2; = *Delphinium consolida* Linnaeus – C, G, S]

9. Delphinium Linnaeus 1753 (Larkspur)

A genus of about 320 species, herbs, of Eurasia, Africa, and North America. References: Warnock in FNA (1997); Kral (1976)=Z; Warnock 1995; Tamura in Kubitzki, Rohwer, & Bittrich (1993). [also see *Consolida*]

1 Follicles divergent; raceme 0.5-2 (-3) dm long; flowering plants 2-9 (-13) dm tall; flowering March-May; [section *Diedropetala*; subsection *Grumosa*].
2 Stems (4.5-) 6-9 (-13) dm tall; flowers (sepals) deep blue; lower stem pubescent; [in sunny or semi-sunny situations, apparently endemic to n. AL] ..... ***D. alabamicum***
2 Stems 2-6 dm tall; flowers (sepals) deep bluish purple, pink, or white; lower stem glabrous or nearly so; [usually in deep shade, widespread in our area]..... ***D. tricorne***
1 Follicles erect; raceme > 3 dm long; flowering plants 5-20 dm tall; flowering May-September.
3 Seeds wing-margined, the surfaces smooth; stem below the inflorescence glabrous; flowering plants 8-20 dm tall; flowering July-September; [section *Diedropetala*; subsection *Exaltata*]..... ***D. exaltatum***
3 Seeds with prominent transverse ridges; stem below the inflorescence pubescent; flowering plants 2-10 (-15) dm tall; flowering May-July; [section *Diedropetala*; subsection *Virescens*].
4 Basal leaves usually present at anthesis; flowers (sepals) white; stems 2-4 (-7) dm tall; ultimate segments of midcauline leaves 5-12 in number, 2-4 mm wide ..... ***D. carolinianum*** *ssp.* ***calciphilum***
4 Basal leaves absent at anthesis; flowers (sepals) blue to purple (rarely white); stems (3-) 6-10 (-15) dm tall; ultimate segments of midcauline leaves 12-25 in number, 0.5-1.5 mm wide..... ***D. carolinianum*** *ssp.* ***carolinianum***

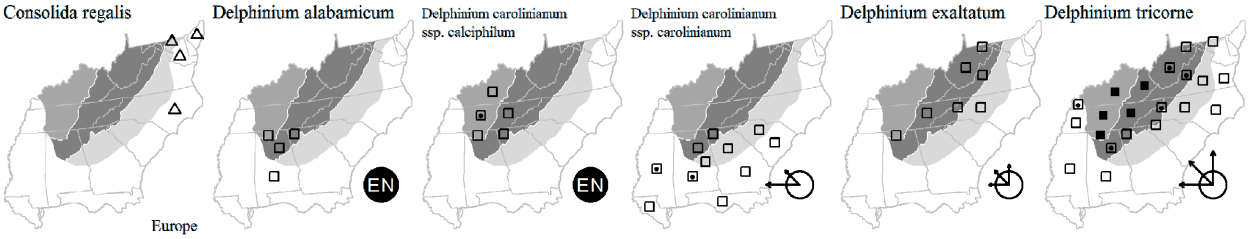
Delphinium alabamicum Kral, Alabama Larkspur. Limestone prairies and glades. Endemic to c. and n. AL and nw. GA. [= FNA, K]

Delphinium carolinianum Walter *ssp.* ***calciphilum*** M.J. Warnock, Glade Larkspur. Limestone glades. KY south through e. and c. TN to ne. AL and nw. GA. [= FNA, K; < *D. virescens* Nuttall – C, G; < *D. carolinianum* var. *carolinianum* – F; < *D. carolinianum* – S; < *D. virescens* var. *virescens* – Z; < *D. carolinianum* Walter ssp. *virescens* (Nuttall) R.E. Brooks]

Delphinium carolinianum Walter *ssp.* ***carolinianum***, Prairie Larkspur, Carolina Larkspur, Blue Larkspur. Rocky woodlands, granite outcrops, Altamaha Grit outcrops, blackland prairies, moist sandy woodlands associated with longleaf pine. May-July. IL west to MO, south to LA and TX, with disjunct occurrences eastward in SC, GA, Panhandle FL (Gadsden County), TN, and MS. The flowers are a pale to medium blue. This species has been reported for NC (by C) and "north to Va." (by F and S). I know of no documentation for its past or present occurrence in NC or VA, but its presence in those states is plausible. [= FNA, K; = *D. carolinianum* Walter – C, G, WH, Z; < *D. carolinianum* var. *carolinianum* – F; < *D. carolinianum* – S]

Delphinium exaltatum Aiton, Tall Larkspur. Dry to moist soils over calcareous (such as dolostone, especially Elbrook Formation) or mafic rocks (such as amphibolite, metagabbro, greenstone, and diabase), usually in the open (as grassy balds) or on forest edges in partial sun. July (low elevations) - September (high elevations). Sw. PA and OH southwest to MO and e. TN, and south to the Mountains of VA and the Mountains and Piedmont of NC. The flowers are a pale to medium blue. [= RAB, C, F, FNA, G, K, S, W, WV, Z]

Delphinium tricorne Michaux, Dwarf Larkspur. Rich, moist forests, especially over mafic or calcareous rocks, less commonly (as along the Roanoke River in ne. NC) on very fertile alluvial deposits. March-May. Sw. PA and MN south to NC, nw. GA, AL, and OK. The flowers are variable in color, usually a deep bluish violet, but ranging through pink to pure white. [= RAB, C, F, FNA, G, K, S, W, WV, Z]



10. Nigella Linnaeus 1753 (Fennel-flower)

A genus of about 20 species, annual herbs, of Europe, n. Africa, and Asia. References: Ford in FNA (1997); Tamura in Kubitzki, Rohwer, & Bittrich (1993).

* ***Nigella damascena*** Linnaeus, Love-in-a-mist, Fennel-flower. Cultivated in gardens, rarely persistent or escaping; native of s. Europe. [= C, F, FNA, G, K]

11. Helleborus Linnaeus 1753 (Hellebore, Christmas-rose)

A genus of about 21 species, perennial herbs, of Europe and Asia. References: Ford in FNA (1997); Tamura in Kubitzki, Rohwer, & Bittrich (1993).

Identification notes: Other species of *Helleborus* are increasingly being cultivated; all have the potential to naturalize.

1 Primary leaves of mature (fertile) plants all cauline; leaf segments <1.5 cm wideflowers <3 cm across, >9 per inflorescence.....***H. foetidus***
1 Primary leaves of mature (fertile) plants basal (the stem with reduced, bracteal leaves subtending the inflorescence); leaf segments >3 cm wide; flowers >4 cm across, (1-) 3 (-5) per inflorescence.....***H. viridis***

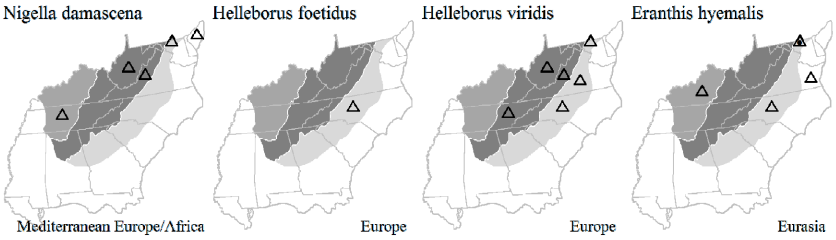
Helleborus foetidus Linnaeus, Stinking Hellebore. Cultivated in gardens, seeding down and spreading locally near plantings; native of Europe. December-March. [= K2]

* ***Helleborus viridis*** Linnaeus, Green Hellebore, Christmas-rose. Mt (VA, WV), Pd (NC): cultivated in gardens, seeding down, rarely escaped or persistent; rare, native of Europe. December-May. [= C, F, FNA, G, K1, K2, S, WV]

12. Eranthis Salisbury 1808 (Winter-aconite)

A genus of about 8 species, perennial herbs, of Europe and Asia. References: Parfitt in FNA (1997); Tamura in Kubitzki, Rohwer, & Bittrich (1993).

* ***Eranthis hyemalis*** (Linnaeus) Salisbury, Winter-aconite. Cp (VA), Pd (DE, NC): cultivated in gardens, sometimes persisting or escaped; uncommon (rare in NC and VA), native of Eurasia. January-March. [= F, FNA, G, K]



13. Actaea Linnaeus 1753 (Baneberry)

A genus of about 28 species, perennial herbs, of temperate regions of the Northern Hemisphere. Compton, Culham, & Jury (1998) support the inclusion of *Cimicifuga* in *Actaea*, based on analyses of both morphology and DNA sequences. References: Ford in FNA (1997); Compton, Culham, & Jury (1998)=Z; Tamura in Kubitzki, Rohwer, & Bittrich (1993); Park & Lee 1996). References: Ramsey in FNA (1997); Compton, Culham, & Jury (1998)=Z; Ramsey (1987, 1988); Tamura in Kubitzki, Rohwer, & Bittrich (1993).

Identification notes: In rich coves, *Actaea* occurs with and is sometimes mistaken for (especially when in vegetative condition) various other superficially similar genera, including *Astilbe* (Saxifragaceae), *Aruncus* (Rosaceae), *Caulophyllum* (Berberidaceae), *Angelica* and *Ligusticum* (Apiaceae), *Aralia* (Araliaceae), and others. The curious evolutionary convergence of leaf morphology (to a 2-3-ternately compound form) of a large number of unrelated genera of Appalachian cove forests is interesting.

1 Plant with leaves only present.
2 Terminal leaflet deeply cordate, mostly > 12 cm wide, with 7-9 major veins arising palmately from the base; principal leaves with 3-9 (-17) leaflets; [section *Oligocarpae*].....***A. rubifolia***

2 Terminal leaflet broadly cuneate, rounded, truncate, or subcordate, mostly < 12 cm wide, with 3 major veins arising from the base; principal leaves with (15-) 20-70 leaflets.
3 Petiole of basal leaves with a deep, broad groove (ca. 1 mm wide and 1 mm deep), persistent on fully expanded leaves; roots with vascular tissue in lunate bundles arranged in a circle; flowering July-September; [section *Podocarpae*].....***A. podocarpa***
3 Petiole of basal leaves terete, not grooved (or with a shallow, narrow groove early, obscure or absent on fully expanded leaves); roots with vascular tissue in a central (3-) 4 (-5)-armed cross or star; flowering April-August; [section *Actaea*] .....
.....***A. pachypoda, A. racemosa,*** *or* ***A. rubra***
1 Plant in flower or fruit.
4 Carpels 3-8, on a short stipe elongating to 5-8 mm long; flowering July-September; roots with vascular tissue in lunate bundles arranged in a circle; [section *Podocarpae*].....***A. podocarpa***
4 Carpels 1 (-3), sessile; flowering April-October; roots with vascular tissue in a central (3-) 4 (-5)-armed cross or star.
5 Fruit fleshy, indehiscent; flowering April-May; [section *Actaea*].
6 Fruiting pedicels thick, 1-2 mm in diameter; fruit white (rarely red); [widespread in our area] .....***A. pachypoda***
6 Fruiting pedicels slender, 0.4-0.7 mm in diameter; fruit red (rarely white); [northern, just reaching our area in ec. NJ].....***A. rubra***
5 Fruit dry, follicular, dehiscent; flowering May-October.
7 Staminodes present; principal leaves with (15-) 20-70 leaflets; follicles 6-9 mm long; terminal leaflet broadly cuneate, rounded, truncate, or subcordate, with 3 major veins arising from the base; flowering May-August; [section *Actaea*].....***A. racemosa***
7 Staminodes absent; principal leaves with 3-9 (-17) leaflets; follicles 12-17 mm long; terminal leaflet deeply cordate, with 7-9 major veins arising palmately from the base; flowering August-October; [section *Oligocarpae*].....***A. rubifolia***

Actaea pachypoda Elliott, White Baneberry, Dolls'-eyes, White Cohosh. Rich cove forests and slopes. April-May; August-October. QC and MN south to c. GA, FL Panhandle, s. AL, s. MS, e. LA, and OK. [= RAB, F, FNA, K, W, Z; = *A. alba* (Linnaeus) P. Miller – C, G, S, probably misapplied; > *A. pachypoda* f. *pachypoda* – Z; > *A. pachypoda* f. *rubrocarpa* (Killip ex House) Fernald – Z]

Actaea podocarpa A.P. de Candolle, Mountain Black-cohosh, Late Black-cohosh. Rich cove forests and slopes, at moderate to high elevations. July-September. Endemic to the Southern and Central Appalachians: s. PA to w. NC, ne. GA, and e. TN. Most closely related to *Actaea laciniata* (S. Watson) J. Compton of OR and WA. [= K, Z; = *Cimicifuga americana* Michaux – RAB, C, F, FNA, G, S, W]

Actaea racemosa Linnaeus, Common Black-cohosh, Early Black-cohosh. Rich cove forests, other mesic and moderately to very fertile forests. May-August. Primarily Appalachian: w. MA south to SC and c. GA, but extending e. into the Coastal Plain and west to OH, IN, and MO. Var. *dissecta* appears to be a sporadically occurring form, apparently always occurring in small numbers associated with typic material; McCoy (2004) reports its collection in NC. [= *Cimicifuga racemosa* (Linnaeus) Nuttall – RAB, C, F, FNA, S, W; >< *C. racemosa* var. *cordifolia* (Pursh) Gray – F, misapplied in part; > *C. racemosa* var. *racemosa* – F; < *C. racemosa* – G (also see *C. rubifolia*); > *Actaea racemosa* Linnaeus var. *racemosa* – K, Z; > *Actaea racemosa* Linnaeus var. *dissecta* (A. Gray) J. Compton – K, Z]

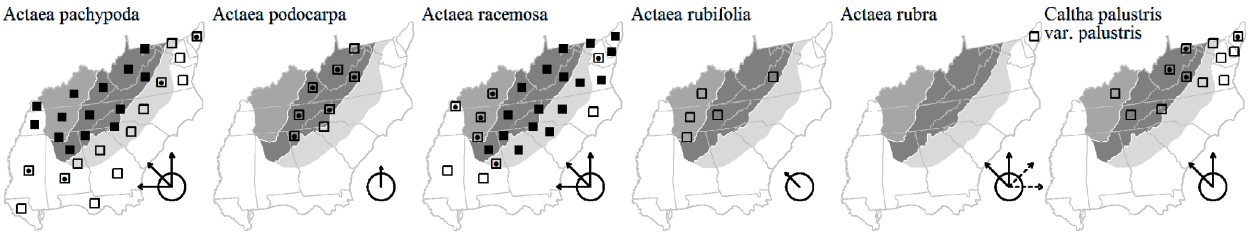
Actaea rubifolia (Kearney) Kartesz, Appalachian Black-cohosh. Rich cove forests over calcareous rocks (limestone or dolostone). August-October. Sw. VA south to e. TN; disjunct in s. IL, w. KY, and nw. TN. This species is alleged by C (1991) to occur in NC, but this is probably an error, based on confusion with *Cimicifuga cordifolia* Pursh, now considered a form of *Actaea racemosa*. For this reason, the name *Actaea cordifolia* used by Compton, Culham, & Jury (1998) does not apply to this taxon. *Actaea rubifolia* is related to *Actaea elata* (Nuttall) Prantl of nw. North America. [= K; = *Cimicifuga rubifolia* Kearney – C, FNA, S, W; >< *C. racemosa* var. *cordifolia* (Pursh) A. Gray – F, misapplied in part; < *C. racemosa* – G; = *Actaea cordifolia* A.P. de Candolle – Z, misapplied]

Actaea rubra (Aiton) Willdenow, Red Baneberry. Moist forests. May-July. Circumboreal, in e. North America to ec. NJ (Monmouth Co.), sc. PA (Rhoads & Klein 1993), OH, IN, IL, IA, and ne. KS. [= C, F, FNA, G, Z; > *A. rubra* ssp. *rubra* – K]

14. Caltha Linnaeus 1753 (Marsh Marigold, Cowslip)

A genus of about 12 species, perennial herbs, of the Northern and Southern Hemispheres (sometimes further divided). References: Ford in FNA (1997); Tamura in Kubitzki, Rohwer, & Bittrich (1993).

Caltha palustris Linnaeus *var.* ***palustris***, Marsh Marigold, Cowslip. Bogs, wet meadows, seepage swamps, brookbanks. April-June. *Caltha palustris* is circumboreal, widespread in n. Eurasia and n. North America, south in e. North America to e. VA, w. NC, ne. TN, WV, IN, IL, IA, and NE. *Caltha palustris* is polymorphic; one or more additional varieties (some of them sometimes recognized as separate species) are more northern. Eastern North American material is apparently uniformly 2n=32 (Keener 1977). [= G, GW, K; < *C. palustris* – RAB, C, F, FNA, S, W; *C. palustris* var. *flabellifolia* (Pursh) Torrey & A. Gray]



15. Anemone Linnaeus 1753 (Anemone)

A genus of about 140-200 species (depending on circumscription), perennial herbs (rarely shrubs), of Eurasia, North America, Central America, South America, and Africa. Hoot, Reznicek, & Palmer (1994) discuss the phylogeny of *Anemone*, and also

suggest that *Hepatica* be included within it. References: Dutton, Keener, & Ford in FNA (1997); Keener, Dix, & Dutton (1996); Tamura in Kubitzki, Rohwer, & Bittrich (1993); Steyermark & Steyermark (1960)=Z; Ziman et al. (2004)=Y.

1 Basal leaves lobed but not fully divided into 3 or more leaflets; [subgenus *Anemonidium*].
  2 Leaves lobed, and also toothed and variously cleft; leaves not variegated; [section *Anemonidium*] ..... ***A. canadensis***
  2 Leaves lobed, the margins of the lobes entire; leaves often prominently variegated; [section *Hepatica*].
    3 Leaves 3 (-7) lobed, the lobes acute, the primary sinuses deep, over halfway to the petiole (the middle lobe 70-90% of the total length of the leaf blade); involucral bracts acute ..... ***A. acutiloba***
    3 Leaves 3-lobed, the lobes broadly rounded, the primary sinuses less deep, about halfway to the petiole (the middle lobe 50-70% of the total length of the leaf blade); involucral bracts obtuse ..... ***A. americana***
1 Basal leaves compound, fully divided into 3 or more leaflets.
  4 Stem branched, 4-11 dm tall, bearing 2 or more flowers; involucral bracts petiolate; [subgenus *Anemone*; section *Anemone*; group *Multifida*].
    5 Base of involucral bracts usually truncate to subtruncate, sometimes reniform or cordate, terminal leaflets deep green, margins proximally concave- to straight-sided, distally incised, thinly pubescent; anthers typically < 0.8-1.2 (-1.5) mm long; heads of achenes more or less ovoid-cylindric, 8-10 (-11) mm in diameter ..... ***[A. virginiana** var. **alba]***
    5 Base of involucral bracts cordate or reniform, rarely subtruncate, terminal leaflets light green, margins proximally mostly straight- to convex-sided, variously lobed or serrate, variously pubescent; anthers typically > (0.9-) 1.1-1.5 (-1.7) mm long; heads of achenes ovoid to ovoid-cylindric, (9-) 10-12 (-14) mm in diameter ..... ***A. virginiana** var. **virginiana***
  4 Stem unbranched, 0.5-4 dm tall, bearing 1 flower.
    6 Sepals (5-) 8-20, cream-white, violet, blue, pink, or green; involucral leaves sessile; [subgenus *Anemone*; section *Anemone*; group *Coronaria*].
      7 Stem densely pubescent above and below the involucre; involucre above the midpoint of the stem at anthesis; plant from a globose, vertically oriented bulb; involucral leaflets linear, (1.5-) 3-6 cm long, 1-4 (-6) mm wide; achene bodies > 2.7-3.5 mm long ..... ***A. berlandieri***
      7 Stem densely pubescent above the involucre, glabrous to very sparsely pubescent beneath the involucre; involucre at or below the midpoint of the stem at anthesis; plant with horizontal rhizomes; involucral leaflets oblanceolate, 1-2.5 cm long, {width}; achene bodies < 1.5-2.5 (-3.0) mm long ..... ***A. caroliniana***
    6 Sepals 5 (-8), white; involucral leaves petiolate, the leaflets ovate, obovate, elliptic, lanceolate, or oblanceolate 2-8 cm long, 8-30 mm wide; [subgenus *Anemonanthea*, section *Anemonanthea*, series *Quinquefoliae*].
      8 Ovaries and achenes with hairs 0.1-0.2 mm long; terminal leaflet broadest at or below the middle (lanceolate or ovate), serrate to below the middle; sepals 15 mm or more long ..... ***A. lancifolia***
      8 Ovaries and achenes with hairs 0.5-1.0 mm long; terminal leaflet broadest at or above the middle (elliptic, oblanceolate, or obovate), serrate only above the middle; sepals < 15 mm long.
        9 Achene bodies 2.5-3.0 mm long; lateral leaflets of radical leaves toothed only (rarely lobed); terminal leaflet usually broadest at the middle; styles 0.5-1 mm long; sepals about 8 mm long ..... ***A. minima***
        9 Achene bodies 3.0-4.5 mm long; lateral leaflets of radical leaves lobed or cleft (sometimes only toothed); terminal leaflet usually broadest above the middle; styles 1-2 mm long; sepals 6-15 mm long ..... ***A. quinquefolia***

Anemone acutiloba (A.P. de Candolle) G. Lawson, Sharp-lobed Hepatica, Sharp-lobed Liverleaf. Moist forests, especially over calcareous or mafic rocks. March-April. ME, s. QC, s. ON, and MN south to SC, AL, MS, and AR. See comments under *A. americana* about the taxonomy of the two taxa of "Hepatica." [= FNA; = *Hepatica acutiloba* A.P. de Candolle – RAB, C, F, G, W, WV; = *Hepatica nobilis* P. Miller var. *acuta* (Pursh) Steyermark – K, Z; = *Hepatica acuta* (Pursh) Britton – S]

Anemone americana (A.P. de Candolle) H. Hara, Round-lobed Hepatica, Round-lobed Liverleaf. Moist forests. February-May. NS, s. QC, s. ON, and MB south to Panhandle FL, AL, MS, and AR. The two taxa of "Hepatica" seem entirely distinct in our area; they are described as hybridizing freely or merging indistinguishably in other parts of their ranges. They are also both closely related to the European *H. nobilis* P. Miller. Steyermark & Steyermark (1960) chose to treat the three entities as varieties of *H. nobilis*; I prefer to retain them at the specific level. [= FNA, WH; = *Hepatica americana* (A.P. de Candolle) Ker-Gawler – RAB, C, F, G, W, WV; = *Hepatica nobilis* P. Miller var. *obtusa* (Pursh) Steyermark – K, Z; < *Hepatica hepatica* (Linnaeus) Karsten – S]

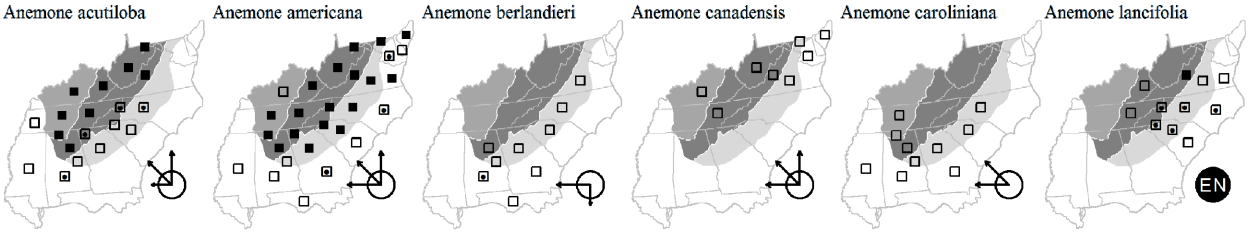
Anemone berlandieri Pritzel, Eastern Prairie Anemone, Ten-petal Anemone. Thin, circumneutral soils around rock outcrops, calcareous hammocks (in FL). March-April. *A. berlandieri* and *A. caroliniana* have been much confused in floras; see Joseph & Heimburger (1966) for clarification. *A. berlandieri* is primarily a species of midwestern prairies, occurring from n. AR and s. KS south through OK to c. LA and s. TX; disjunct eastwards in AL, c. GA, n. FL, c. NC, c. SC, and sc. VA. It reaches its northeastern limit (and only VA occurrence) at calcareous mudstone cliffs on the Banister River in Pittsylvania County, VA; it is scattered in the Piedmont of NC on a variety of rock types, including mafic meta-argillite and plagioclase-rich granite. [= FNA, K, WH; < *A. caroliniana* Walter – RAB, C, F, G, S, W; *? A. heterophylla* Nuttall ex Torrey & Gray; < *A. decapetala* Arduino, misapplied (a South American species)]

* *Anemone blanda* Schott & Kotschy, Greek Anemone. Reported by Harvill et al. (1992) from Madison County, VA and for Fauquier County, VA by Shetler & Orli {}. It is not known whether this species is established in our area. {make sure this is not a misidentified specimen of *A. berlandieri* – see FNA p. 140} [= FNA, K] {not yet keyed; not mapped; rejected}

Anemone canadensis Linnaeus, Canada Anemone. Moist forests. May-August. QC west to AB, south to MD, w. VA, s. WV, e. TN (Chester, Wofford, & Kral 1997), KY, MO, and NM. [= C, F, FNA, G, K, W]

Anemone caroliniana Walter, Prairie Anemone, Carolina Anemone. Clayey soils of post oak and blackjack oak woodlands (Iredell soils), wet meadows. Ranging primarily in the Midwest, north in the Southeast to disjunct locations in c. and sc. GA, c. SC, c. TN (Chester, Wofford, & Kral 1997), and sc. NC. [= FNA, K; < *A. caroliniana* Walter – RAB, C, F, G, S, W (also see *A. berlandieri*)]

Anemone lancifolia Pursh, Lanceleaf Anemone. Rich, moist soils on slopes or in bottomlands. March-May. Appalachian: s. PA south to GA (?), in and near the Appalachians. It is a somewhat larger plant than the closely related *A. quinquefolia*. [= RAB, C, F, FNA, G, K, S, W; = *A. quinquefolia* var. *lancifolia* (Pursh) Fosberg]



Anemone minima A.P. de Candolle, Tiny Anemone. Acidic forests, especially under *Alnus serrulata* along small streams. March-May. A Southern Appalachian endemic: VA and WV south to NC and TN. See Dutton & Keener (1994). [= C, F, G, W; = *Anemone quinquefolia* Linnaeus var. *minima* (A.P. de Candolle) Frodin ex Dutton & Keener – FNA, K; = *A. minima* A.P. de Candolle – C, F, G, W]

Anemone quinquefolia Linnaeus, Wood Anemone. Rich, moist forests, grassy balds, often abundant at high elevations. March-May. NL, QC, ON, MB, SK, and AB south to SC, GA, AL, MS, AR, and SD. [= *A. quinquefolia* var. *quinquefolia* – FNA; = *A. quinquefolia* – RAB, S, W; > *A. quinquefolia* var. *quinquefolia* – C, F, K; > *A. quinquefolia* var. *bifolia* Farwell – C, G, K; > *A. quinquefolia* var. *interior* Fernald – F, G]

Anemone virginiana Linnaeus *var.* ***virginiana***, Tall Anemone, Thimbleweed. Rich forests and woodlands, especially prevalent on circumneutral soils. May-July. NL (Newfoundland), ME, s. ON, and SK, south to GA, AL, MS, LA, OK, and WY. Two other varieties are more northern; see discussion of var. *alba* below. [= C, FNA, K; < *A. virginiana* – RAB, W; = *A. virginiana* – F, G, S; > *A. virginiana* – S; > *A. riparia* Fernald – S, misapplied]

Anemone virginiana Linnaeus var. *alba* (Oakes) A. Wood ranges south to se. NY and NJ (Kartesz 1999) and has been reported for our area. Keener, Dix, & Dutton (1996) discuss the intergrading varieties of *A. virginiana*. This variety might be expected in n. VA, especially in river scour situations. [= C, FNA; = *A. virginiana* var. *riparia* (Fernald) Boivin – K; = *A. riparia* Fernald – F, G] {keyed; not mapped}

16. Clematis Linnaeus 1753 (Clematis, Virgin's-bower)

A genus of about 295 species, shrubs, vines, and suffruticose herbs, of Eurasia, North America, South America, Africa, Madagascar, and Oceania. W.A. Weber (1995) proposes generic status (as *Coriflora* W.A. Weber) for the leatherflowers, here treated as *Clematis*, subgenus *Viorna*. References: Pringle in FNA (1997); Moreno & Essig in FNA (1997); Essig (1990); Keener (1975); Keener (1967); Pringle (1971)=Z; Tamura in Kubitzki, Rohwer, & Bittrich (1993).

Identificatiopn notes: Additional species of *Clematis*, of Asian or European origin, are cultivated as ornamentals and might be encountered.

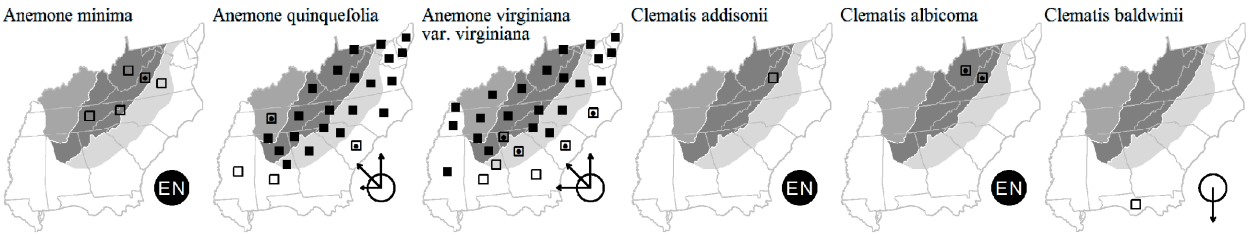
1 Flowers numerous, in compound cymose-paniculate inflorescences; sepals white; filaments glabrous; [subgenus *Clematis*].
  2 Flowers perfect, with 5-10 carpels; anthers 1.5-3 mm long; leaf margins entire (rarely cleft); leaflets (3-) 5 (-7); [alien, in disturbed areas]..... ***C. terniflora***
  2 Flowers mostly polygamo-dioecious, the pistillate with 18-60 carpels; anthers 0.5-1 mm long; leaf margins coarsely toothed; leaflets 3 (*C. virginiana*) or 5-7 (*C. catesbyana*); [native, though sometimes weedy].
    3 Leaves 3-foliolate; pistillate flowers with 40-60 carpels..... ***C. virginiana***
    3 Leaves (3-) 5-7-foliolate; pistillate flowers with 18-35 carpels ..... ***C. catesbyana***
1 Flowers solitary or in groups of 3's; sepals usually at least partly bluish, purplish or red; filaments pubescent.
  4 Leaves (most or all of them) simple, sessile or subsessile; plant an erect herb to 7 dm tall; [subgenus *Viorna*].
    5 Leaves glaucous and glabrous beneath, the uppermost commonly pinnate and tendril-bearing..... ***C. addisonii***
    5 Leaves green and usually pubescent beneath (glabrous in *C. baldwinii*), the uppermost usually simple and entire, neither pinnate nor tendril-bearing (though occasionally lobed).
      6 Leaves of flowering material soft-pubescent beneath, the largest 3-9 cm wide, with stomates on the lower surface only; leaves of fruiting material usually light green with the secondary and tertiary veins forming prominent reticulations on the upper surface.
        7 Stems and leaves usually densely sericeous-woolly; sepal backs densely sericeous; mature styles white to pale yellow, sharply recurved and flexuous; [of shale barrens and calcareous woodlands of w. VA] ..... ***C. coactilis***
        7 Stems and leaves villous; sepal backs moderately sericeous-pilose; mature styles yellowish-white to deep tawny, loosely spreading-recurved; [of various woodlands, fairly widespread in our area]..... ***C. ochroleuca***
      6 Leaves of flowering material glabrous to sparsely pilose beneath, the largest 2-5 cm wide (or 3.5-11 cm wide in *C. fremontii*), with stomates on both surfaces; leaves of fruiting material often dark green, either with the secondary and tertiary veins forming prominent reticulations on the upper surface (*C. fremontii*) or the upper with the secondary and tertiary veins not forming prominent reticulations on the upper surface (*C. albicoma*, *C. viticaulis*, and *C. baldwinii*).
        8 Sepal tips acuminate; achene bodies cobwebby-tomentose toward the tip (*C. fremontii*) or long pilose (*C. baldwinii*)
          9 Leaf blades 0.2-2.5 (-3.5) cm wide, not notably reticulate on the upper surface; beak of the achene plumose with long hairs; [of wet pinelands of n. FL southwards] ..... ***C. baldwinii***
          9 Leaf blades 3.5-11 cm wide, prominently reticulate on the upper surface; beak of the achene silky tomentose near the base, nearly glabrous towards the tip; [of prairies of nw. GA] ..... ***C. fremontii***
        8 Sepals tips obtuse to acute; achene bodies pilose throughout; [of shale barrens of w. VA and WV].
          10 Sepal backs villous; pubescence on the summit of the achene and the base of the style spreading or reflexed; mature styles white to pale yellow, sharply recurved and flexuous..... ***C. albicoma***
          10 Sepal backs finely puberulent; pubescence on the summit of the achene and the base of the style closely appressed-ascending; mature styles tawny to deep reddish-brown, loosely spreading-recurved ..... ***C. viticaulis***
  4 Leaves (most of them) compound, petiolate; plant a trailing or climbing vine, to many meters long (or erect or ascending in *C. addisonii* and *C. socialis*).
    11 Sepals thin in texture, 3-5 cm long, soft-villous, neither apically recurved nor with broad, strongly crisped margins; leaves 3-foliolate; [subgenus *Atragene*]..... ***C. occidentalis*** *var.* ***occidentalis***
    11 Sepals thick in texture, 1-5 cm long, short-sericeous, apically recurved; leaves 1-11-foliolate; [subgenus *Viorna*].

12 Lower surface of leaves glaucous and glabrous (rarely with a few scattered hairs).
13 Plant an erect or ascending herb; lower leaves simple, upper leaves simple to 2-6-foliolate; [of dry limestone glades, endemic to VA] ..... ***C. addisonii***
13 Plant a climbing vine; all leaves generally compound, often 6-10-foliolate; [of various habitats, ranging from NC south].
14 Leaf blade thin in texture; secondary and tertiary veins not prominently reticulate ..... ***C. glaucophylla***
14 Leaf blade leathery in texture; secondary and tertiary veins prominently reticulate; [in the Ridge and Valley of eastern TN and westward] ..... ***C. versicolor***
12 Lower surface of leaves not glaucous, pubescent (rarely nearly glabrous).
15 Plants erect, to 2-3 (-5) dm tall, forming clonal patches by underground rhizomes; leaflets linear-lanceolate, averaging ca. 10× as long as wide ..... ***C. socialis***
15 Plants viny, sprawling or climbing, the stems usually over 1 m long, not rhizomatous-clonal; leaflets generally broader.
16 Leaves coriaceous, the secondary and tertiary veins forming prominent reticulations on the upper surface.
17 Leaf blade coarsely reticulate-veined, the ultimate closed areoles often > 2 mm long in the longer dimension, the tertiary and quaternary veins not prominently raised; achene beak sparsely pubescent to silky, with ascending or appressed hairs ..... ***C. pitcheri var. pitcheri***
17 Leaf blade finely reticulate-veined, the ultimate closed areoles mostly < 2 mm long in the longest dimension, the tertiary and quaternary veins often pominently raised; achene beak plumose, with spreading hairs ..... ***C. reticulata***
16 Leaves membranous, the secondary and tertiary veins forming faint, indistinct reticulations on the upper surface.
18 Sepals 2.5-5 cm long, the tips widely spreading, the upper margins thin, crisped, to 6 mm wide; peduncles usually without bracts ..... ***C. crispa***
18 Sepals 1.5-3 cm long, the tips either abruptly and shortly recurved (*C. viorna*) or spreading to short-reflexed (*C. morefieldii*), the upper margins not thin or crisped, to 2.5 mm wide; peduncles usually with bracts.
19 Stems with cobwebby pubescence; bracts near the base of the peduncle; sepals densely silky-pubescent on the outer surface, pinkish-green; [limestone habitats of n. AL and se. TN] ..... ***C. morefieldii***
19 Stems glabrous to sparsely pilose; bracts well above the base of the peduncle; sepals sparsely pubescent on the outer surface, pale lavender to purple; [widespread in our area] ..... ***C. viorna***

Clematis addisonii Britton, Addison's Leatherflower. Dry to mesic calcareous barrens, woodlands, and forests, over dolostone (Elbrook Formation). April-June. Endemic to w. VA (Botetourt, Montgomery, Roanoke, and Rockbridge counties). [= C, F, FNA, G, K, W; = *Viorna addisonii* (Britton) Small – S; = *Coriflora addisonii* (Britton) W.A. Weber]

Clematis albicoma Wherry, White-haired Leatherflower. Shale barrens. May-June. Endemic to w. VA (Alleghany, Augusta, Bath, Botetourt, Highland, and Rockbridge counties), and e. WV. [= C, FNA, G, K, W; = *Clematis albicoma* var. *albicoma* – F; = *Coriflora albicoma* (Wherry) W.A. Weber]

Clematis baldwinii Torrey & A. Gray, Pine-hyacinth, Flatwood Clematis. Wet pine flatwoods. April-August. Ne. FL south to s. FL. [= FNA, GW, WH; > *Clematis baldwinii* var. *baldwinii* – K2; > *Clematis baldwinii* var. *latiuscula* R.W. Long – K2; = *Viorna baldwinii* (Torrey & A. Gray) Small – S; = *Coriflora baldwinii* (Torrey & A. Gray) W.A. Weber] {not yet keyed}



Clematis catesbyana Pursh, Coastal Virgin's-bower, Satin-curls. Dunes and interdune swales with abundant shell hash, calcareous woodlands and thickets, calcareous hammocks. July-September. Se. VA south to c. peninsular FL and west to LA, and inland especially in calcareous parts of c. TN and n. AR and s. MO, as well as in the Ridge and Valley of VA and disjunct at Linville Caverns, McDowell County, NC, where on dolomite in a geologic window in the Blue Ridge. [= C, FNA, GW, K, WH; < *Clematis ligusticifolia* Nuttall – RAB, misapplied; > *Clematis catesbyana* – S; > *Clematis micrantha* Small – S]

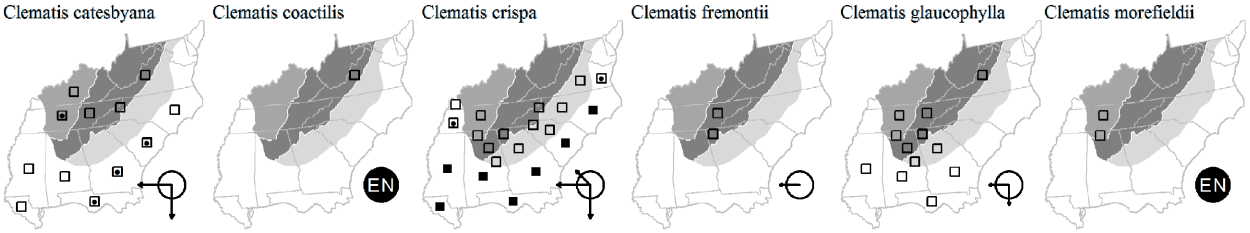
Clematis coactilis (Fernald) Keener, Virginia White-haired Leatherflower. Shale barrens, shaly woodlands, dry calcareous barrens and woodlands. May-June. Endemic to w. VA (Botetourt, Craig, Giles, Montgomery, Pulaski, Roanoke, and Wythe counties). [= C, FNA, K, W; = *Clematis albicoma* Wherry var. *coactilis* Fernald – F; = *Coriflora species 1*]

Clematis crispa Linnaeus, Marsh Clematis, Southern Leatherflower, Blue Jasmine. Marshes, swamps, floodplain forests, disturbed wet or moist areas. April-August. Widespread in Southeastern United States, FL to TX, north to se. VA and s. IL. [= RAB, C, F, FNA, G, GW, K, W, WH; = *Viorna crispa* (Linnaeus) Small – S; = *Coriflora crispa* (Linnaeus) W.A. Weber]

Clematis fremontii S. Watson. Calcareous flatwoods. E. MO, s. MO, nc. KS and sc. NE; disjunct in the Ridge and Valley of nw. GA (Floyd County) and se. TN (Hamilton County). See Anonymous (2003) and Horn & Shaw (2007) for additional information. [= FNA, K; = *Coriflora fremontii* (S. Watson) W.A. Weber]

Clematis glaucophylla Small, White-leaved Leatherflower. Wet hammocks, habitat in our area poorly known, also probably in dry woodlands or openings over calcareous rocks, according to RAB in "rich woods". May-September. Widespread in Southeastern United States, from se. TN and OK, south to FL Panhandle and LA, but apparently rare and poorly known. Previous attributions of this species for NC, SC, KY, and (perhaps) VA appear to be based on misidentifications. [= RAB, C, F, FNA, G, GW, K, WH; = *Viorna glaucophylla* (Small) Small – S; = *Coriflora glaucophylla* (Small) W.A. Weber]

Clematis morefieldii Kral, Morefield's Leatherflower. Limestone habitats. Endemic to nc. AL and se. TN. See Estes & Fleming (2006) for additional information. [= FNA, K; = *Coriflora morefieldii* (Kral) W.A. Weber]



Clematis occidentalis (Hornemann) A.P. de Candolle *var.* ***occidentalis***, Purple Clematis, Mountain Clematis. Rocky slopes over mafic rocks (greenstone, amphibolite), known positively in NC only from amphibolite peaks in Ashe County. May-June. Var. *occidentalis* is widespread in ne. North America, from NB west to w. ON, south to NJ, DE, OH, nw. IL, and ne. IA, and in the mountains to w. VA and w. NC. Two other varieties occur in the Rocky Mountains. Fernald's var. *cacuminis,* published under *C. verticillaris,* described plants from the mountains of VA and NC; it is apparently merely a form based on material in early flower (Pringle 1971). [= FNA, K; < *Clematis verticillaris* A.P. de Candolle – RAB, G; < *Clematis occidentalis* – C, W; > *Clematis verticillaris* var. *verticillaris* – F; > *Clematis verticillaris* A.P. de Candolle var. *cacuminis* Fernald – F; < *Atragene americana* Sims – S]

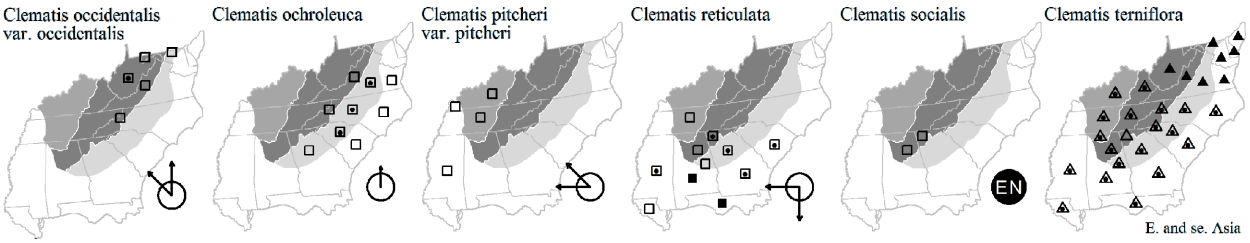
Clematis ochroleuca Aiton, Curlyheads. Dry woodlands and woodland borders, generally over mafic or calcareous rocks, such as diabase, gabbro, or calcareous siltstone. April-June. Primarily Piedmont: C. MD south to ec. GA; disjunct on Long Island, NY. [= RAB, C, F, FNA, G, K, W; = *Viorna ochroleuca* (Aiton) Small – S; = *Coriflora ochroleuca* (Aiton) W.A. Weber]

Clematis pitcheri Torrey & A. Gray *var.* ***pitcheri,*** Bellflower Leatherflower. Limestone glades and barrens. April-October. IN, IL, IA, and e. NE south to w. KY, c. TN, ne. MS, AR, TX, and NM. [= FNA, K; < *Viorna pitcheri* (Torrey & A. Gray) Britton – S]

Clematis reticulata Walter. Dry, sandy woodlands, such as longleaf pine sandhills and dry hammocks. May-August. Se. SC south to c. peninsular FL, west to TX, and north in the interior to TN and AR. [= RAB, FNA, K, WH; = *Viorna reticulata* (Walter) Small – S; = *Coriflora reticulata* (Walter) W.A. Weber]

Clematis socialis Kral, Alabama Leatherflower. Wet calcareous flatwoods. Nw. GA (Floyd Co.) and ne. AL (St. Clair and Cherokee counties). Timmerman-Erskine & Boyd (1999) report on reproductive ecology of this endangered species; Goertzen & Boyd (2007) on its genetic diversity. [= FNA, K]

* ***Clematis terniflora*** A.P. de Candolle, Sweet Autumn Clematis, Yam-leaved Clematis. Disturbed areas; native of e. Asia (Japan, China, Korea). July-September. [= C, FNA, GW, K, W, WH; ? *Clematis dioscoreifolia* Léveillé & Vaniot – RAB; > *Clematis dioscoreifolia* Léveillé & Vaniot var. *robusta* Carrière & Rehder – F; ? *Clematis paniculata* Thunberg – S; ? *Clematis maximowicziana* Franchet & Savatier]



Clematis versicolor Small ex Rydberg, Pale Leatherflower. Calacreous barrens. June-August. Sc. KY, c. TN, nc. AL; Ozarks and Ouachitas of s. MO, n. and c. AR, and e. OK south into e. TX. [= FNA, K; = *Viorna versicolor* (Small ex Rydberg) Small – S; = *Coriflora versicolor* (Small ex Rydberg) W.A. Weber]

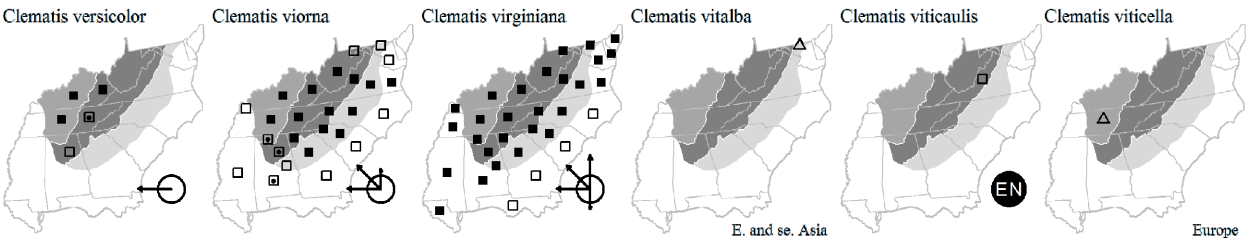
Clematis viorna Linnaeus, Northern Leatherflower, Vase-vine. Mesic forests, woodlands, thickets, especially over mafic rocks. May-September. PA, IL, and MO south to GA, AL, MS, and AR. [= RAB, C, F, FNA, G, K, W; > *Viorna viorna* (Linnaeus) Small – S; > *Viorna beadlei* Small – S; > *Viorna flaccida* (Small) Small – S; > *Viorna gattingeri* (Small) Small – S; > *Coriflora viorna* (Linnaeus) W.A. Weber; > *Coriflora beadlei* (Small) W.A. Weber]

Clematis virginiana Linnaeus, Virgin's-bower. Moist forests, thickets, and openings. July-September. Noca Scotia, ON and MB, south to c. peninsular FL and TX. Vegetatively, this species can be distinguished from *C. viorna* and *C. crispa* (the other common and widespread species in our area) by its leaves with three relatively symmetrical leaflets (vs. leaves with 3-many irregular leaflets). [= RAB, C, F, FNA, GW, K, S, W; ? *C. virginiana* var. *virginiana* – G]

* *Clematis vitalba* Linnaeus, Traveler's Joy. Disturbed areas, persistent after culticavation; native of e. Asia. Reported for Baltimore County, MD (Kartesz 2010). [= FNA, K2] {not yet keyed}

Clematis viticaulis Steele, Millboro Leatherflower. Shale barrens and shaly woodlands. May-June. Endemic to w. VA (Augusta, Bath, and Rockbridge counties). [= C, F, FNA, G, K, W; = *Coriflora viticaulis* (Steele) W.A. Weber]

* *Clematis viticella* Linnaeus, Italian Clematis. Disturbed areas, persistent after cultivation; native of Europe. Reported for TN (Pringle in FNA 1997). [= FNA, K; *Viticella viticella* (Linnaeus) Small] {not yet keyed}



17. Trautvetteria Fischer & C.A. Meyer 1835 (Tassel-rue)
[contributed by Aaron J. Floden and Alan S. Weakley]

A genus of 4-6 closely related species, perennial herbs, disjunctly distributed in temperate to boreal e. North America, w. North America, and Japan. References: Parfitt in FNA (1997); Floden (2011)=Z; Tamura in Kubitzki, Rohwer, & Bittrich (1993); Johansson (1998).

1 Basal leaves deeply (over halfway to nearly all the way to the petiole) 5-9-lobed, the lobes oblanceolate, membranous (to fairly stiff when growing in an exposed setting), each lobe further divided into 2-4 lobules, the margin irregularly serrate, the venation not highly reticulate; cauline leaves 3-7-lobed; [rather widespread in our area] ..... ***T. caroliniensis***
1 Basal leaves shallowly (less than halfway to the petiole) 3 (-5)-lobed, thickly chartaceous and stiff, lobes round/deltoid, outer lobes usually shallowly 1-lobed, margin regularly crenate/dentate, venation highly reticulate; cauline leaves unlobed to shallowly 3-5-lobed, lobes deltoid; [endemic to Ridge and Valley of TN] ..... ***T. species 1***

Trautvetteria caroliniensis (Walter) Vail, Tassel-rue, False Bugbane. Streambanks, seepages, grassy balds, moist forests, swamp forests, very rarely in calcareous longleaf pine savanna ecotones. Late May-July. Sw. PA and KY to GA, AL, and Panhandle FL, primarily in the Southern and Central Appalachians, disjunct on calcareous sites in AR (Sundell et al. 1999), e. TX (Floden 2011), IN, IL, and MO. The discovery of this species in the edge of a calcareous savanna (Camp Branch Savanna, Brunswick County, NC) in the outer Coastal Plain was surprising; the small population has since apparently been destroyed by intensive silvicultural practices. *T. nervata* Greene, named from the Coastal Plain of s. GA, needs additional evaluation (Floden 2011); the type specimen is striking in its deeply and multiply divided leaf segments. [= G, S, Z; < *T. caroliniensis* – RAB, F, FNA, GW, W, WV; = *T. caroliniensis* var. *caroliniensis* – C, K; > *T. nervata* Greene

Trautvetteria species 1. Dolomitic fens. Endemic (so far as known) to Claiborne County, ne. TN.

18. Ficaria Schaeffer 1760 (Lesser Celandine)

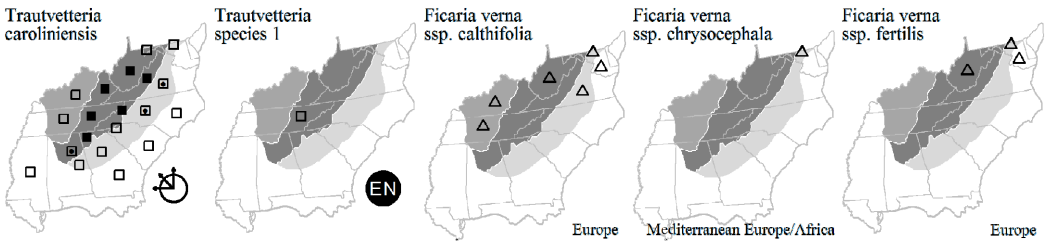
A genus of about 5 species, herbs, or Europe west to c. Asia. Best treated as a genus separate from *Ranunculus*, based on morphology and molecular phylogenetics; *Myosurus* is (for instance) more closely related to *Ranunculus* than is *Ficaria* (Paun et al. 2005; Emadzade et al. 2010). Post et al. (2009) analyze the presence in North America of the various infrataxa recognized in Europe and find evidence that all are naturalizing. The species is reported to be developing into a seriously invasive species in ne. United States and adjacent Canada (Axtell, DiTommaso, & Post 2010). References: Sell (1994)=Z; Stace (2010)=Y; Paun et al. (2005).

1 Leaves up to 8 cm long and 9 cm wide; petioles up to 28 cm long; petals 17-26 mm long, 4-15 (-18) mm wide; achenes 3-5 mm long, 2-3.5 mm wide.
  2 Stem robust and erect; bulbils absent in leaf axils after flowering; petals 9-15 (-18) mm wide ..... ***F. verna*** *ssp.* ***chrysocephala***
  2 Stem rather robust, but straggling; bulbils present in leaf axils after flowering; petals 4-12 mm wide ..... ***F. verna*** *ssp.* ***ficariiformis***
1 Leaves up to 4 cm long and 4 cm wide; petioles up to 15 cm long; petals 6-20 mm long, 2-9 mm wide; achenes 2.5-3.5 mm long, 1.7-2.2 mm wide.
  3 Leaves crowded at base with few on short stems; petiole to10 cm long; petals 2.5-6 mm wide ..... ***F. verna*** *ssp.* ***calthifolia***
  3 Leaves less crowded at base and more numerous on the elongating stem; petiole to 15 cm long (at least some on a plant > 10 cm long); petals 2-9 mm wide.
    4 Bulbils not present in leaf axils after flowering; achenes well-developed; petals 4-9 mm wide ..... ***F. verna*** *ssp.* ***fertilis***
    4 Bulbils present in leaf axils after flowering; achenes poorly developed (rarely fertile, and then only several per flower); petals 2-5 mm wide ..... ***F. verna*** *ssp.* ***verna***

* ***Ficaria verna*** Hudson *ssp.* ***calthifolia***(Reichenbach) Nyman. Disturbed rich forests and bottomlands, mesic suburban forests, lawns, naturalized locally from horticultural plantings; native of ec. and se. Europe. Naturalized in the US in CT, DE, DC, IL, KY, MD, MA, MI, MO, NJ, NY, OH, OR, PA, TN, VA, WA, WV, WI (Post et al. 2009). [< *Ranunculus ficaria* Linnaeus – C, F, FNA, G, WV; < *R. ficaria* var. *bulbifera* Marsden-Jones – K; = *Ranunculus ficaria* Linnaeus ssp. *calthifolius* (Reichenbach) Arcangeli – Z]

* ***Ficaria verna*** Hudson *ssp.* ***chrysocephala*** (P.D. Sell) Stace. Disturbed areas; native of e. Mediterranean Europe. Naturalized in the US in MD, NY, OR, WA (Post et al. 2009). [= Y; < *Ranunculus ficaria* Linnaeus – C, F, FNA, G; < *R. ficaria* var. *bulbifera* Marsden-Jones – K; = *Ranunculus ficaria* Linnaeus ssp. *chrysocephalus* P.D. Sell – Z]

* ***Ficaria verna*** Hudson *ssp.* ***fertilis*** (Lawralrée ex Laegaard) Stace. Disturbed areas; native of w. Europe. Naturalized in the US in DC, IL, MD, MA, NY, PA, WA, WV (Post et al. 2009). [= Y; < *Ranunculus ficaria* Linnaeus – C, F, FNA, G; < *R. ficaria* var. *bulbifera* Marsden-Jones – K; = *Ranunculus ficaria* Linnaeus ssp. *ficaria* – Z]



* ***Ficaria verna*** Hudson *ssp.* ***ficariiformis*** (F.W. Schultz) B. Walln. Disturbed rich forests and bottomlands, mesic suburban forests, lawns, naturalized locally from horticultural plantings; native of c. and w. Mediterranean Europe. First reported for NC by Krings et al. (2005). Naturalized in the US in MO, NY, NC, OH, PA, TX (Post et al. 2009). [= Y; < *Ranunculus ficaria* Linnaeus

– C, F, FNA, G; < *R. ficaria* var. *bulbifera* Marsden-Jones – K; = *Ranunculus ficaria* Linnaeus ssp. *ficariiformis* (F.W. Schultz) Rouy & Fouc. – Z]

* ***Ficaria verna*** Hudson *ssp.* ***verna***. Disturbed rich forests and bottomlands, mesic suburban forests, lawns, naturalized locally from horticultural plantings; native of Europe. Naturalized in the US in CT, DC, DE, MA, MD, MI, MO, NH, NJ, NY, OH, OR, PA, VA, WA, WV (Post et al. 2009). [= Y; < *Ranunculus ficaria* Linnaeus – C, F, FNA, G, WV; < *R. ficaria* var. *bulbifera* Marsden-Jones – K; = *Ranunculus ficaria* Linnaeus ssp. *bulbilifer* Lambinon – Z]

19. Myosurus Linnaeus 1753 (Mousetail)

A genus of about 15 species, annual scapose herbs, nearly cosmopolitan (lacking in e. Asia and tropical regions), with a center of diversity in w. North America. References: Whittemore in FNA (1997); Campbell (1952)=Z; Tamura in Kubitzki, Rohwer, & Bittrich (1993).

Myosurus minimus Linnaeus, Mousetail. Usually in disturbed areas, such as fields in floodplains. March-May. The species is circumboreal and also found in various places in the Southern Hemisphere. Widely distributed in North America, Eurasia, and the Southern Hemisphere. A number of subspecies have been described; if these are recognized, our material is the typic ssp. *minimus*. The pre-Columbian occurrence of *Myosurus* in our area is uncertain; it may well be an alien, early introduced from sc. North America. [= RAB, C, F, FNA, G, GW, K, S; > *M. minimus* ssp. *minimus* – Z]

20. Ranunculus Linnaeus 1753 (Buttercup, Crowfoot, Spearwort)

A genus of about 600 species, perennial and annual herbs, nearly cosmopolitan (most diverse in temperate and boreal regions of the Northern Hemisphere). The subgenera are distinctive and have often been recognized at the generic level; two are represented in our area (after removal of *Ficaria* as a separate genus). Distributions given in many works (including Harvill et al. 1992) for the *R. hispidus* complex are apparently garbled by differences in taxonomic concepts. I am here following Duncan's (1980) taxonomic entities, though recognizing some of his varieties as species. References: Whittemore in FNA (1997); Duncan (1980)=Z; Keener (1976)=Y; Keener & Hoot (1987)=X; Paun et al. (2005); Tamura in Kubitzki, Rohwer, & Bittrich (1993). Keys adapted, in part, from C, GW, X, Y, and Z. [also see *Ficaria*]

Identification notes: Mature or relatively mature achenes are necessary for the identification of some species. Shape and pubescence of the receptacle is also a frequently used taxonomic character, best judged by stripping off the achenes.

1 Petals dull, white; achenes roughly transverse-ridged; plants aquatic, the leaves finely dissected to merely shallowly lobed; [native, occurring in circumneutral waters]; [subgenus *Batrachium*] ..... **Key A**
1 Petals shiny, yellow (sometimes fading or bleaching to whitish); achenes usually not transverse-ridged (though often variously ornamented); plants aquatic or terrestrial, the leaves various; [native or introduced, occurring in various habitats]; [subgenus *Ranunculus*].
  2 Cauline leaves all simple, mostly lanceolate, either entire, denticulate, or serrate, but not lobed or deeply divided; [native, occurring in marshes or other wetlands]; [section *Flammula*] ..... **Key B**
  2 Cauline leaves (at least most them) lobed, divided, or compound; [native or introduced, occurring in various habitats].
    3 Basal leaves not divided, mostly cordate, reniform, or ovate (and merely toothed), distinctly unlike the deeply divided cauline leaves; achenes turgid, ovoid, 1-2.5 mm long, without pronounced marginal rims; petals 1.5-6.5 mm long; [native, occurring in mesic to dry forests and woodlands, and also (especially *R. abortivus*) weedy]; [section *Epirotes*] ..... **Key C**
    3 Basal leaves mostly deeply parted or compound, the cauline leaves generally similar but smaller and often less divided; achenes various, 1-5 mm long, with or without pronounced marginal rims; petals 2-15 mm long; [native or introduced, occurring in various habitats].
      4 Achenes markedly spiny, papillose, or tuberculate (the protuberances few and small in *R. sardous*, keyed both here and below); [introduced, usually weedy and in disturbed habitats]; [section *Echinella*] ..... **Key D**
      4 Achenes smooth (rarely pubescent or papillose); [native or introduced, occurring in various habitats].
        5 Achenes turgid, 1-1.5 (-2) mm long, the marginal rims scarcely or not at all evident, the achenes corky-thickened at their bases for dispersal by floating; [of mucky marshes or ditches, or aquatic in pools]; [section *Hecatonia*] ..... **Key E**
        5 Achenes moderately turgid or flattened, 1.5-3.8 mm long, with a pronounced (at 10× or more) marginal rim appearing as a differentiated border or flange, more-or-less flattened, and separated from the central bulge of the achene by a concavity or even a groove, the achenes not corky-thickened at their bases; [of mostly terrestrial or in bottomland forests]; [section *Ranunculus*] ..... **Key F**

Key A – subgenus *Batrachium* (White Water Crowfoots)

1 Leaves floating, shallowly lobed; receptacles glabrous ..... ***R. hederaceus***
1 Leaves submersed (or stranded by falling water levels), dissected into filiform segments; receptacles hispid.
  2 Leaves firm (not collapsing when removed from water); free petioles much shorter than the dilated stipular base; leaves usually much shorter than the internode above; achene beaks 0.7-1.5 mm long ..... ***R. longirostris***
  2 Leaves flaccid (collapsing when removed from water); free petioles about as long as the dilated stipular base; leaves usually about as long as the internode above; achene beaks 0.1-0.3 (-0.5) mm long ..... ***R. trichophyllus*** *var.* ***trichophyllus***

Key B – subgenus *Ranunculus*, section *Flammula* (simple-leaved buttercups) (Spearworts)

1 Petals 1-3 (-5), 1-2 mm long, about as long as the sepals; annual ..... ***R. pusillus***

1 Petals (4-) 5-9, distinctly longer than the sepals; annual or perennial.
  2 Cauline leaves 6-14 cm long; sepals 4-7 mm long; achene beak 1.0-1.3 mm long ..... ***R. ambigens***
  2 Cauline leaves 1-6.5 cm long; sepals 1.5-4 mm long; achene beak 0.1-0.6 mm long.
    3 Cauline leaves linear, < 1 mm wide; achenes 1.2-1.6 mm long ..... ***R. flammula*** *var.* ***reptans***
    3 Cauline leaves ovate to lanceolate, 4-24 mm wide; achenes 0.8-1.0 mm long ..... ***R. laxicaulis***

Key C – subgenus *Ranunculus*, section *Epirotes*

1 Achene beaks (0.6-) 0.7-1.0 mm long; petals < ½ as long as the sepals; sepals hirsute ..... ***R. allegheniensis***
1 Achene beaks 0.1-0.3 mm long; petals > ½ as long as the sepals; sepals glabrous to sparsely long-villous.
  2 Petals 4-8 mm long, longer than the sepals ..... ***R. harveyi***
  2 Petals 1.5-3.5 mm long, slightly shorter than the sepals.
    3 Leaves and stems glabrous or nearly so (or the upper stem puberulent); basal leaves 1-6 (-10) cm wide, reniform to cordate at the base; roots usually all filiform ..... ***R. abortivus***
    3 Leaves and stems villous, at least toward the base; basal leaves 1-2.5 cm wide, truncate to cuneate (rarely cordate) at the base; roots sometimes in part fusiform-thickened ..... ***R. micranthus***

Key D – subgenus *Ranunculus*, section *Echinella*

1 Flowers sessile, opposite the petioles; sepals 3; petals 3 ..... ***R. platensis***
1 Flowers pedunculate, axillary; sepals usually 5; petals usually 5.
  2 Petals 1-2 (-3) mm long; receptacles glabrous ..... ***R. parviflorus***
  2 Petals (3-) 4-12 mm long; receptacles pubescent.
    3 Achenes bodies 1.5-3 mm long, 30-60 per head; achene beak ca. 0.5 mm long; achene with conical protuberances or short spines, to 0.16 mm long; achene beak 0.1-0.5 mm long.
      4 Achene with a few conical protuberances; petals 5-12 mm long; plant sparsely to densely hirsute; achenes 30-40 per head ..... ***R. sardous***
      4 Achene with numerous short spines; petals (3-) 4-5 mm long; plant with a few, widely scattered, long hairs; achenes 40-60 per head ..... ***R. trilobus***
    3 Achenes 3-5 mm long, 4-20 per head; achene beak 1.5-3.0 mm long; achene conspicuously spiny, the longer spines mostly 0.30-0.85 mm long.
      5 Achenes 4-9 per head, in a single whorl; achene margins spiny, as also the faces; beak of the achene 2.5-3 mm long ..... ***R. arvensis***
      5 Achenes 10-20 per head, in several whorls; achene margins smooth, the spines restricted to the faces; beak of the achene 1.5-2.5 mm long ..... ***R. muricatus***

Key E – subgenus *Ranunculus*, section *Hecatonia*

1 Petals 6-14 mm long; achene body 1.3-2.5 mm long, the beak 0.7-1.5 mm long; plants with submersed leaves dissected into numerous linear segments; [aquatic] ..... ***R. flabellaris***
1 Petals 2-4 (-5) mm long; achene body 0.8-1.2 mm long, the beak 0-0.1 mm long; plants without distinctive, dissected submersed leaves; [terrestrial or semi-aquatic] ..... ***R. sceleratus*** *var.* ***sceleratus***

Key F – subgenus *Ranunculus*, section *Ranunculus*

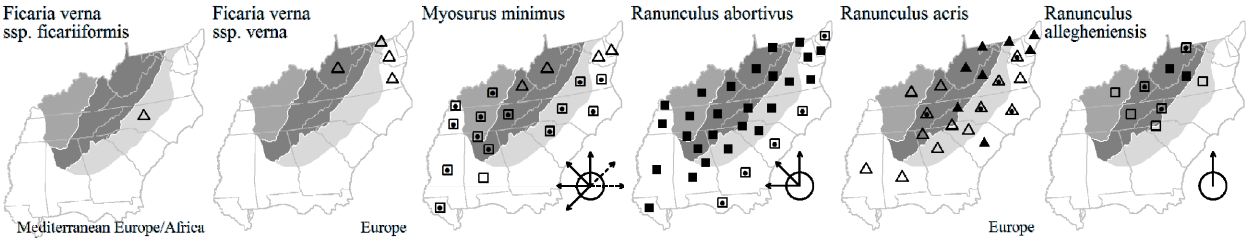
1 Petals 2-6 mm long, about as long as the sepals.
  2 Basal leaves simple; achene beak strongly hooked ..... ***R. recurvatus*** *var.* ***recurvatus***
  2 Basal leaves 3-foliolate; achene beak straight or nearly so.
    3 Petals 4-6 mm long, 3.5-5 mm wide; achene beak 1.0-1.2 mm long; [WV northwards] ..... ***R. macounii***
    3 Petals 2-4 mm long, 1.2.5 mm wide; achene beak 0.6-0.8 mm long; [widespread] ..... ***R. pensilvanicus***
1 Petals 5-15 mm long, (1.3-) 1.5× or more as long as the sepals; achene beak straight, flexuous, slightly curved, or hooked, 0.2-3.0 mm long.
  4 Achene beaks recurved or hooked, the stigmatic surface elongate, along the upper (curved) side of the style (beak) (visible at 10×); [introduced, usually weedy in disturbed habitats].
    5 Stems repent, rooting at the nodes ..... ***R. repens***
    5 Stems erect, not rooting at the nodes.
      6 Petals 5-8 mm long; plant a soft-based annual; achene face usually with at least a few conical protuberances (if examined carefully at 10× or more) ..... ***R. sardous*** **[of section *Echinella*]**
      6 Petals 8-16 mm long; plant a cormose or hard-based perennial; achene face truly smooth.
        7 Sepals spreading; stems not cormose-thickened at the base; larger leaves appearing (3-) 5-parted, all of the segments sessile; plant to 12 dm tall ..... ***R. acris***
        7 Sepals tightly reflexed; stems cormose-thickened at the base; larger leaves pinnately 3-5-parted, the terminal segment long-stalked; plant to 6 dm tall ..... ***R. bulbosus***
  4 Achene beaks straight or slightly curved, flexuous, the stigmatic surface limited to the tip of the style (beak); [native, normally in more-or-less natural habitats].
    8 Larger leaves mostly pinnately 3-7-foliolate, the terminal leaflet larger than the lateral leaflets, the leaflets (especially the terminal) often further cleft or lobed, the blade usually longer than wide in outline, the segments often rather narrow; naked receptacle conical, tapering gradually to the apex (the region of staminal attachment as thick as the region of gynoecial attachment, which tapers through all or nearly all of its length, best seen by stripping off the achenes); rhizome regenerating totally each growing season, producing both fibrous and (at the end of the growing season) tuberous roots (1.3-4.9 mm in diameter); [rare in our area, in calcareous, mafic, or ultramafic sites with prairie affinities] ..... ***R. fascicularis***

8 Larger leaves mostly palmately 3-foliolate, the terminal leaflet about the same size as the lateral leaflets, the leaflets sometimes further cleft or lobed, the blade usually as wide as long or wider; naked receptacle clavate or ellipsoid (the region of staminal attachment distinctly narrower than the region of gynoecial attachment, thus forming a waist, from which the gynoecial region expands and then tapers to the apex); rhizome regenerated partially each growing season, producing uniform, fibrous roots (up to 3.0 mm in diameter); leaves usually simple and ovate, or trifoliate with ovate leaflets; [collectively widespread in our area].
9 Achenes wide-margined (wider portions of the margin 1/4 to 2/3 as wide as the achene body); plants colonial, sending out stolons (by the time of fruiting) which root at the nodes, forming new plants; sepals reflexed at full anthesis ..... ***R. carolinianus***
9 Achenes narrow-margined (wider portions of the margin 1/8 or less as wide as the achene body); plants usually erect or repent by the time of fruiting (if repent sometimes forming adventitious roots at the nodes, but not generally developing new plants); sepals spreading at full anthesis (sometimes reflexed later).
10 Plants repent; aerial shoots 50-80 (-91) cm long at time of fruiting; [generally of swamps and marshes] ..... ***R. caricetorum***
10 Plants erect; aerial shoots 14-45 (-60) cm long at time of fruiting; [generally of upland habitats] ..... ***R. hispidus***

Ranunculus abortivus Linnaeus, Kidneyleaf Buttercup. Low fields, disturbed areas, bottomlands, lawns, roadsides. (February-) March-June. NL (Labrador) to AK, south to FL, TX, and CO. A common weed in shady and sunny places. [= RAB, FNA, GW, K, S, W, WV, Y; > *R. abortivus* var. *abortivus* – C, F, G; > *R. abortivus* var. *indivisus* Fernald – F]

* ***Ranunculus acris*** Linnaeus, Tall Buttercup, Bitter Buttercup. Pastures, fields, roadsides, disturbed areas; native of Europe. May-August. [= RAB, C, F, FNA, G, GW, S, W, WV, Y; > *R. acris* var. *acris* – K]

Ranunculus allegheniensis Britton, Allegheny Buttercup, Mountain Crowfoot. Cove forests, rich forested slopes. April-June. MA west to OH, south to w. NC and ne. TN, an Appalachian endemic. [= RAB, C, F, FNA, G, GW, K, S, W, WV, Y]



Ranunculus ambigens S. Watson, Water-plantain Crowfoot, Water-plantain Spearwort. Marshes. April-June. ME west to MN, south to VA, NC, ne. TN, w. TN, and LA. [= RAB, C, F, FNA, G, GW, K, W, WV, Y; = *R. obtusiusculus* Rafinesque – S]

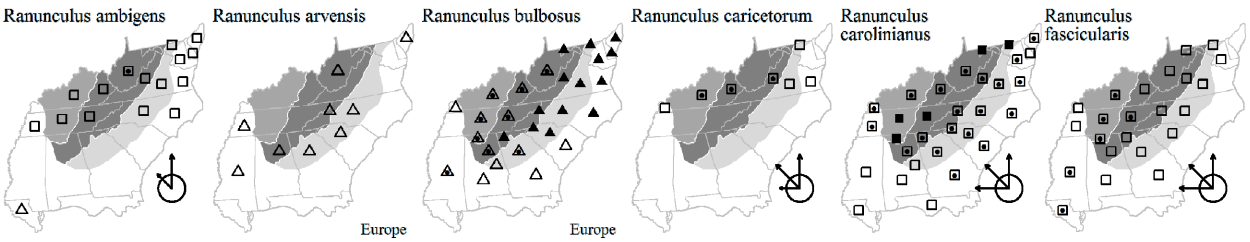
* ***Ranunculus arvensis*** Linnaeus, Corn Crowfoot, Hungerweed. Fields, disturbed areas; native of Europe. April-June. [= C, FNA, G, GW, K, WV, X, Y; > *R. arvensis* var. *arvensis* – RAB; > *R. arvensis* var. *tuberculatus* (A.P. de Candolle) Koch – RAB]

* ***Ranunculus bulbosus*** Linnaeus, Bulbous Buttercup. Fields, roadsides, disturbed areas; native of Europe. April-June. [= RAB, C, FNA, GW, K, S, W, WV, Y; > *R. bulbosus* var. *bulbosus* – F; > *R. bulbosus* var. *dissectus* Barbey – F; > *R. bulbosus* var. *valdepubens* (Jordan) Briquet – F]

Ranunculus caricetorum Greene, Northern Swamp Buttercup, Marsh Buttercup. Swampy forests and marshes. April-August. NB west to s. MB, south to NJ, n. VA, s. OH, and s. MO; reports of this species further south are probably in error. This species is octoploid (n = 32); the remainder of the *R. hispidus* complex is tetraploid. [= *R. hispidus* Michaux var. *caricetorum* (Greene) T. Duncan – C, FNA, K, Z; = *R. septentrionalis* Poiret – GW, W, Y, misapplied; > *R. septentrionalis* var. *caricetorum* (Greene) Fernald – F, G; > *R. septentrionalis* var. *pterocarpus* Linnaeus Benson – G; > *R. septentrionalis* var. *septentrionalis* – F, G]

Ranunculus carolinianus A.P. de Candolle, Carolina Buttercup. Swamp forests, wet woodlands, open marshy wetlands. April-August. NY west to s. ON, WI, and MN, south to n. peninsular FL, LA, and e. TX. This species is tetraploid (n = 16). [= RAB, F, G, GW, W, WV, Y; = *R. hispidus* Michaux var. *nitidus* (Chapman) T. Duncan – C, FNA, K, Z; > *R. palmatus* Elliott – S; > *R. septentrionalis* – S]

Ranunculus fascicularis Muhlenberg ex Bigelow, Thick-root Buttercup, Early Buttercup. Wet flats with prairie affinities (with *Camassia scilloides*), rocky barrens and glades over mafic rocks (such as gabbro or diabase), ultramafic outcrop barrens (over olivine), limestone barrens. March-June. MA and NY west to s. ON, MN, and se. MB, south to c. NC, nc. SC, sw. GA, and e. TX; occurrences which are both south of New England and east of the Appalachians are scattered and disjunct. This species is tetraploid (n = 16). [= C, FNA, GW, K, S, W, Y, Z; > *R. fascicularis* var. *fascicularis* – F, G]



Ranunculus flabellaris Rafinesque, Yellow Water Crowfoot. Pools in floodplains of small stream swamps, other stagnant or slowly moving waters. March-May. ME west to BC, south to ne. NC, KY, IN, IL, LA, OK, UT, and CA. [= RAB, C, F, FNA, G, GW, K, Y; = *R. delphiniifolius* Torrey ex Eaton – S]

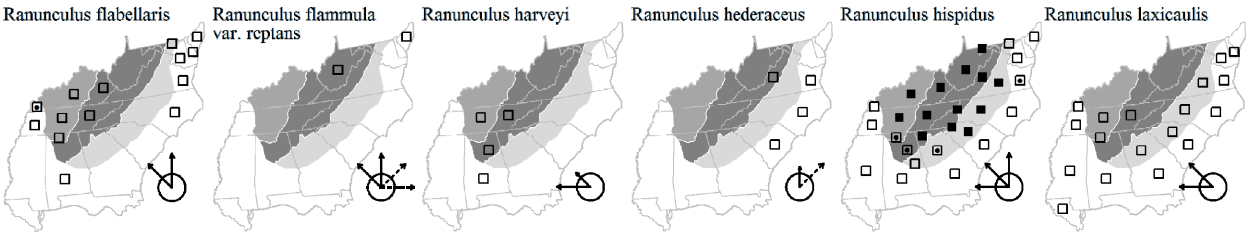
Ranunculus flammula Linnaeus *var.* ***reptans*** (Linnaeus) E. Meyer, Creeping Spearwort. Shallow water. Circumboreal, south in North America to NJ, WV, MI, MN, and WY. [= FNA; = *R. flammula* Linnaeus var. *filiformis* (Michaux) Hooker – C, G, K; = *R. reptans* Linnaeus var. *reptans* – F]

Ranunculus harveyi (A. Gray) Britton. Forests and prairies. IN, IL, MO, and OK south to TN, AL, and LA. [= C, F, G; = *R. harveyi* var. *harveyi* – FNA, K; < *R. harveyi* – C, F, G]

Ranunculus hederaceus Linnaeus, Ivy-leaved Water Crowfoot. Longstalked Crowfoot. Coastal brackish marshes, other circumneutral marshes. April-June. Se. PA south to SC on the Coastal Plain; disjunct in NL (Newfoundland); also in Europe. Perhaps questionable whether native in North America. [= RAB, C, F, FNA, G, GW, K, Y]

Ranunculus hispidus Michaux, Hispid Buttercup, Hairy Buttercup. Rich moist forests, creekbanks, mesic to dry woodlands and forests, bottomlands. March-June. MA and VT west to s. ON, n. IL, and se. KS, south to e. and c. NC, s. GA, s. AL, AR, and ne. OK. This species is tetraploid (n = 16). [= RAB, GW, S, W, Y; = *R. hispidus* var. *hispidus* – C, FNA, K, Z; > *R. hispidus* var. *hispidus* – F, G, WV; > *R. hispidus* var. *falsus* Fernald – F; > *R. hispidus* var. *marilandicus* (Poiret) L. Benson – G; > *R. hispidus* var. *eurylobus* L. Benson – F, G, WV]

Ranunculus laxicaulis (Torrey & A. Gray) Darby, Coastal Plain Spearwort. Marshes. April-June. DE south to sw. GA, west to TX, inland in the interior to w. TN, s. IN, s. IL, MO, and KS, almost entirely on the southeastern Coastal Plain. *R. subcordatus* E.O. Beal, allegedly endemic to NC, is conspecific with *R. laxicaulis*. [= RAB, F, FNA, G, K, W; *? R. texensis* Engelmann – C; > *R. laxicaulis* – GW, Y; > *R. subcordatus* E.O. Beal – GW, Y; *? R. oblongifolius* Elliott – S, misapplied]



Ranunculus longirostris Godron, White Water Crowfoot. Submerged in streams. Sw. QC west to SK, ID, and OR, south to DE, VA, KY, nc. TN, AL, AR, TX, NM, and AZ. [= C, F, GW, K, WV, Y; < *R. aquatilis* Linnaeus var. *diffusus* – FNA; ? *R. circinatus* Sibthorp – G; ? *Batrachium trichophyllum* – S, misapplied]

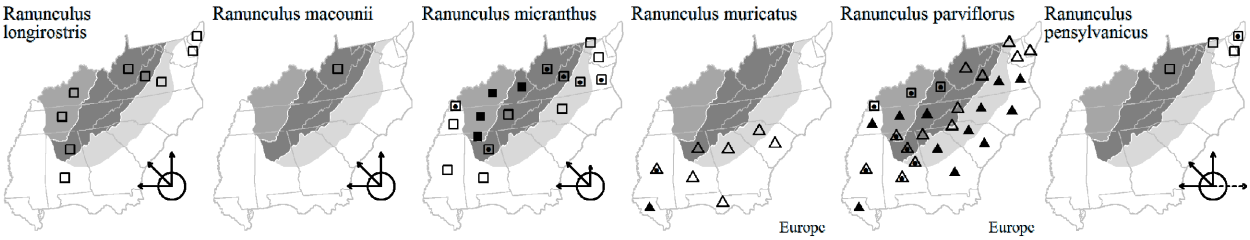
Ranunculus macounii Britton. Bogs, marshes. June. NL (Newfoundland) west to AK, south to MI, IA, TX, NM, AZ, CA; disjunct in WV. [= C, F, FNA, G, K, WV]

Ranunculus micranthus Nuttall, Small-flowered Buttercup, Rock Buttercup. Rich forests. April-June. MA west to SD, south to e. VA, c. NC, sc. TN, WV, OH, and OK. [= RAB, C, FNA, G, GW, K, S, W, WV, Y; > *R. micranthus* var. *micranthus* – F; > *R. micranthus* var. *delitescens* (Greene) Fernald – F]

* ***Ranunculus muricatus*** Linnaeus. Ditches and marshes; native of Europe. April-June. [= RAB, FNA, GW, K, S, X, Y]

* ***Ranunculus parviflorus*** Linnaeus, Small-flowered Buttercup, Stickseed Crowfoot. Disturbed areas; native of Europe. February-July. [= RAB, C, F, FNA, G, GW, K, S, W, X, Y]

Ranunculus pensylvanicus Linnaeus f., Bristly Buttercup. Wet meadows, floodplans. NL (Newfoundland) west to AK, south to s. PA (Rhoads & Klein 1993), DE, DC, MD (Whittemore in FNA 1997), WV, OH, n. IN, n. IL, MN, and AZ; also in ne. Asia. [= C, F, FNA, G, K, WV]



* ***Ranunculus platensis*** Sprengel. Lawns, ditches; native of South America. [= FNA, GW, K, X, Y]

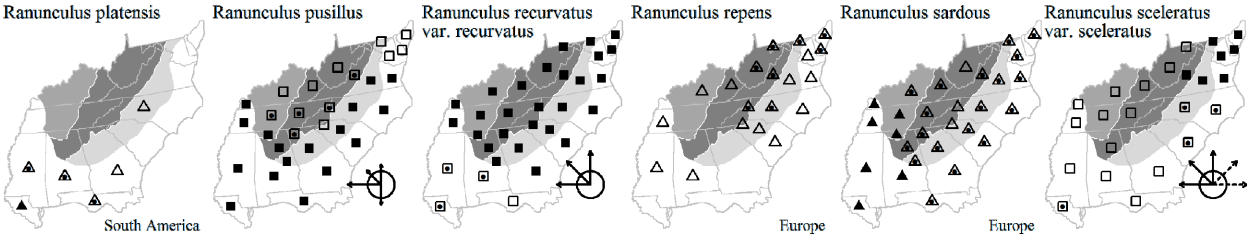
Ranunculus pusillus Poiret, Low Spearwort. Marshes, ditches, other wet habitats. April-June. S. NY south to c. peninsular FL, west to TX, north in the interior to OH, IN, and MO. [= RAB, C, F, FNA, G, GW, S, W, WV, Y; > *R. pusillus* var. *pusillus* – K]

Ranunculus recurvatus Poiret *var.* ***recurvatus***, Hooked Buttercup, Hooked Crowfoot. Bottomland forests, cove forests, swamps, mesic slope forests. April-June. ME and QC west to MN, south to sw. GA, MS, and OK. Var. *tropicus* (Grisebach) Fawcett & Rendle occurs in Puerto Rico {and elsewhere?}. [= FNA, K; < *R. recurvatus* – RAB, C, G, GW, S, W, Y; > *R. recurvatus* var. *recurvatus* – F, WV; > *R. recurvatus* var. *adpressipilis* Weatherby – F, WV]

* ***Ranunculus repens*** Linnaeus, Creeping Buttercup, Meg-many-feet. Low meadows, disturbed areas; native of Europe. [= RAB, FNA, G, GW, K, S, W, Y; > *R. repens* var. *repens* – C, F, WV; > *R. repens* var. *degeneratus* Schur – C; > *R. repens* var. *glabratus* A.P. de Candolle – C, F; > *R. repens* var. *pleniflorus* Fernald – F, WV]

* ***Ranunculus sardous*** Crantz, Sardinian Buttercup, Hairy Buttercup. Low fields, disturbed areas; native of Europe. April-July. [= RAB, C, F, FNA, G, GW, K, X, Y]

Ranunculus sceleratus Linnaeus *var.* ***sceleratus***, Cursed Buttercup, Celery-leaf Crowfoot. Marshes, ditches, and stream margins. June-September. The species is circumboreal, ranging south in North America (partly introduced, at least southward) to n. FL, LA, TX, and CA. Var. *sceleratus* is widespread and the only variety in e. North America; var. *multifidus* occurs in w. North America. The epithet is often misspelled "*scleratus*." [= C, F, FNA, G, K; < *R. sceleratus* – RAB, GW, S, W, Y]



Ranunculus trichophyllus Chaix *var.* ***trichophyllus***, White Water Crowfoot. Submerged in water of acidic streams. *R. trichophyllus* is circumboreal, ranging south in North America to NJ, VA, nc. TN, PA, MN, SD, NM, AZ, and CA. Var. *trichophyllus* ranges south to the southern limit of the species. This taxon was reported as far south as NC by G and S; the documentation is unknown and the species was not treated by RAB. The more northern var. *calvescens* W. Drew, with the receptacle glabrous or with a few scattered hairs (vs. hirsute with tufted hairs), ranges south to PA and MI. [= C, F, K; < *R. aquatilis* Linnaeus var. *diffusus* Withering – FNA; < *R. trichophyllus* – WV, Y; ? *R. aquatilis* Linnaeus var. *capillaceus* (Thuill.) A.P. de Candolle – G; ? *Batrachium flaccidum* (Persoon) Ruprecht – S]

* ***Ranunculus trilobus*** Desfontaines. Fields, roadsides, ditches; native of sw. Europe. [= FNA, K, X, Y]

116. NELUMBONACEAE Dumortier 1829 (Lotus-lily Family) [in PROTEALES]

A family of 1 genus and 2 species, aquatic herbs, of temperate and subtropical e. North America and e. Asia. References: Wiersema in FNA (1997); Williamson & Schneider in Kubitzki, Rohwer, & Bittrich (1993).

Nelumbo Adanson 1763 (Lotus-lily, Lotus, Sacred-lotus, Sacred-bean)

A genus of 2 species, aquatic herbs, of temperate and subtropical e. North America and e. Asia. References: Williamson & Schneider in Kubitzki, Rohwer, & Bittrich (1993).

Identification notes: *Nelumbo* can be immediately distinguished in vegetative condition from the other "pads" (*Nymphaea*, *Nuphar,* and *Nymphoides*) by its peltate leaves, and from the peltate *Brasenia* by the much larger size and roundness of the leaves.

1 Petals yellow; mature fruits ("nuts") usually < 1.25× as long as wide ..... ***N. lutea***
1 Petals pink or white; mature fruits ("nuts") usually > 1.5× as long as wide ..... ***N. nucifera***

Nelumbo lutea Willdenow, Yonkapin, American Lotus-lily, Yellow Lotus, Yockernut, Water-chinquapin, Pond-nuts. Ponds, natural lakes. June-September. NY and s. ON west to MN and IA, south to s. FL and e. TX, and south into the West Indies and Mexico. [= RAB, C, F, FNA, G, GW, K, S, W, WV; *N. pentapetala* (Walter) Fernald]

* ***Nelumbo nucifera*** Gaertner, Sacred-lotus, Oriental Lotus-lily, Pink Lotus. Ponds and lakes; native of Asia. June-September. [= RAB, C, F, FNA, G, GW, K]

117. PLATANACEAE Dumortier 1829 (Plane-tree Family) [in PROTEALES]

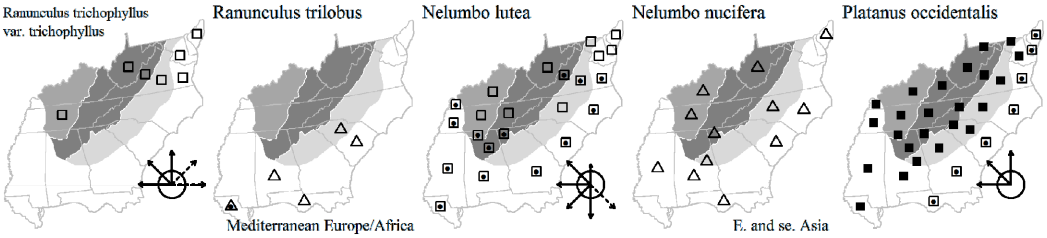
A family of a single genus and about 7 species (and several addional infrataxa), trees, of North America south to Central America and w. Asia to se. Asia. Probably with a close relationship to the Proteaceae (Angiosperm Phylogeny Group 2009), and sometimes included there (Angiosperm Phylogeny Group 1998, 2003). References: Kaul in FNA (1997); Kubitzki in Kubitzki, Rohwer, & Bittrich (1993).

Platanus Linnaeus 1753 (Plane-tree, Sycamore)

A genus of about 7 species (and several additional infrataxa), trees, of North America south to Central America and w. Asia to se. Asia. References: Kaul in FNA (1997); Grimm & Denk (2010)=Y; Nixon & Poole (2003)=Z; Kubitzki in Kubitzki, Rohwer, & Bittrich (1993).

Identification notes: The exposed white inner bark on the middle and upper trunks make *Platanus* recognizable at long distances, especially in winter.

Platanus occidentalis Linnaeus, Sycamore, Plane-tree. Riverbanks and alluvial forests, streambanks, sometimes weedy on rocky roadcuts. April-May; September-November. S. ME west to s. ON, MI, and MN, south to w. FL and TX. One of the largest trees in e. North America, and probably the largest that is widespread in the Piedmont of our area. *P. palmeri* Kuntze, sometimes treated as *P. occidentalis* var. *palmeri* (Kuntze) Nixon & Poole ex Geerinck but better interpreted as a species (Grimm & Denk 2010), occurs from central TX south into Coahuila. [= Y; = *P. occidentalis* var. *occidentalis* – Z; < *P. occidentalis* – RAB, C, FNA, G, GW, K, S, W, WV; > *P. occidentalis* var. *occidentalis* – F; > *P. occidentalis* var. *glabrata* (Fernald) Sargent – F]



121. BUXACEAE Dumortier 1822 (Boxwood Family) [in BUXALES]

A family of 5 genera and about 100 species, mainly shrubs, mainly of the Northern Hemisphere. References: von Balthazar, Endress, & Qiu (2000); Channell & Wood (1987); Köhler in Kubitzki, Bayer, & Stevens (2007).

1 Plant a woody shrub; leaves opposite, < 1 cm wide ..... ***Buxus***
1 Plant a suffrutescent herb; leaves alternate, 1.5-7 cm wide ..... ***Pachysandra***

Buxus Linnaeus 1753 (Boxwood)

A genus of about 50-90 species, shrubs, of tropical to temperate areas of Europe, Africa, West Indies, Central America, and e. Asia; Köhler in Kubitzki, Bayer, & Stevens (2007).

* ***Buxus sempervirens*** Linnaeus, Boxwood. Persistent for decades at abandoned homesites; native of Europe. Popular for hedges and landscaping; also cultivated in the Mountains for wreathing. [= K]

Pachysandra Michaux 1803 (Pachysandra)

A genus of 4-5 species, 1 of e. North America, the others of e. Asia, suffruticose herbs and shrubs. References: Robbins (1968)=Z; Köhler in Kubitzki, Bayer, & Stevens (2007).

1 Leaves subcoriaceous, semi-evergreen, pubescent, mottled with several shades of green (more apparently so at some seasons than others); [native plant of rich forests] ..... ***P. procumbens***
1 Leaves coriaceous, evergreen, glabrous, dark green; [cultivated alien plant, rarely persistent] ..... ***P. terminalis***

Pachysandra procumbens Michaux, Mountain Pachysandra, Allegheny-spurge. Moist rich woods. March-April; July-August. C. KY south to w. NC, nw. SC, w. GA, Panhandle FL (Jackson County only), AL, MS, and e. LA (on loess in the Tunica Hills). Its distribution (and, for that matter, that of the genus as a whole) appears to be relictual and to reflect a poor ability to disperse itself and colonize new territory. Channell & Wood (1987) refer to *P. procumbens* as a "nonaggressive if not 'senile' species with a very low evolutionary potential." The only locations for this species in NC are in Polk County, NC, which has other notable disjunctions of species which normally occur west of the Blue Ridge (*Veratrum woodii*, *Smilax lasioneura*). [= RAB, C, F, G, K, S, W, WH, Z]

* ***Pachysandra terminalis*** Siebold & Zuccarini, Pachysandra, Japanese-spurge. Persistent after cultivation, and spreading vegetatively to adjacent forests; commonly cultivated, rarely persistent to naturalized, native of China and Japan. This species is a popular ground-cover, difficult to eradicate once well-established. [= RAB, C, F, G, K, Z]

127. ALTINGIACEAE Lindley 1846 (Sweet-gum Family) [in SAXIFRAGALES]

A family of 2 genera and about 12 species, trees, of e. Asia, Indomalaysia, e. North America, Central America, and e. Mediterranean. Various molecular studies show that *Liquidambar* is better separated from the Hamamelidaceae (Hoot, Magallón, and Crane 1999). References: Endress in Kubitzki, Rohwer, & Bittrich (1993); Hoot, Magallón, and Crane (1999).

Liquidambar Linnaeus 1753 (Sweet Gum)

A genus of 4-5 species, trees, north temperate, of e. North America, Central America (Mexico to Nicaragua), e. Asia (s. China, Taiwan, Vietnam), and e. Mediterranean (Turkey, Rhodos, Cyprus). References: Endress in Kubitzki, Rohwer, & Bittrich (1993); Li & Donoghue (1999).

Liquidambar styraciflua Linnaeus, Sweet Gum, Red Gum. Swamp forests, floodplains, moist forests, depressional wetlands, old fields, disturbed areas. April-May; August-September. CT west to s. OH, s. IL and OK, south to s. FL, TX, and Guatemala. One of the most spectacular of our trees in the fall; a single tree often has a mixture of green, yellow, orange, dark red, bronze, and purple leaves. The sap was previously gathered as a source of chewing gum. The bark is one of the favorite foods of beavers. Although sometimes thought of as a small and weedy tree, *Liquidambar* reaches its greatest abundance and size in Coastal Plain swamp forests, where it can reach 2 meters in diameter. Along with such species as *Pinus taeda*, *Quercus phellos*, and others, *Liquidambar* is a good example of a primarily bottomland tree which has proven to be an excellent colonizer of disturbed uplands. [= RAB, C, F, FNA, G, GW, K, S, W, WV]

128. HAMAMELIDACEAE R. Brown 1818 (Witch Hazel Family) [in SAXIFRAGALES]

A family of ca. 27 genera and ca. 87 species, trees and shrubs, tropical to temperate, and especially e. Asian. References: Meyer in FNA (1997); Endress in Kubitzki, Rohwer, & Bittrich (1993).

1 Leaves 5-7-palmately lobed and palmately veined, glabrous..... [see ***Liquidambar*** in ***ALTINGIACEAE***]
1 Leaves unlobed, pinnately veined, stellate-pubescent beneath (at least when young).
2 Petals 0; stamens 12-32; flowers numerous in dense globose or elongate spikes; leaves with a symmetric or asymmetric (oblique) base, the lateral veins marginal for a distance of at least 2-3 mm; [tribe *Fothergilleae*] ..... ***Fothergilla***
2 Petals 4; stamens 4; flowers few in small clusters; leaves with a weakly to strongly asymmetric (oblique) base, the lateral veins included in the blade tissue or barely exposed for a distance of <1 mm; [tribe *Hamamelideae*]..... ***Hamamelis***

Fothergilla Murray in Linnaeus 1774 (Witch-alder)

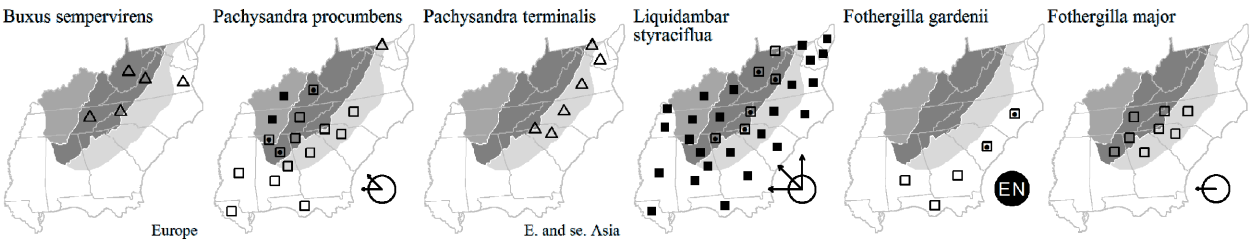
A genus of 2 species, shrubs, of temperate e. North America. References: Meyer in FNA (1997); Weaver (1969)=Z; Darke (2008); Ranney et al. (2007); Endress in Kubitzki, Rohwer, & Bittrich (1993).

Identification notes: *Fothergilla major* often occurs with *Hamamelis virginiana*, with which it is easily confused in vegetative condition; a reliable character is the base of the lateral veins (marginal in *Fothergilla*, included in leaf tissue in *Hamamelis*). Most of the cultivated material of *Fothergilla*, including the best known cultivar 'Mount Airy,' are *Fothergilla* ×*intermedia* Ranney & Fantz, a pentaploid hybrid of tetraploid *F. gardenii* and hexaploid *F. major* (Ranney et al. 2007; Darke 2008).

1 Leaves stellate-pubescent above, up to 6 cm long and 5 cm wide (the largest < 5.2 cm wide); stamens 12-24; capsules 6.5-10-5 (-13) mm long, the persistent hypanthium 3.4.5 mm long; seeds 4.8-6.3 mm long; [of wet savannas, pocosins, and pocosin margins of the Coastal Plain] ..... ***F. gardenii***
1 Leaves glabrous or sparsely stellate-pubescent above, up to 12 cm long and 10 cm wide (the largest > 5.2 cm wide); stamens (18-) 22-32; capsules 8-15.2 mm long, the persistent hypanthium 4-9.2 mm long; seeds 6.2-7.8 mm long; [of rocky habitats of the Mountains and Piedmont] ..... ***F. major***

Fothergilla gardenii Linnaeus, Coastal Witch-alder. Wet savannas, pocosins, and pocosin margins. March-May; September-October. Se. NC (and allegedly se. VA) south to Panhandle FL and s. AL. An ornamental prized for its small size and attractive fall color. [= RAB, F, FNA, GW, K, Z; > *F. gardeni* – S, orthographic variant; > *F. parvifolia* Kearney – S]

Fothergilla major (Sims) Loddiges, Large Witch-alder. Dry ridgetop forests of middle elevation ridges in the mountains, especially along the Blue Ridge Escarpment, summits and upper slopes of Piedmont monadnocks, north-facing bluffs in the lower Piedmont. April-May; July-October. C. NC west to ne. TN, south to nc. GA and nc. AL; disjunct in AR. [= RAB, FNA, K, S, W, Z; > *F. monticola* Ashe]



Hamamelis Linnaeus 1753 (Witch-hazel)

A genus of 5-6 species, shrubs and small trees, of e. North America and e. Asia (China and Japan). The other North American species, *H. vernalis* Sargent, is endemic to the Ozark/Ouachita region of AR, OK, and MO. References: Leonard (2006)=X; Meyer in FNA (1997); Lane (2005)=Z; Jenne (1966)=Y; Wen & Shi (1999); Endress in Kubitzki, Rohwer, & Bittrich (1993).

1 Outer surface of calyx scarlet; petals 7-14 mm long, red or reddish (often yellow-tipped), flowering late December to early February; leaves 12-24 cm long, 5-17 cm wide, densely stellate-pubescent below, usually with 11 lateral veins (6 on one side of the leaf, 5 on the other); [plants of pineland ravines in s. AL and s. MS]..... ***H. ovalis***
1 Outer surface of calyx yellow; petals 6-8 mm long, yellow, flowering October-January; leaves 3.7-16.7 cm long, 2.5-13 cm wide, glabrous to densely stellate-pubescent beneath, usually with 9 or 10 lateral veins (5 on one side of the leaf, 4-5 on the other); [plants widespread in our area]
2 Stellate trichomes of the leaves moderately dense to dense, averaging 0.09 mm across, with 7-11 rays; leaves (3.6-) avg. 6.4 (-10.3) cm long, (1.8-) avg. 4.1 (-6.2) cm wide; petals 7-15 mm long, 0.5-0.8 mm wide; [e. SC south to Panhandle FL, west to se. LA in the Coastal Plain] ..... ***H. virginiana*** *var.* ***henryae***
2 Stellate trichomes of the leaves sparse to moderately dense, averaging 0.16-0.40 mm across, with 3-6 (-8) rays; leaves (4.7-) avg. 9.9 (-14.0) cm long, (3.9-) avg. 6.6 (-9.2) cm wide; petals 15-20 mm long, 1 mm wide; [widespread in our area] .... ***H. virginiana*** *var.* ***virginiana***

Hamamelis ovalis S.W. Leonard, Running Witch-hazel, Southern Red Witch-hazel, Bigleaf Witch-hazel. Dry-mesic pineland ravines. Late December-early February. Originally believed to be possibly endemic to sc. MS (Perry County) (Leonard 2006), but recently found in s. AL (Keener & Webb, in prep.). [= X]

Hamamelis virginiana Linnaeus *var.* ***henryae*** Jenne ex C. Lane, Small-leaved Witch-hazel. Sandhill margins, xeric hammocks, streamheads. November-January. E. SC (Horry and Hampton counties), s. GA, and Panhandle FL west to se. LA. Though cited in Lane (2005) as var. *henryi*, the honoree is collector Mary G. Henry; thus the honorific epithet should be corrected to the feminine. Additional study is needed of these small-leaved Coastal Plain populations. [< *H. virginiana* – FNA, GW, K, S, WH; = *H. virginiana* var. *henryi* Jenne ex C. Lane – Y, Z, orthographic error]

Hamamelis virginiana Linnaeus *var.* ***virginiana***, Northern Witch-hazel. Moist to dryish forests. October-December; October-November (of the following year). QC and NS west to n. MI and MN, south to FL and TX. The bark is still gathered in large quantities in the Southern Appalachians, as the source for witch hazel liniment. The name "witch-hazel" alludes to its superficial resemblance to *Corylus*, the true hazel, and to its "perverse" habit of flowering in the fall, as it drops its leaves. [= Y, Z; < *H. virginiana* – RAB, C, FNA, G, GW, K, S, W, WH, WV; > *H. virginiana* var. *parvifolia* Nuttall – F; > *H. virginiana* var. *virginiana* – F]

131. ITEACEAE J. Agardh 1858 (Sweetspire Family) [in SAXIFRAGALES]

A family of 1 genus and about 27 species, shrubs, of e. and se. Asia (about 25 species), e. North America (1 species), and sub-Saharan Africa (1 species). References: Kubitzki in Kubitzki, Bayer, & Stevens (2007).

Itea Linnaeus 1753 (Virginia-willow, Sweetspire, Tassel-white)

A genus of about 27 species, shrubs and trees, all but 2 (ours and 1 in sub-Saharan Africa) are in e. and se. Asia. The closest relative of our species is *I. japonica* Oliver, of Japan. Variously treated in a very broadly-conceived Saxifragaceae (RAB, F, G, GW, W), a less comprehensive Grossulariaceae (C, K), a narrow Escalloniaceae, or a very narrow (single genus) Iteaceae (S), the relationships of *Itea* remain problematic. Recent molecular data suggest that the relationship between *Itea* and other woody "saxifragaceous" genera (including *Escallonia*) is only distant (Morgan & Soltis 1993). *Itea* is here conservatively treated in a narrow Iteaceae. References: Morin in FNA (2009); Spongberg (1972); Morgan & Soltis (1993); Bohm et al. (1999); Kubitzki in Kubitzki, Bayer, & Stevens (2007).

Identification notes: Sometimes confused needlessly with *Clethra*, whose much more coarsely serrate, obovate leaves contrast with the serrulate, elliptic leaves of *Itea*. Also often confused with *Eubotrys racemosa* in vegetative condition.

Itea virginica Linnaeus, Virginia-willow, Sweetspire, Tassel-white. Moist forests and thickets, especially along the banks of small streams. May-June. S. NJ south to s. FL and west to e. TX and OK, north in the interior (especially in the Mississippi Embayment) to s. IL and se. MO. [= RAB, C, F, FNA, K, G, GW, S, W, WH]

132. GROSSULARIACEAE A.P. de Candolle 1805 (Currant Family) [in SAXIFRAGALES]

A family of one genus, of the northern hemisphere and montane South America (Andes). The familial distinction from the Saxifragaceae is supported by recent molecular data, though the affinities of Grossulariaceae and Saxifragaceae (sensu stricto) are closer than those of many other groups traditionally included in the Saxifragaceae, such as *Parnassia*, *Lepuropetalon*, and *Penthorum* (Morgan & Soltis 1993). References: Weigend in Kubitzki, Bayer, & Stevens (2007).

Ribes Linnaeus 1753 (Currant, Gooseberry)

A genus of 150-200 species, temperate, of the Northern Hemisphere and montane South America. The genus is separated into distinctive subgenera, these sometimes maintained as full genera (as by S). Of the species treated here, the currants (subgenus *Ribes*) include *R. americanum*, *R. aureum* var. *villosum*, *R. glandulosum*, *R. lacustre*, *R. nigrum*, *R. rubrum*, and *R. triste*. The gooseberries (subgenus *Grossularia*) include *R. curvatum*, *R. cynosbati*, *R. echinellum*, *R. hirtellum*, *R. missouriense*, *R.*

rotundifolium, and *R. uva-crispa*. The dried "currants" commonly available in stores are actually raisins made from a small variety of grape, and have nothing to do with *Ribes*. A molecular study suggests that recognition of *Grossularia* as a genus distinct from *Ribes* is not warranted, though it does form a monophyletic group nested within *Ribes* s.l. (Senters & Soltis 2003; Weigend, Mohr, & Motley 2002). References: Morin in FNA (2009); Sinnott (1985)=Z; Weigend, Mohr, & Motley (2002); Spongberg (1972); Schultheis & Donoghue (2004); Senters & Soltis (2003); Weigend in Kubitzki, Bayer, & Stevens (2007). Key adapted from C, F, and Z.

1 Flowers solitary or in corymbs of 2-4; pedicels not jointed just beneath the ovary or fruit, the fruit not disarticulating at maturity and thus the fruit shed with the entire pedicel; stems generally with (0-) 1-3 nodal spines and sometimes also with internodal bristles (especially on young, vigorous growth) (though these sometimes absent or nearly so in some species); [subgenus *Grossularia*].
- 2 Ovary and fruit glabrous.
  - 3 Stamens (at full anthesis) 3-4.5 mm long, about equaling the calyx lobes ..... ***R. hirtellum***
  - 3 Stamens (at full anthesis) 6-12 mm long, exserted well beyond the calyx lobes.
    - 4 Calyx tube white; stamens 9-12 mm long; nodal spines 1-3 per node, 7-18 mm long, stout..... ***R. missouriense***
    - 4 Calyx tube purplish or purplish-green; stamens 6-8 mm long; nodal spines 0-1 (-2) per node, 3-11 mm long, slender..... ***R. rotundifolium***
- 2 Ovary and fruit hairy or bristly.
  - 5 Stamens (at full anthesis) 9-15 mm long, exserted well beyond the calyx lobes; calyx lobes 4-7 mm long; petals 2-3 mm long..... ***R. echinellum***
  - 5 Stamens (at full anthesis) <7.5 mm long, shorter than the calyx lobes; calyx lobes **either** 2.5-4 mm long **or** 7.5-9 mm long; petals 1-2.5 mm long.
    - 6 Calyx lobes 7.5-9 mm long; stamens 6-7.5 mm long..... ***R. curvatum***
    - 6 Calyx lobes 2.5-4 mm long; stamens 1-2 mm long or 4-6 mm long
      - 7 Fruit hispid; stamens 1-2 mm long; peduncles 7-25 mm long; pedicels 5-16 mm long; [of native habitats of the Mountains]..... ***R. cynosbati***
      - 7 Fruit glandular-pubescent; stamens 4-6 mm long ; peduncles < 5 mm long; pedicels < 5 mm long; [alien]..... ***R. uva-crispa***

1 Flowers in racemes of 4-many; pedicels jointed just beneath the ovary or fruit, a portion of the pedicel thus remaining attached to the plant when mature sfruit or aborted flowers are shed, the fruit disarticulating at maturity; stems lacking nodal spines and internodal bristles (except *R. lacustre*); [subgenus *Ribes*].
- 8 Ovaries and fruits bristly or spiny with gland-tipped hairs.
  - 9 Stems lacking internodal bristles and nodal spines; racemes ascending to erect; fruit dark red when mature ..... ***R. glandulosum***
  - 9 Stems (especially young, vigorous growth) with internodal bristles and sometimes internodal spines; racemes spreading to drooping; fruit purple or black when mature..... ***R. lacustre***
- 8 Ovaries and fruits glabrous or with sessile glands.
  - 10 Lower leaf surface with scattered golden glands; fruit black when mature (except sometimes in *R. aureum* var. *villosum*).
    - 11 Bracts of the pedicels 0.5-2 mm long; ovaries and fruits with sessile glands; fruits black when mature..... ***R. nigrum***
    - 11 Bracts of the pedicels 3-10 mm long; ovaries and fruits glabrous; fruits black, red, brown, or orange when mature.
      - 12 Pedicels 0.1-2 mm long, shorter than the lanceolate bracts (which are 3-10 mm long); fruits black when mature..... ***R. americanum***
      - 12 Pedicels 2-8 mm long, about as long as the obovate bracts (which are 4-9 mm long); fruits black (rarely red, orange, brown, or yellow) when mature..... ***R. aureum*** *var.* ***villosum***
  - 10 Lower leaf surface lacking golden glands.
    - 13 Hypanthium narrowly tubular, 6-20 mm long; fruits black (rarely red, orange, brown, or yellow) when mature; sepals golden yellow. ..... ***R. aureum*** *var.* ***villosum***
    - 13 Hypanthium saucer-shaped, < 1 mm long; fruits bright red when mature; sepals brown, greenish brown, or greenish purple.
      - 14 Pedicels glabrous; petals cream to pinkish; anther sacs separated by a connective as broad as the anther sacs; erect shrub [cultivated and sometimes persisting or escaping]..... ***R. rubrum***
      - 14 Pedicels stipitate-glandular; petals reddish purple; anther sacs almost adjacent, the connective much narrower than the sacs; declining or ascending shrub; [native]..... ***R. triste***

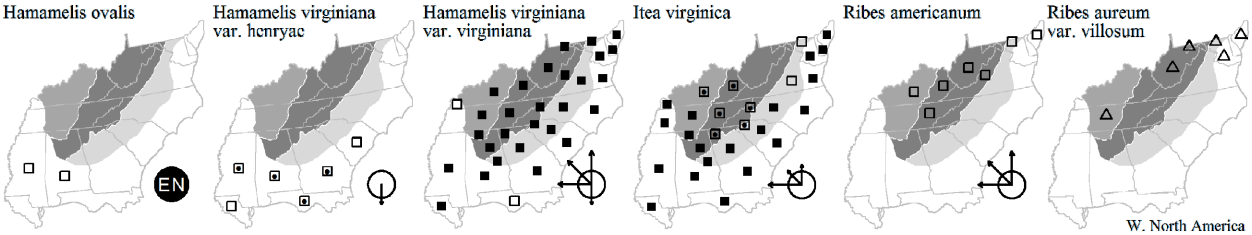
Auxiliary Key to widely distributed native *Ribes* of the Mountains

1 Leaves usually 5-10 cm long and wide, serrate or doubly serrate with sharp teeth; plants usually without nodal spines; inflorescence a raceme of 4-15 flowers; pedicel jointed below the fruit..... ***R. glandulosum***

1 Leaves 1-5 cm long and wide, serrate with rounded teeth; plants usually with nodal spines; inflorescence a raceme of 1-4 flowers; pedicel not jointed below the fruit.
- 2 Ovary with glandular hairs which become stiff spines on the mature fruit; leaf bases cordate to deeply cordate (rarely truncate or cuneate), the angle of leaf tissue mostly 190-230º, moderately to sparsely silvery-pilose beneath, usually on the surface as well as on the veins and in the vein axils; stamens at full anthesis equaling the petals ..... ***R. cynosbati***
- 2 Ovary and fruit glabrous; leaf bases rounded or cuneate (rarely truncate or cordate), the angle of leaf tissue mostly 130-170º, glabrescent to sparsely pubescent beneath (mostly on the veins and in the vein axils); stamens at full anthesis exceeding the petals..... ***R. rotundifolium***

Ribes americanum P. Miller, American Black Currant. Moist forests, marl marshes. April-June. NS west to AB, south to w. VA, WV, e. and nc. KY (Clark et al. 2005), ne. TN, IN, NE, and NM. [= C, F, FNA, G, K, W, WV]

Ribes aureum Pursh *var.* ***villosum*** A.P. de Candolle, Buffalo Currant. {habitats}. MA, ON, MN, ND, and MT south to MD, TN, AR, TX, and NM; the original eastward extent unclear because of occasional cultivation and naturalization). It is reported as occurring as a native species as far east as Montgomery County in nc. TN (Chester, Wofford, & Kral 1997). [= FNA, K; = *R. odoratum* H. Wendland – C, F, G, WV]



Ribes curvatum Small, Granite Gooseberry. Rocky upland forests. E. TN, AR, and OK south to GA, AL, LA, and TX. Also reported for NC by Sinnott (1985); the specimens came from cultivated plants in a botanist's garden, so there is no evidence that *R. curvatum* is a native or naturalized component of NC's flora. [= FNA, K; = *Grossularia curvata* (Small) Coville & Britton – S]

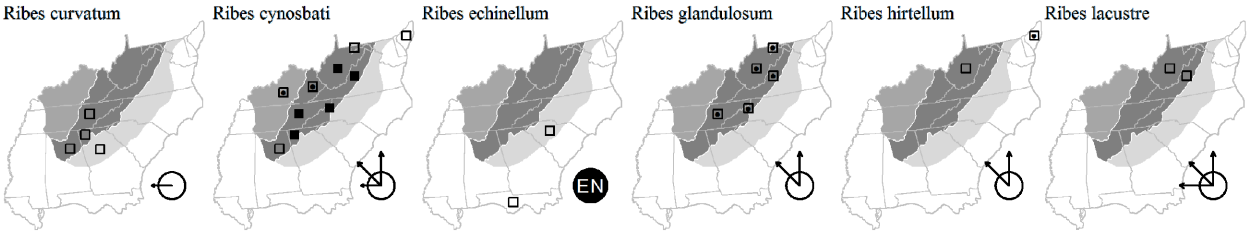
Ribes cynosbati Linnaeus, Prickly Gooseberry, Dogberry. Moist slopes, periglacial boulderfields, grassy balds, mostly at high elevations. May-June; July-September. NB, ON, MN, and ND south to w. NC, e. TN, n. GA, n. AL, AR, and OK. [= RAB, C, FNA, G, K, W, WV, Z; > *R. cynosbati* var. *cynosbati* – F; > *R. cynosbati* var. *glabratum* Fernald – F; = *Grossularia cynosbati* (Linnaeus) P. Miller – S]

Ribes echinellum (Coville) Rehder, Miccosukee Gooseberry. Mesic, nutrient-rich forests. March-April; June-September. This species has a remarkable range, known only from a small area of McCormick County, SC and the vicinity of Lake Miccosukee, Jefferson County, FL. Godfrey (1988) has a detailed description of *R. echinellum*. Catling, Dumouchel, & Brownell (1998) discuss its pollination biology. [= FNA, K, WH, Z; = *Grossularia echinella* Coville – S]

Ribes glandulosum Grauer, Skunk Currant, Mountain Currant. Periglacial boulderfields, high elevation seeps, spruce-fir forests. May-June; June-September. NL (Newfoundland) west to AK, south to VT, MI, MN, and BC, and in the Appalachians south to w. NC and e. TN. [= RAB, C, F, FNA, G, K, S, W, WV]

Ribes hirtellum Michaux, Northern Gooseberry. Rocky forests. NL (Newfoundland) west to AB, south to WV (Tucker County), n. NJ, s. PA, OH, IN, IL, IA, and NE. [= C, FNA, K; > *R. hirtellum* var. *hirtellum* – F, G]

Ribes lacustre (Persoon) Poiret, Bristly Black Currant, Spiny Swamp Currant. Forests, acid swamps. May-June. NL (Labrador) to AK, south to MA, PA, w. VA, TN (allegedly), n. OH, MI, MN, SD, CO, UT, and CA. Reported for AL (FNA). The alleged documentation for the inclusion of *R. lacustre* in the flora of VA is a sterile specimen at WILLI that is not definitely identifiable (Wieboldt, pers. comm.). [= C, F, FNA, G, K, W, WV]



Ribes missouriense Nuttall, Missouri Gooseberry. Forests, rock outcrops. April-June; May-July. W. WV, sw. OH, IN, WI, MN, and e. ND south to KY, e. TN (Roane and Grainger counties), s. IL, MO, n. AR, and KS, with scattered occurrences (perhaps escapes from cultivation) in CT, NJ, PA, MD, VA, and WV. [= C, F, FNA, G, K, WV, Z; = *Grossularia missouriensis* (Nuttall) Coville & Britton – S]

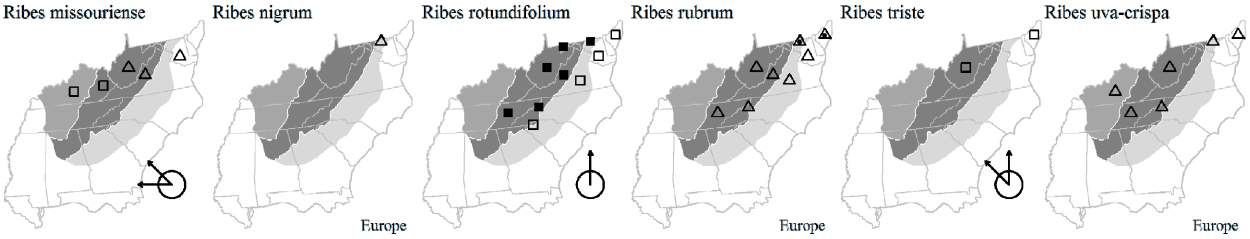
* ***Ribes nigrum*** Linnaeus, Garden Black Currant, Cassis. Disturbed areas; native to Europe. Cultivated in ne. United States, rarely as far south as our area (in MD and NJ according to FNA); it may escape. [= C, F, FNA, G, K]

Ribes rotundifolium Michaux, Appalachian Gooseberry. Moist slopes, balds, boulderfields, rocky forests, mostly at high elevations south of VA. April-May; June-September. An Appalachian endemic: MA, CO, and NY south to w. NC and e. TN. [= RAB, C, F, FNA, G, K, W, WV, Z; = *Grossularia rotundifolia* (Michaux) Coville & Britton – S]

* ***Ribes rubrum*** Linnaeus, Garden Red Currant. Persistent from cultivation and escaped to adjacent fence-rows and disturbed areas; native of Europe. [= FNA, K; > *R. sativum* Syme – C, F, G, WV]

Ribes triste Pallas, Swamp Red Currant, Wild Red Currant. Boggy forests, seepage wetlands. May-July. NL (Labrador) west to AK, south to MD, WV (Mineral, Pocahontas, and Randolph counties), OH, MN, SD, MT, ID, and OR. [= C, F, FNA, G, K, WV]

* ***Ribes uva-crispa*** Linnaeus, Garden Gooseberry, European Gooseberry. Fencerows, disturbed areas; native of Europe. Cultivated in ne. United States. [= C, FNA; = *Ribes uva-crispa* Linnaeus var. *sativum* A.P. de Candolle – K; > *R. uva-crispi* – C; = *R. grossularia* Linnaeus – F, G, WV]



133. SAXIFRAGACEAE A.L. de Jussieu 1789 (Saxifrage Family) [in SAXIFRAGALES]

If narrowly circumscribed (as here), a family of about 35 genera and 500-650 species, herbs (mianly perennial), nearly cosmopolitan, but especially diverse in warm temperate and cold temperate regions of North America and Eurasia. The circumscription of a much narrower Saxifragacaeae is clearly warranted, based on a wide variety of data, and recently strongly corroborated by molecular data (Morgan & Soltis 1993). References: Wells & Elvander in FNA (2009); Spongberg (1972); Morgan & Soltis (1993); Soltis in Kubitzki, Bayer, & Stevens (2007). [also see *GROSSULARIACEAE*, *HYDRANGEACEAE, ITEACEAE, PARNASSIACEAE,* and *PENTHORACEAE*]

1 Leaves compound.....***Astilbe***
1 Leaves simple (sometimes cleft or lobed).
2 Stem creeping, the leaves all cauline, opposite; leaves short-petioled or sessile, < 2 cm long.....***Chrysosplenium***
2 Stem erect, the leaves mostly or entirely basal, alternate (stem leaves opposite in *Mitella*); leaves long-petioled, > 4 cm long (except short-petioled or sessile and sometimes < 4 cm long in *Micranthes*).
3 Basal leaves short-petioled or sessile, the petioles 0-1× as long as the blade; basal leaves cuneate or rounded at the base; leaf venation predominately pinnate.
4 Corolla bilaterally symmetrical, the 3 upper petals distinctly clawed (the petal blade with a cordate or truncate base) and with 2 yellow spots, the 2 lower petals smaller, cuneate, and not spotted zygomorphic; leaf margins coarsely dentate.....***Hydatica***
4 Corolla radially symmetrical; leaf margins entire to serrate.....***Micranthes***
3 Basal leaves long-petioled, the petioles (1-) 2-5× as long as the blade; basal leaves cordate at the base; leaf venation predominantly palmate.
5 Stem leaves opposite; petals fimbriate; inflorescence a raceme; flowers on pedicels 1.5-3 mm long.....***Mitella***
5 Stem leaves absent or alternate; petals not fimbriate; inflorescence a panicle or raceme; flowers mostly on pedicels > 3 mm long.
6 Inflorescence racemose; stamens 10.....***Tiarella***
6 Inflorescence paniculate; stamens 5.
7 Seeds winged, 1.3-1.5 mm long; leaves cleft < ½ way to base; hypanthium fused to the pistils only at their bases; stems normally with several petiolate leaves much like the basal leaves (though typically somewhat smaller).....***Sullivantia***
7 Seeds papillose, echinate, smooth, or slightly ridged, 0.4-0.7 mm long; leaves cleft > ½ way to base (in *Boykinia*) or < ½ way (in *Heuchera*); hypanthium fused to the lower half or more of the pistils; stems with (in *Boykinia*) or without (in *Heuchera*) several petiolate leaves.
8 Stems normally with several petiolate leaves much like the basal leaves (though typically somewhat smaller); ovary with 2 locules; leaves cleft > ½ way to base.....***Boykinia***
8 Stems with only very reduced sessile bracts unlike the basal leaves; ovary with 1 locule; leaves cleft < ½ way to base.....***Heuchera***

Astilbe Buchenau-Hamilton ex D. Don 1825 (False Goat's-beard)

A genus of 14-25 species, perennial herbs, of e. Asia and e. North America. References: Mellichamp in FNA (2009); Soltis in Kubitzki, Bayer, & Stevens (2007).

Identification notes: Superficially, *Astilbe* is quite similar to *Aruncus* (Rosaceae). *Astilbe* may be distinguished by the following characteristics: pubescence of the stem and lower leaf surface glandular, plants monoecious, carpels 2 per flower, stamens 10 per flower (vs. *Aruncus*: pubescence nonglandular, plants dioecious, carpels 3-4 per flower, stamens 15-20 per flower).

1 Leaves serrate, the teeth sharp; fruit conic-lanceolate, tapering gradually, 4-5 mm long.....***A. biternata***
1 Leaves crenate, the teeth rounded (but with a prominent mucronate tip); fruit ovoid, abruptly contracted to the tip, 3 mm long.....***A. crenatiloba***

Astilbe biternata (Ventenat) Britton, Appalachian False Goat's-beard. Cove forests, seepage slopes. May-June; July-August. VA, sw. WV, and KY south to n. GA. [= C, F, G, K, S, W; < *A. biternata* – RAB, FNA (also see *A. crenatiloba*)]

Astilbe crenatiloba (Britton) Small, Roan Mountain False Goat's-beard. Mountain forests. July?; September. Known only from Roan Mountain, Carter County, TN and very rare or extinct. This species has apparently not been seen since the original collections (11 September 1885) by N.L. Britton and Mrs. Britton ("Tennessee. Base of Roan Mountain. Collected on the slope of Roan Mountain, East Tennessee, along the trail from 'Cloudland' to the Roan Mountain station of the E.T. & W.N.C.R.R."); the habitat, phenology, and other characteristics of this species are therefore poorly known. The morphologic characters are striking. [= K, S, W; < *A. biternata* – RAB, FNA]

Boykinia Nuttall 1834 (Boykinia)

A genus of 7 species, herbs, of e. Asia, e. North America, and w. North America, a classic relictual distribution. The other species are distributed primarily in the Pacific Northwest or Rocky Mountains, with several endemics in Japan and an endemic in the unglaciated portions of AK and e. Siberia. References: Gornall in FNA (2009); Soltis in Kubitzki, Bayer, & Stevens (2007)

Identification notes: Sometimes mistaken in vegetative condition for *Trautvetteria*, which is a coarser plant, often occupying similar habitats.

Boykinia aconitifolia Nuttall, Brook-saxifrage, Aconite-saxifrage, Eastern Boykinia. Streambanks, riverbanks, in crevices in spray cliffs around waterfalls, seepages. June-July. A Southern Appalachian endemic: sw. VA and s. WV, south through w. NC, e. TN, and nw. SC, to n. GA and ne. AL. Apparently closely related to the Japanese endemic *B. lycoctonifolia* (Maximowicz) Engler. [= RAB, C, F, G, GW, K, W; = *Therophon aconitifolium* (Nuttall) Millspaugh – S; > *B. turbinata* (Rydberg) Fedde; > *Therofon turbinatum* Rydberg]

Chrysosplenium Linnaeus 1753 (Golden-saxifrage)

A genus of about 60 species, herbs, of Europe, ne. Asia, n. North America, n. Africa, and temperate South America. References: Freeman & Levsen in FNA (2009); Soltis in Kubitzki, Bayer, & Stevens (2007).

Chrysosplenium americanum Schweinitz ex Hooker, Golden-saxifrage, Water-mat, Water-carpet. In shallow seepage in shade. March-June. QC west to SK, south to e. VA, w. NC, n. GA, e. TN, and IN. [= RAB, C, F, FNA, G, GW, K, S, W]

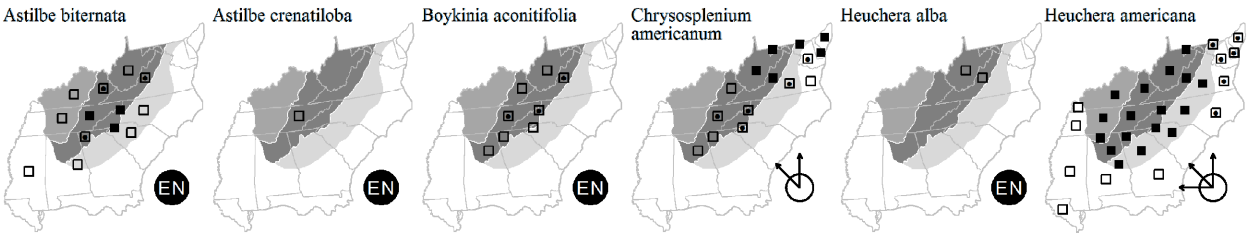
Heuchera Linnaeus 1753 (Alumroot)

A genus of about 37 species, perennial herbs, of North America. Soltis (1985) found that speciation in *Heuchera* "apparently occurs with little divergence at genes coding for isozymes." Vegetatively, *Heuchera* resembles *Tiarella* and *Mitella*. References: Wells & Shipes in FNA (2009); Wells (1984)=Z; Rosendahl, Butters, & Lakela (1936)=Y; Wells (1979); Soltis in Kubitzki, Bayer, & Stevens (2007). The keys adapted from Wells (1984).

1 Calyx glandular-villous, white or pink, often with green-tipped lobes, 1.3-3.3 mm long, 1.1-2.9 mm in diameter; free hypanthium 0.1-0.4 mm long; petals linear or oblanceolate, 2-3× as long as the calyx lobes, glabrous; plants flowering (June-) July-October.
  2 Leaves with widely to narrowly triangular lobes and triangular teeth; petals linear, often coiled; seeds echinate; internodes of flora branches 0.3-2.9 mm long.
    3 Leaves deeply and sharply lobed, the terminal lobe wider than long; bracts of the inflorescence oblong to spatulate, at least the lower ones toothed; [of the Alleghenies, Cumberlands, and Interior Low Plateau] ..... ***H. villosa*** *var.* ***macrorhiza***
    3 Leaves deeply and sharply lobed, the terminal lobe longer than wide; bracts of the inflorescence linear, rarely toothed; [primarily of Ridge and Valley, Blue Ridge, and upper Piedmont] ..... ***H. villosa*** *var.* ***villosa***
  2 Leaves with rounded lobes and rounded teeth; petals oblanceolate, reflexed; seeds smooth; internodes of floral branches 2.5-11.2 mm long.
    4 Petioles and peduncles more-or-less villous, the hairs 0.7-2.5 mm long; leaf blades slightly to fairly densely villous above and below, at least on the veins; [of ec. TN, KY, s. WV, sw. VA, w. NC, n. GA, n. AL, s. MO, s. IL, and s. IN] ..... ***H. parviflora***
    4 Petioles and peduncles densely glandular-puberulent, the hairs < 0.6 mm long; leaf blades densely puberulent above and below; [of c. KY westward] ..... ***[H. puberula]***
1 Calyx glandular-puberulent, greenish, 2.9-13.2 mm long, 2.4-7.5 mm in diameter; free hypanthium 0.6-7.0 mm long; petals rhombic-spatulate, slightly shorter to slightly longer than the calyx lobes, glandular-puberulent on the abaxial (lower) surface; plants flowering April-June.
  5 Free hypanthium < 2 mm long; calyx weakly zygomorphic; calyx urceolate, subglobose, or campanulate.
    6 At the onset of anthesis stamens exserted 0.2-1.5 mm beyond the calyx and styles included or exserted up to 1.1 mm beyond the calyx; calyx subglobose ..... ***H. caroliniana***
    6 At the onset of anthesis the stamens exserted 3 mm or more beyond the calyx and styles exserted 2.6 mm or more beyond the calyx; calyx urceolate or campanulate.
      7 Petioles densely hirsute; free hypanthium (1.1-) avg. 1.5 (-1.9) mm long ..... ***H. hirsuticaulis***
      7 Petioles glabrous, short-pubescent, or scantily hirsute; free hypanthium **either** (0.6-) avg. 1.1 (-1.5) mm long **or** (1.5-) avg. 1.7 (-1.9) mm long.
        8 Free hypanthium 0.6-1.5 mm long; petals greenish, white, creamy, or pink, the margins entire or bearing short teeth ..... ***H. americana***
        8 Free hypanthium 1.5-1.9 mm long; petals purple or pink, the margins fimbriate ..... ***H. hispida***
  5 Free hypanthium > 2 mm long; calyx weakly to strongly zygomorphic; calyx subglobose, campanulate, or tubular.
    9 Stigmas included within the calyx (the calyx lobes extending 1.3-5.3 mm beyond the stigma tips); calyx tubular; calyx lobes and petals inflexed, closing the mouth of the flower ..... ***H. longiflora***
    9 Stigmas barely included within the calyx (the calyx lobes extending up to 0.6 mm beyond the stigma tips) to moderately exserted beyond it; calyx subglobose or campanulate; calyx lobes and petals erect or spreading, not closing the mouth of the flower.
      10 Calyx 2.8-4.5 mm long, subglobose; [of the Piedmont of sc. VA southward to SC] ..... ***H. caroliniana***
      10 Calyx 5.5-13.2 mm long, narrowly campanulate; [primarily of the Mountains and upper Piedmont of VA and nc. NC].
        11 Flowers large, with white, exserted petals; [of high elevations (usually over 1000 m) on strongly acidic substrates, such as quartzitic sandstones, in w. VA and adjacent e. WV] ..... ***H. alba***
        11 Flowers smaller, with greenish or purplish-green petals; [of lower elevations on circumneutral or subacidic substrates] .....

Heuchera alba Rydberg. Quartzitic outcrops at high elevations. July-September. Further study of *H. alba* Rydberg is needed; its recognition as distinct from *H. pubescens* is probably warranted (R. Bartgis, pers. comm.). It apparently differs from *H. pubescens* in its large flowers with white, exserted petals (vs. greenish or purplish-green petals), and occurs at higher elevations (usually over 1000 m) on acidic substrates, such as quartzitic sandstones (vs. at lower elevations on circumneutral or subacidic substrates). [= FNA, K, WV; < *H. pubescens* – C, F, S, W, Z; < *H. pubescens* var. *brachyandra* Rosendahl, Butters, & Lakela – F, G, Y]

Heuchera americana Linnaeus, American Alumroot. Rocky forests, rock outcrops, particularly where soils are subacidic to circumneutral. April-August. CT and NY west to s. ON, n. IN, s. IL, and sc. MO south to c. GA, c. AL, n. MS, n. LA, and ne. TX. *H. americana* is the most widespread species of *Heuchera* in e. North America. Within the range of *H. caroliniana*, *H. americana* is nearly absent. [= C; > *H. americana* var. *americana* – F, G, WV; = *H. americana* var. *americana* – FNA, K, Z; < *H. americana* – RAB, W; > *H. americana* var. *heteradenia* Fernald – F; > *H. americana* var. *subtruncata* Fernald – F; > *H. americana* var. *brevipetala* Rosendahl, Butters, & Lakela – G, Y; > *H. calycosa* Small – S; > *H. curtisii* – S; > *H. lancipetala* Rydberg – S; > *H. americana* var. *typica* – Y; > *H. americana* var. *calycosa* (Small) Rosendahl, Butters, & Lakela – Y]



Heuchera caroliniana (Rosendahl, Butters, & Lakela) E.F. Wells, Carolina Alumroot. Rocky forests, rock outcrops, particularly where soils are subacidic to circumneutral, replacing *H. americana* in much of the upper Piedmont. April-June. Endemic to the Piedmont of sc. VA, NC, and nc. SC; first found in VA (Henry County) by T.F. Wieboldt in 2002 (Belden et al. 2004). [= FNA, K, Z; = *H. americana* Linnaeus var. *caroliniana* Rosendahl, Butters, & Lakela – Y; < *H. americana* – RAB, S]

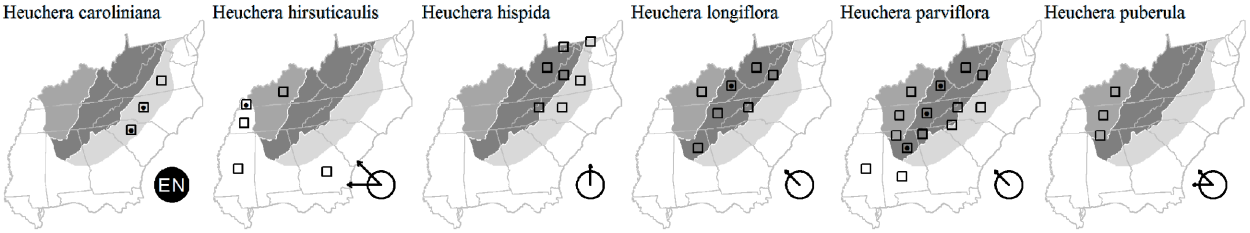
Heuchera hirsuticaulis (Wheelock) Rydberg. River bluffs (GA), bluffs and outcrops. S. MI west to n. IL and sw. MO, south to c. TN, nw. AR, and ne. OK; disjunct in e. GA (Screven County). Considered by Wells (1984) to represent fertile hybrids between *H. americana* var. *americana* and *H. richardsonii*; here regarded as a stabilized taxon, with numerous occurrences beyond the distribution of one or the other alleged parent. East to w. KY (Medley 1993), w. and c. TN (D. Estes, pers. comm. 2008), and e. GA (Screven County specimens at NCU). [= *H. americana* Linnaeus var. *hirsuticaulis* (Wheelock) Rosendahl, Butters, & Lakela – FNA, K, Z; > *H. americana* Linnaeus var. *hirsuticaulis* (Wheelock) Rosendahl, Butters, & Lakela – F, Y; > *H. americana* var. *interior* Rosendahl, Butters, & Lakela – F, Y] {add to synonymy, C, G, S}

Heuchera hispida Pursh, Purple Alumroot. Calcareous rocky forests, rock outcrops, particularly where soils are subacidic to circumneutral. April-June. S. PA south through MD, WV, and VA to nw. NC. This species is intermediate between *H. americana* and *H. pubescens*; it is almost certainly of hybrid origin. The treatment of this hybrid derivative of *H. americana* and *H. pubescens* as *H. americana* var. *hispida* (a variety of one parent) seems undesirable. Since it partly replaces its parents within its range, occurs in populations away from one or both parent, and is not strictly intermediate, it seems best to accord it species status. [= F, G, S, WV, Y; < *H. americana* – RAB, W; = *H.* ×*hispida* Pursh – C; = *H. americana* var. *hispida* (Pursh) E.F. Wells – FNA, K, Z]

Heuchera longiflora Rydberg, Long-flowered Alumroot. Rich shaded forests and woodlands over calcareous rocks such as limestone, dolostone, or calcite-cemented shales, siltstones, or sandstones, in circumneutral soils. May-June. This species is nearly limited to sedimentary rocks, occurring in e. and c. KY, s. OH, sw. WV, sw. VA, ne. TN, w. NC, and c. AL (?). In NC, it occurs primarily in the sedimentary window around Hot Springs, and is possibly limited to Madison, Buncombe, and Haywood counties. Wells (1984) calls it "most distinctive", "characterized by a unique combination of floral characters: long, tubular calyx, deeply included styles, inflexed calyx lobes and petals that close the mouth of the flower obliquely, and horizontal orientation of the flowers." [= C, F, FNA, G, K, W, WV, Z ; = *H. pubescens* – RAB, misapplied; > *H. longiflora* – S; > *H. aceroides* Rydberg – S; > *H. scabra* Rydberg – S; > *H. longiflora* Rydberg var. *aceroides* (Rydberg) Rosendahl, Butters, & Lakela – Y; > *H. longiflora* var. *typica* – Y]

Heuchera parviflora Bartling, Cave Alumroot. Shaded cliff bases, usually under overhangs, on grotto floors, behind waterfalls where humidity is high but not in the spray zone, nearly always in deeply shaded situations where little or no direct sunlight falls. July-September. An uncommon species throughout its range (ec. TN, KY, s. WV, sw. VA, w. NC, n. GA, n. AL, s. MO, s. IL, and s. IN), *H. parviflora* is probably most common in the gorge and waterfall country of sw. NC and in the Cumberland Plateau of TN and KY. In deeply shaded sites, it is often the only vascular plant present. The closely related species *H. puberula* Mackenzie & Bush [*H. parviflora* var. *puberula* (Mackenzie & Bush) E.F. Wells] occurs in s. MO and nc. AR, with scattered disjunct sites as far east as c. KY, c. TN, and s. IN. [= RAB, S, W; = *H. parviflora* var. *parviflora* – C, FNA, K, Z; > *H. parviflora* var. *parviflora* – F, G; > *H. parviflora* var. *rugelii* (Shuttleworth) Rosendahl, Butters, & Lakela – F, G, WV, Y; > *H. parviflora* var. *typica* – Y]

Heuchera puberula Mackenzie & Bush. Shaded cliff bases, usually under overhangs, on grotto floors, behind waterfalls where humidity is high but not in the spray zone, nearly always in deeply shaded situations where little or no direct sunlight falls. C. KY (Medley 1993), s. IN, s. IL, and s. MO south to n. AL and c. AR. [= F, G, Y; = *H. parviflora* Bartling var. *puberula* (Mackenzie & Bush) E.F. Wells – FNA, K, Z]



Heuchera pubescens Pursh, Marbled Alumroot. Rocky forests, rock outcrops, particularly where soils are subacidic or circumneutral. May-July. Primarily a species of the Ridge and Valley Province of PA, MD, WV, and VA, *H. pubescens* ranges south to only a few locations in the upper Piedmont of NC. See discussion under *H. alba*. The report in RAB of the occurrence of *H. pubescens* in Madison County is apparently erroneous; Wells (1984) shows *H. pubescens* reaching its southern limit just south of the VA border, and not occurring at all in KY, TN, or the mountains of NC. She found the bract characters used in the key in RAB to be unreliable. Reported by Hill & Horn (1997) for South Carolina {report needs verification}. [= FNA, K, WV; < *H. pubescens* – C, S, W, Z (also see *H. alba*); >< *H. pubescens* var. *brachyandra* Rosendahl, Butters, & Lakela – F, G, Y; > *H. pubescens* var. *pubescens* – F; > *H. pubescens* var. *typica* – Y]

* *Heuchera sanguinea* Engelmann var. *sanguinea*, Coral Bells. Cultivated as an ornamental "wildflower;" native of w. North America. [= K; < *H. sanguinea* – FNA, G; = *H. sanguinea* var. *typica* – Y] {not keyed; not mapped; rejected as a component of the flora}

Heuchera villosa Michaux *var.* ***macrorhiza*** (Small) Rosendahl, Butters, & Lakela, Giant Alumroot. Cliffs, riverbanks. July-October. S. WV, s. OH, and s. IN south through c. KY and c. TN to n. AL and ne. MS. This taxon has usually been disregarded in recent years, but is recognized by Chester et al. (1997). In its purest form, this plant seems to be very distinct from typical *H. villosa*, and actually may be more closely related to *H. arkansana*. The existence of intermediates and intergrades with *H. villosa* var. *villosa* muddies the taxonomic waters, however, and the overall best treatment seems to be at the varietal level. Some intermediates occur in the primary area, as in w. VA. [= G; < *H. villosa* var. *villosa* – C, FNA, K, Z; > *H. villosa* var. *macrorhiza* – F, WV, Y; = *H. macrorhiza* Small – S; > *H. villosa* var. *intermedia* Rosendahl, Butters, & Lakela – F, WV, Y]

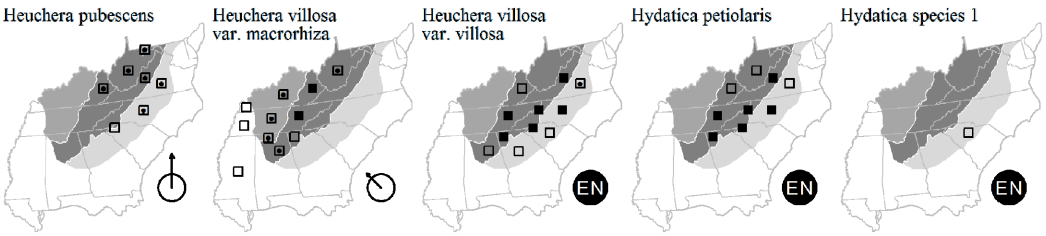
Heuchera villosa Michaux *var.* ***villosa***, Crag-jangle, Rock Alumroot. In crevices of rock outcrops, or in thin soil over boulders, a characteristic component of the flora of high elevation cliffs and summits (to at least 1920 m), not particular about the rock type, occurring on a wide range of rock types in our area, including felsic gneisses and schists, mafic gneisses, granites, quartzites, and others, probably the most acidophilic of our species of *Heuchera*. Late June-October. W. VA and s. WV south through w. NC and e. TN to nw. SC, n. GA, ne. AL (primarily a Southern Blue Ridge endemic). In the Ozarks of AR it is replaced by the related *H. arkansana* Rydberg [*H. villosa* var. *arkansana* (Rydberg) E.B. Smith] with shorter and narrower inflorescence, shorter pedicels, and larger flowers. [= G; < *H. villosa* – RAB, W; < *H. villosa* var. *villosa* – C, FNA, K, Z; > *H. villosa* var. *villosa* – F; = *H. villosa* – S; > *H. villosa* var. *typica* – Y; >< *H. villosa* var. *intermedia* Rosendahl, Butters, & Lakela – F, Y]

Hydatica Necker ex Gray 1821 (Appalachian Saxifrage)

A genus of about 12 species, herbs, of temperate w. North America, Europe, and e. North America. References: Lanning (2009)=Y.

Hydatica petiolaris (Rafinesque) Small, Cliff Saxifrage. In crevices in exposed rock outcrops at high elevations, other rock outcrops (moist to rather dry), periglacial boulderfields, rocky seeps. June-August. A Southern Appalachian endemic: nw. VA, WV, and KY south to e. TN, w. NC, sw. SC, and ne. GA. The orange anthers are an attractive contrast to the white petals (the three upper with two yellow spots each). [= S, Y; = ***Micranthes petiolaris*** (Rafinesque) Bush – FNA, Z; = *Saxifraga michauxii* Britton – RAB, C, F, G, GW, K, W, WV]

Hydatica species 1. In seepage on granite. Endemic, so far as is known, to Pickens County, SC. Under study by Patrick McMillan. {not yet keyed; not mapped}



Micranthes Haworth 1812 (Saxifrage)

A genus of about 60-75 species, perennials, mostly of north temperate, boreal, and arctic regions of North America, South America, and Eurasia. As shown by molecular data, *Saxifraga*, as often broadly defined, is polyphyletic, and all of our species either belong in *Micranthes* (Soltis 1995, Soltis et al. 1996, Mort & Soltis 1999), or with further seaparation into *Micranthes* and *Hydatica*. Soltis et al. (1996) demonstrate that *Micranthes* is closely allied with *Heuchera, Mitella,* and *Tiarella*, less closely related to *Astilbe, Boykinia, Sullivantia,* and *Chrysosplenium*, and least closely related to the bulk of *Saxifraga*. References:

Elvander & Brouillet in FNA (2009); Lanning (2009)=Y; Brouillet & Gornall (2007)=Z; Soltis in Kubitzki, Bayer, & Stevens (2007). Key based on various sources, including Lanning (2009).

1 Larger leaf blades oblanceolate, 4-10× as long as wide.
  2 Leaf margin entire to crenate; petals greenish-white, lacking yellowish spots ..... ***M. pensylvanica***
  2 Leaf margin coarsely serrate; petals white, either 3 or 5 of them with yellowish spots.
    3 Leaves with mostly 12-40 teeth per side; pubescence of the leaves and scapes mostly nonglandular; corolla radially symmetrical; filaments strongly clavate; [mostly of shaded seepages and brook-banks]..... ***M. micranthidifolia***
    3 Leaves mostly with 4-8 teeth per side; pubescence of the leaves and scapes mostly gland-tipped; corolla bilaterally symmetrical, the 3 upper petals distinctly clawed (the petal blade with a cordate or truncate base) and with 2 yellow spots, the 2 lower petals smaller, cuneate, and not spotted; filaments filiform; [mostly of rock outcrops and seepages, often exposed, but sometimes shaded]..... ..... ***[Hydatica petiolaris]***
1 Larger leaf blades ovate or obovate, 1-3 (-4)× as long as wide.
  4 Leaf margins entire or with obscure teeth mostly < 1 mm long; leaves to 5 (-9) cm long and 2.5 cm wide; filaments 1-1.5 mm long; ovary partly inferior, the hypanthium partly adnate to the ovary; petals spatulate and cuneate, but not clawed; petals not spotted; [widespread in our area].
    5 Inflorescence remaining compact with age; inflorescence axis sparsely short-hairy, the hairs not glandular (or with a very few glandular hairs interspersed; pedicels glabrous or nearly so; petals 2-3.5 mm long; [of granite outcrops in GA, otherwise in sc. US] ..... ***M. texana***
    5 Inflorescence branching with age, some branches often lower than the midpoint of the plant's height; inflorescence axis glandular-hairy; pedicels glandular-hairy; petals 3.5-6 mm long; [widespread in our area] ..... ***M. virginiensis***
  4 Leaf margins with coarse teeth mostly 2-10 mm long; leaves to 15 cm long and 8 cm wide; filaments 2.5-3.5 mm long; ovary superior, the hypanthium free from the ovary; petals (either 3 or 5 of them) moderately to strongly clawed; petals (either 3 or 5 of them each with 2 yellow spots; [of the Mountains and upper Piedmont].
    6 Leaves not petiolate, cuneate to the base, gradually increasing in width from the base to the widest point; corolla bilaterally symmetrical, the 3 upper petals distinctly clawed and with yellow spots, the 2 lower smaller, cuneate, and not spotted..... ..... ***[Hydatica petiolaris]***
    6 Leaves petiolate, the blade rather abruptly contracted to the petiole; corolla radially symmetrical, all the petals alike.
      7 Sepals erect, later spreading; filaments filiform (use 10×) ..... ***M. careyana***
      7 Sepals spreading, later reflexed; filaments slightly clavate (use 10×)..... ***M. caroliniana***

Micranthes careyana (A. Gray) Small, Carey Saxifrage. Moist rock outcrops and cliffs, often under overhangs, often in moist soil at the base of a vertical or overhanging rock outcrop. May-June. A Southern Appalachian endemic: e. TN and nw. NC south to sw. NC and se. TN. Lanning (2009) has clarified the taxonomy of the *M. careyana / caroliniana* complex through molecular and morphological study. [= FNA, S, Z; = *Saxifraga careyana* A. Gray – RAB, C, F, G, GW, K, W]

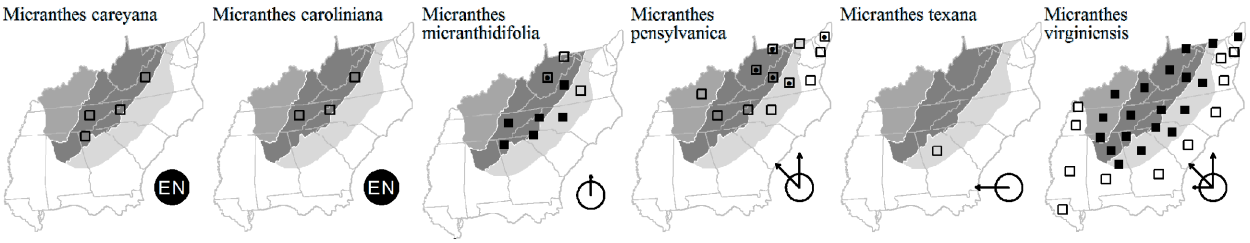
Micranthes caroliniana (A. Gray) Small, Carolina Saxifrage. Moist rock outcrops and cliffs, often under overhangs, often in moist soil at the base of a vertical or overhanging rock outcrop. May-June. A Southern Appalachian endemic: sw. VA south to nw. NC and ne. TN. [= FNA, S, Z; = *Saxifraga caroliniana* A. Gray – RAB, C, F, G, K, W; > *M. caroliniana* – S; > *M. tennesseensis* Small – S]

Micranthes micranthidifolia (Haworth) Small, Branch-lettuce. Wet soils of seepages, in the beds of high elevation brooks, brookbanks; rocky seepages. May-June. A Southern and Central Appalachian endemic: e. PA and WV, south to e. TN, w. NC, nw. SC, and ne. GA. This plant is gathered in considerable quantities as a spring green in the mountains of our area, and can sometimes be seen for sale in local grocery stores. The common name refers to the plant's habitat; "branches" are mountain streams. [= FNA, S, Z; = *Saxifraga micranthidifolia* (Haworth) Steudel – RAB, C, F, G, GW, K, W, WV]

Micranthes pensylvanica (Linnaeus) Haworth, Swamp Saxifrage. Mountain bogs, mucky seeps. April-June. ME west to MN, south to e. VA, c. and w. NC, and MO. [= FNA, Z; = *Saxifraga pensylvanica* Linnaeus – RAB, C, F, K, W, WV; > *S. pensylvanica* ssp. *pensylvanica* – G]

Micranthes texana (Buckley) Small, Texas Saxifrage. Granite outcrops. Found in 1980 by Jim Allison on a small granite outcrop in McDuffie County, GA. It is uncertain whether its occurrence in GA represents a natural disjunction or a freak introduction (J. Allison, pers. comm.). [= FNA, S, Z; = *Saxifraga texana* Buckley – F, G, K]

Micranthes virginiensis (Michaux) Small, Early Saxifrage. Rock outcrops, moist alluvial and slope forests, streambanks, riverbanks. March-May. NB west to MB, south to c. GA, LA, and AR. [= FNA, S, Z; = *Saxifraga virginiensis* Michaux – RAB, C, F, G, GW, W, WV; > *S. virginiensis* var. *virginiensis* – K]



Mitella Linnaeus 1753 (Miterwort)

As traditionally circumscribed, a genus of about 20 species, herbs, of cold temperate e. North America, w. North America, and e. Asia. Soltis (2007) and Okuyama, Pellmyr, & Kato (2008) indicate that *Mitella* as currently circumscribed is polyphyletic and is

likely to be divided; our species will remain in *Mitella*. References: Soltis & Freeman in FNA (2009); Soltis in Kubitzki, Bayer, & Stevens (2007).

Mitella diphylla Linnaeus, Two-leaved Miterwort. Moist rich forests, especially in the Mountains, and especially rocky. April-June. QC west to MN, south to e. VA, w. NC, nw. SC, ne. GA, nw. GA, and MO. The fringed petals will reward a close look. [= RAB, C, F, FNA, G, GW, K, S, W, WV]

Sullivantia Torrey & A. Gray 1842 (Sullivantia)

A genus of 3-4 species, perennial herbs, of c. North America. References: Soltis in FNA (2009); Soltis (1980)=Z; Soltis in Kubitzki, Bayer, & Stevens (2007).

Sullivantia sullivantii (Torrey & A. Gray) Britton, Sullivantia. Moist limestone cliffs. June-August. *S. sullivantii* has a very scattered, relictual distribution, known from w. VA (Russell County), e. KY, ne. TN (Claiborne County), s. OH, IL, sw. WI, ne. IA, se. MN, and MO. [= C, F, FNA, G, K, Z]

Tiarella Linnaeus 1787 (Foamflower)

A genus of 3-6 species, perennial herbs, of temperate North America and e. Asia. References: Jog in FNA (2009); Lakela (1937)=Y; Spongberg (1972)=Z; Wherry (1940, 1949)=X; Fernald (1943)=V; Soltis in Kubitzki, Bayer, & Stevens (2007).

Tiarella cordifolia Linnaeus. Moist forests, cove forests, rock outcrops. April-June. NS west to ON and WI, south to w. NC, nw. SC, sw. GA, AL, MS, and MO. Several taxa have been recognized (or not) in eastern North American *Tiarella*. The characters used to recognize additional species or varieties are often missing on herbarium sheets and also seem to be imperfectly correlated. *T. wherryi* (or var. *collina*) is alleged to differ from *T. cordifolia s.s*. in lacking stolons (vs. having stolons), capsules 6-10 mm long and round-tipped (vs. 8-12 mm long and subacuminate), and lower fruiting pedicels 6-10 mm long (vs. 7-13 mm long). Whether or not to recognize several taxa within what is here treated as *T. wherryi*, and at what level, has been controversial; see Lakela (1937), Wherry (1940, 1949), Fernald (1943), and Spongberg (1972) for discussion. Further study is needed. [> *T. cordifolia* – F, V, WV, Z; > *T. cordifolia* var. *cordifolia* – RAB, C, G, K; = *T. cordifolia* – FNA, S, W; > *T. macrophylla* Small – S (type a combination of *Heuchera* and *Tiarella*); > *T. cordifolia* var. *typica* – Y; > *T. wherryi* Lakela – F, V, Z; > *T. cordifolia* Linnaeus var. *collina* Wherry – RAB, C, G, K; > *T. cordifolia* var. *collina* – X; > *T. wherryi* – X, Y; > *T. cordifolia* var. *austrina* – K, X, Y]

134. CRASSULACEAE A.P. de Candolle 1825 (Stonecrop Family) [in SAXIFRAGALES]

A family of about 34-35 genera and 1100-1410 species, succulent shrubs and herbs, nearly cosmopolitan, but with centers of diversity in s. Africa and Mexico. References: Moran in FNA (2009); Thiede & Eggli in Kubitzki, Bayer, & Stevens (2007).

1 Leaves connate at the base, opposite; flowers solitary in the axils of leaves; flowers 3-4-merous; [subfamily *Crassuloideae*] ..... ***Crassula***
1 Leaves distinct, whorled or alternate; flowers in terminal cymose inflorescences; flowers 4-5 (-8)-merous.
  2 Petals connate as a tube; leaves serrate, bearing plantlets in the serrations; [subfamily *Kalanchoideae*] ..... ***Bryophyllum***
  2 Petals distinct or at most basally connate; leaves entire, crenate, or serrate, but not bearing plantlets along the margin; [subfamily *Sempervivoideae*].
    3 Plants with spheroidal basal rosettes consisting of dozens or more spirally arranged leaves; flowers 8-16-merous..... ***[Sempervivum]***
    3 Plants with or without basal rosettes (if rosettes present, these not as above); flowers 4-6-merous
      4 Perennials without rosettes, the stems 0.5-10 dm tall (dying back in winter to the rootstock); leaves large, relatively thin in texture, usually 5-25 times as wide as thick, often crenate; flowers pink, purple, white, or greenish.
        5 Flowers 5-merous, bisexual; flowering stems 2-10 dm tall, from an underground, tuberous base; average leaves 3-11 cm long, 1-5 cm wide; ovaries attenuate at the base; [tribe *Telephieae*] ..... ***Hylotelephium***
        5 Flowers 4 -(5)-merous, usually unisexual and then the plants dioecious; flowering stems 0.5-4 dm tall, from axils of brown scale-leaves clothing a stout rootstock at least in part exposed aboveground; average leaves 1-5 cm long, 0.4-1.5 cm wide; ovaries not attenuate at the base; [tribe *Umbiliceae*] ..... ***Rhodiola***
      4 Perennials or annuals with or without rosettes, the stems < 2 dm tall (the perennials with stems persistent through the winter); leaves smaller, flat or terete, relatively thicker, entire; flowers white or yellow; [tribe *Sedeae*].
        6 Carpels united basally (to about 1/3 their length); petals cucullate, initially partly enclosing 4 of the 8 stamens; follicles dehiscing by a tear-shaped valve on the abaxial (lower) surface; stem and leaves normally red; [of granitic flatrocks of the Piedmont of NC and SC] ..... ***Diamorpha***
        6 Carpels free; petals flat, never enclosing any of the 8 anthers; follicle dehiscing by a longitudinal slit along the adaxial (upper) suture; stem and leaves normally green, sometimes somewhat pink or reddish; [collectively of various habitats, including granitic flatrocks of GA, NC, SC, and VA] ..... ***Sedum***

Bryophyllum Salisbury 1805

A genus of about 30 species, perennial herbs, of islands of the Indian Ocean. Sometimes treated as a subgenus of *Kalanchoe*. Moran in FNA (2009).

* ***Bryophyllum daigremontianum*** (Raymond-Hamet & H. Perrier) A. Berger, Maternity Plant, Devil's Backbone. Disturbed areas; native of Madagascar. Jan-December. [= FNA; = *Kalanchoe daigremontianum* Raymond-Hamet & H. Perrier – K, WH]

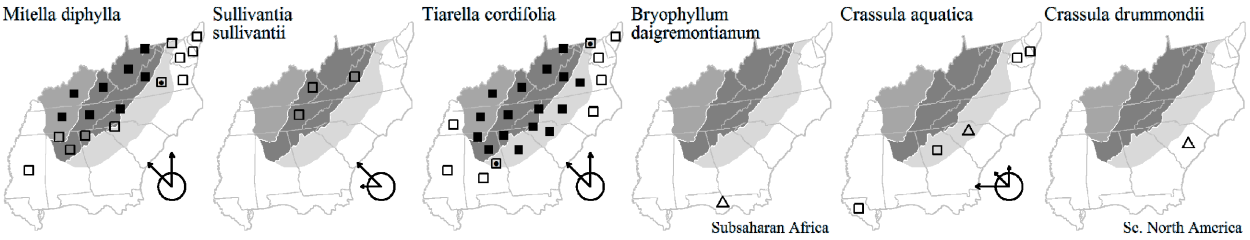
Crassula Linnaeus 1753

A genus of 195-250 species, nearly cosmopolitan (centered in s. Africa). Mort et al. (2009) provide strong evidence supporting the inclusion of *Tillaea* in *Crassula*. References: Moran in FNA (2009); Mort et al. (2009); Thiede & Eggli in Kubitzki, Bayer, & Stevens (2007).

1 Seeds rugulose; leaves 2-6 mm long, the apex acute; sepals 0.5-1.5 mm long ..... ***C. aquatica***
1 Seeds with sharp-pointed papillae; leaves 1.5-3 mm long, the apex acute; sepals 0.4-0.6 mm long ..... ***C. drummondii***

Crassula aquatica (Linnaeus) Schönland, Pygmyweed. Tidal marshes and shores, artificial lake. Occuring in tidal marshes and shores, south to MD and se. PA, and also in GA and AL (Kartesz 1999, FNA). [= FNA, K; = *Tillaea aquatica* Linnaeus – GW; = *Tillaeastrum aquaticum* (Linnaeus) Britton – S]

* ***Crassula drummondii*** (Torrey & A. Gray) Fedde. Waste area around wool-combing mill, perhaps merely a waif; native of sc. United States. [= FNA, K; = *Tillaea drummondii* Torrey & A. Gray]



Crassula longipes (Rose) Bywater & Wickens. {AL, GA}. [= K] {not yet keyed; synonymy incomplete}

Diamorpha Nuttall 1818 (Elf-orpine)

A monotypic genus, a succulent annual, endemic to se. North America. References: Wilbur (1988a)=Z; Moran in FNA (2009); Clausen (1975)=Y; Thiede & Eggli in Kubitzki, Bayer, & Stevens (2007).

Diamorpha smallii Britton ex Small, Elf-orpine. In very thin soil (generally less than 2 cm deep) of vernally wet depressions on granite flatrocks and other granitic outcrops. April-May; May-June. Primarily limited to granitic flatrocks of the Piedmont, ranging from sc. VA to ec. AL, and on sandstone from se. TN south into c. AL. This species is both one of the most typical and one of the most interesting of the dozens of species endemic (or largely so) to granite flatrocks of the southeastern Piedmont. See Wilbur (1988a) for a thorough discussion of the muddled nomenclatural history of this remarkable species, as well as for a detailed summary of systematic and ecological information. [= FNA, GW, K, Z; = *Sedum smallii* (Britton ex Small) Ahles – RAB, W; = *Diamorpha cymosa* (Nuttall) Britton ex Small – Y; > *Diamorpha cymosa* – S; > *Diamorpha smallii* – S]

Hylotelephium H. Ohba 1977 (Live-for-ever)

A genus of about 30 species, of temperate Eurasia and North America. References: Moran in FNA (in prep.); Clausen (1975)=Z; Thiede & Eggli in Kubitzki, Bayer, & Stevens (2007). Key based on Moran in FNA (in prep.).

1 Petals 2× as long as the sepals; nectaries wider than long; flowers fertile; [native] ..... ***H. telephioides***
1 Petals 2.5-4× as long as the sepals; nectaries longer than wide; flowers sterile (rarely fertile); [introduced].
  2 Flowers white or greenish; cymes lax, subcorymbose; leaves not markedly reduced upward from base of plant upward.... ***H. erythrostictum***
  2 Flowers deep pink to purple; cymes densely subglobose; leaves typically strongly reduced in size from base of plant upward ..... ***H. telephium***

* ***Hylotelephium erythrostictum*** (Miquel) H. Ohba, Garden Orpine, Live-for-ever. Disturbed areas; native of Europe. August-September; September-October. [= FNA, K; *? Sedum spectabile* Boreau – RAB, misapplied; = *Sedum* ×*erythrostictum* – C; ? *Sedum alboroseum* Baker – F, G, Z]

Hylotelephium telephioides (Michaux) H. Ohba, Allegheny Live-for-ever. Rock outcrops, mostly at high to moderate elevations, ascending to 2000 m. July-September; August-October. Essentially a Central and Southern Appalachian endemic, *H.*

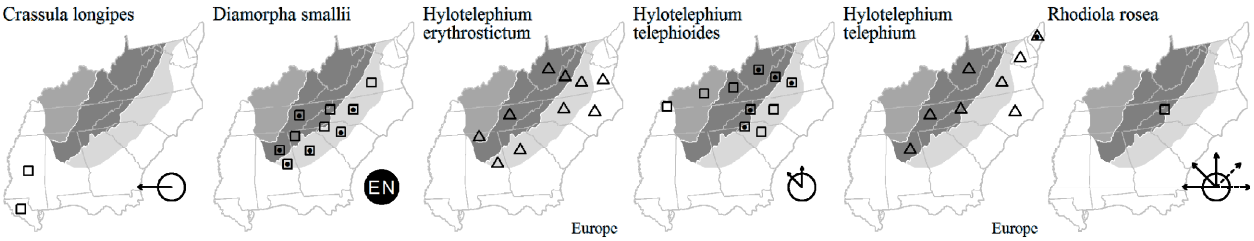
telephioides ranges from s. PA south to w. NC, with a few outlying populations to the west in s. IL, s. IN, and w. KY. The species is apparently not known from TN. [= FNA, K; = *Sedum telephioides* Michaux – RAB, C, F, G, W, WV, Z; = *Anacampseros telephioides* (Michaux) Haworth – S]

* ***Hylotelephium telephium*** (Linnaeus) H. Ohba, Live-for-ever. Disturbed areas; native of Europe. September-October; October-November. [= FNA; > *Sedum purpureum* (Linnaeus) Link – RAB, C, F, WV, Z; > *S. telephium* – F; > *Sedum telephium* Linnaeus ssp. *purpureum* (Link) Schinz & R. Keller – G; > *Sedum telephium* ssp. *fabaria* (Koch) Schinz & Keller – G; = *Hylotelephium telephium* ssp. *telephium* – K]

Rhodiola Linnaeus 1753 (Roseroot)

A genus of about 40-60 species, of cold temperate and boreal areas of the northern hemisphere. Thiede & Eggli (2007) place Rhodiola in a separate tribe from *Sedum* s.s. References: Moran in FNA (2009); Clausen (1975)=Z; Thiede & Eggli in Kubitzki, Bayer, & Stevens (2007).

Rhodiola rosea Linnaeus, Roseroot. High elevation rocky summits. July-August; August-September. Circumboreal, widely distributed in northern Europe, Asia, and North America, south in e. North America to e. PA and thence disjunct to Roan Mountain (Mitchell County, NC) and Grandfather Mountain (Avery County, NC), where nearly (if not completely) extirpated. Dwarfed, high elevation forms of *Hylotelephium telephioides*, with narrow, nearly toothless leaves, have been confused with *Rhodiola rosea*; they are perhaps readily distinguished only in flower or fruit. [= FNA, K; = *Sedum rosea* (Linnaeus) Scopoli – Z; = *Sedum rosea* (Linaeus) Scopoli var. *rosea* – C; < *S. rosea* var. *rosea* – F; < *S. rosea* – RAB, G, W; > *Rhodiola roanensis* Britton – S; > *Sedum rosea* (Linnaeus) Scopoli var. *roanense* (Britton) Berger]



Sedum Linnaeus 1753 (Stonecrop, Orpine, Sedum)

A genus of perhaps 200 species, depending on circumscription. There is considerable controversy about the circumscription of the genus *Sedum*. *Diamorpha* is usually separated, but Thiede & Eggli (2007) include it in *Sedum*; the separation of *Rhodiola* and *Hylotelephium* have been more controversial, but Thiede & Eggli (2007) place these in separate tribes from *Sedum* s.s. Other segregates which would affect the species treated below have been proposed, such as *Chetyson*, *Clausenellia*, and *Spathulata* (see synonymy). References: Ohba in FNA (2009); Clausen (1975)=Z; Calie (1981)=Y; Thiede & Eggli in Kubitzki, Bayer, & Stevens (2007). [also see *Diamorpha*, *Hylotelephium*, and *Rhodiola*]

Identification notes: Other species of *Sedum* are grown as ornamentals, especially in rock gardens; some are aggressive and rather weedy and can be expected eventually to become a naturalized part of our flora.

1 Leaves primarily whorled in 3's or 4's (to 5's).
- 2 Largest leaves distinctly spatulate, much wider than thick, 8-20 mm wide; flowers and fruits 4-merous; petals white; [native, of moist forest and rock outcrops]; [section *Ternata*] ..... ***S. ternatum***
- 2 Largest leaves linear-lanceolate, oblanceolate, or elliptic, almost as thick as wide, < 7 mm wide; flowers and fruits 5-merous; petals yellow; [alien].
  - 3 Leaves 4 (-5) per whorl; flowering shoots erect ..... ***S. mexicanum***
  - 3 Leaves 3 (-4) per whorl; flowering shoots pendulous, creeping, or ascending.
    - 4 Flowering shoots pendulous or ascending; leaves linear-lanceolate ..... ***S. lineare***
    - 4 Flowering shoots creeping or ascending; leaves oblanceolate to elliptic ..... ***S. sarmentosum***

1 Leaves primarily alternate.
- 4 Flowers and fruits 5-merous; [plants aliens].
  - 5 Leaves 2-5 mm long; petals yellow ..... ***S. acre***
  - 5 Leaves 6-15 mm long; petals yellow or white.
    - 6 Petals white; flowers 5-merous ..... ***S. album***
    - 6 Petals yellow; flowers (5-) 7 (-9) merous ..... ***S. rupestre***
- 4 Flowers and fruits 4-merous; [plants natives].
  - 7 Leaves of flower-bearing stems linear, sagittate-spurred at the base (the spurs clasping the stem); petals pink to white; annual; [section *Ternata*] ..... ***S. pulchellum***
  - 7 Leaves of flower-bearing stems narrowly elliptic, oblanceolate, spatulate, cuneate or short-spurred at the base (not clasping); petals white; perennial or annual.
    - 8 Plants annual; sepals 0.4-1 mm long; petals 1.4-4.2 mm long; [restricted to shallow soils of granitic flatrocks of the Piedmont, from s. NC south to wc. GA]; [section *Tetrorum*] ..... ***S. pusillum***

8 Plants perennial; sepals 2-9 mm long; petals 4-9 mm long; [of outcrops of various rocks, not as above]; [section *Ternata*].
9 Leaves of flowering stems with width/thickness ratio of >2.0; seeds averaging 0.8 mm long; leaves pale green or bluish green, sometimes with a glaucous coating; [of MD south through VA and WV to sc. and sw. NC].....***S. glaucophyllum***
9 Leaves of flowering stems with width/thickness ratio of <1.7; seeds averaging 0.7 mm long; leaves green or gray-green, but not glaucous; [of se. TN south into AL and GA].....***S. nevii***

* ***Sedum acre*** Linnaeus, Wallpepper, Mossy Stonecrop, Golden Carpet, Gold-moss, Bitter Stonecrop. Rock outcrops, gravel parking lots, disturbed areas, commonly cultivated; native of Europe. May-June; June-July. [= RAB, C, F, FNA, G, K, S, W, WH, WV, Z]

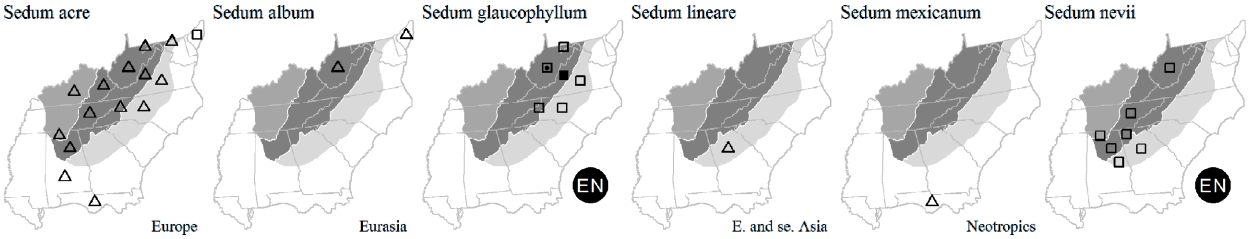
* ***Sedum album*** Linnaeus, White Stonecrop. Disturbed areas; native of Eurasia. Introduced and naturalized as far south as se. PA and WV. [= C, F, FNA, G, K, Z; = *Oreosedum album* (Linnaeus) Grulich]

Sedum glaucophyllum Clausen, Cliff Stonecrop. Rock outcrops, usually basic and/or sedimentary. May-June; June-July. Endemic to the Central and Southern Appalachians (extending into the Piedmont), known from MD, WV, VA, and NC (reports for GA are based on confusion with *S. nevii*). This species is complex, with several ploidies and morphologies represented, some at least showing geographic integrity and perhaps worthy of taxonomic recognition. Material in sw. NC (south of the Asheville Basin) has been identified as polyploid and differs in many ways from more typical *S. glaucophyllum*, in some ways suggesting the similar and closely related *S. nevii* A. Gray (known from nearby TN and AL). Further study is needed of this group. [= C, F, FNA, K, W, WV, Y, Z; < *S. nevii* A. Gray – RAB, G, S]

* ***Sedum lineare*** Thunberg. Margin of granitic flatrock; native of e. Asia. Duncan (1985) discusses the establishment of this species in Columbia County, GA. [= FNA, K, Z]

* ***Sedum mexicanum*** Britton, Mexican Stonecrop. Dry, disturbed areas; native of Mexico or perhaps e. Asia. [= FNA, WH]

Sedum nevii A. Gray, Nevius's Stonecrop. Gneiss rock outcrops on river bluffs. Endemic to se. TN (Polk County, just west of Cherokee County, NC) (Chester, Wofford, & Kral 1997), nc. and ec. AL, and wc. GA (where it occurs on gneiss outcrops along the Chattahoochee River in Muscogee and Harris counties), and reported for s. WV (Greenbrier County) by Harmon, Ford-Werntz, & Grafton (2006). [= FNA, K, W, Y, Z; < *S. nevii* – S (also see *S. glaucophyllum*)]



Sedum pulchellum Michaux, Widow's-cross. Calcareous rock outcrops. E. TN (Monroe, Knox, and Bradley counties) (Chester, Wofford, & Kral 1997) and nw. GA (Jones & Coile 1988) west to KS, OK, and TX. [= C, F, FNA, G, K, W, Y, Z; > *Chetyson pulchella* (Michaux) A. & D. Löve; > *Sedum pulchellum* – S; > *Sedum vigilimontis* Small – S; > *Chetyson vigilimontis* (Small) A. & D. Löve]

Sedum pusillum Michaux, Puck's Orpine. In very thin soil (generally less than of vernally wet depressions on granite flatrocks, often in mats of the moss *Hedwigia ciliata*. March-April; April-May. Endemic to granite flatrocks of the southeastern Piedmont, from sc. NC south to wc. GA. Superficially rather similar to *Diamorpha smallii*, and historically confused with it (see Wilbur 1988 for details). Wyatt (1983) discusses the reproductive biology of this species. [= RAB, FNA, GW, K, S, Z; = *Tetrorum pusillum* (Michaux) Rose]

* ***Sedum rupestre*** Linnaeus. Disturbed rock outcrops; native of Europe. Reported for nc. GA (Jones & Coile 1988), as *S. reflexum* Linnaeus. [= FNA; = *S. reflexum* Linnaeus – C, K, misapplied; = *Petrosedum reflexum* (Linnaeus) Grulich, misapplied]

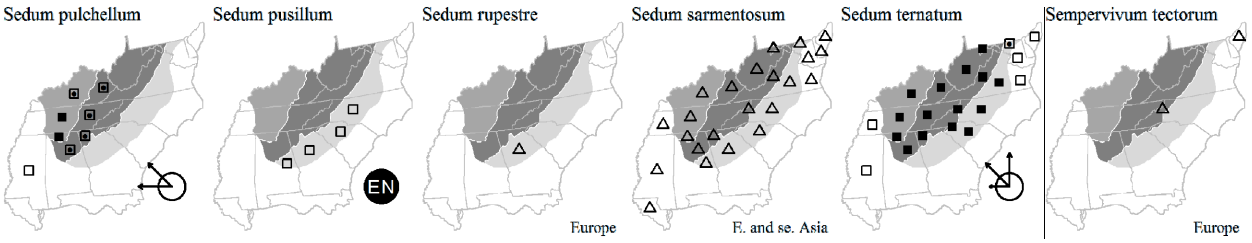
* ***Sedum sarmentosum*** Bunge. Xeric rock outcrops, disturbed areas; native of China. May-June; June-July. [= RAB, C, F, FNA, G, K, W, WH, WV, Z]

Sedum ternatum Michaux, Mountain Stonecrop. Moist forests, coves, bottomlands, shaded rock outcrops. April-June; May-July. NJ west to IA and AR, south to nw. GA and AL. [= RAB, C, F, FNA, G, K, S, W, WV, Y, Z; = *Clausenellia ternata* (Linnaeus) A. & D. Löve]

Sempervivum Linnaeus 1753 (Hen-and-chickens, Houseleek)

A genus of 40-100 species, perennials, of Eurasia. References: Lis in FNA (2009).

* ***Sempervivum tectorum*** Linnaeus, Hen-and-chickens, Houseleek. Disturbed areas, cultivated as a rock garden and potted plant, rarely persistent; native of Europe. *S. tectorum* is reported for VA by Massey (1961) as "escapes from cultivation;" the documentation of this is unknown, but the record has been perpetuated by Kartesz (1999), Lis in FNA (2009), and others. [= FNA, C, F, K]



137. PENTHORACEAE Rydberg ex Britton 1901 (Ditch-stonecrop Family) [in SAXIFRAGALES]

A family of one genus and 2 species, herbs, of e. North America and e. Asia. *Penthorum* has been variously placed in the Crassulaceae, Saxifragaceae, or in the Penthoraceae. Haskins & Hayden (1987) concluded that *Penthorum* was best treated in a monogeneric Penthoraceae, a conclusion based on extensive anatomical evidence. Among those who do not favor a monotypic family, there is nearly evenly divided opinion between the Crassulaceae and Saxifragaceae; this in itself perhaps supports segregation in the Penthoraceae. Molecular evidence supports the recognition of the Penthoraceae, and suggests closer affinities with the Haloragaceae than with either the Crassulaceae or the Saxifragaceae (Morgan & Soltis 1993). References: Thiede in Kubitzki, Bayer, & Stevens (2007); Freeman in FNA (2009).

Penthorum Linnaeus 1753 (Ditch-stonecrop, Penthorum)

A genus of 2 species, herbs, of e. North America and e. and se. Asia. The only other species in the genus is *P. chinense* Pursh, of e. Russia, China, Korea, and Japan. References: Freeman in FNA (2009); Haskins & Hayden (1987)=Z; Thiede in Kubitzki, Bayer, & Stevens (2007).

Penthorum sedoides Linnaeus, Ditch-stonecrop, American Penthorum. Shores, drawdown areas, moist forests, floodplain forests, moist disturbed areas, ditches. June-October. NB west to MB, south to Panhandle FL and TX; introduced from BC south to OR. [= RAB, C, F, FNA, G, GW, K, S, W, WV, Z]

138. HALORAGACEAE R. Brown 1814 (Water-milfoil Family) [in SAXIFRAGALES]

A family of 8-9 genera and about 150 species, aquatic and wetland herbs, but also shrubs and trees, cosmopolitan but centered in the Southern Hemisphere, especially Australia. The family has sometimes spelled "Haloragidaceae." References: Kubitzki in Kubitzki, Bayer, & Stevens (2007).

1 Leaves whorled or alternate; stamens 4 or 8; carpels 4; emersed leaves bract-like and much-reduced (except in *M. aquaticum*) ..... ***Myriophyllum***
1 Leaves alternate; stamens 3; carpels 3; emersed leaves foliaceous, little if at all reduced ..... ***Proserpinaca***

Myriophyllum Linnaeus 1753 (Water-milfoil)
(contributed by B.A. Sorrie and A.S. Weakley)

A genus of about 68 species, aquatic and wetland herbs, cosmopolitan, with a primary center of diversity in Australia and secondary centers in North America and Asia. The species taxonomy and infrageneric classification used here follow Moody & Les (2010). References: Moody & Les (2010)=X; Crow & Hellquist (2000)=Z; Aiken (1981)=Y.

Identification notes: Stranded plants of *M. heterophyllum* and *M. humile* (and perhaps others) produce leaves that are reduced in size. Leaves and bracts become pectinate or pinnate, so that plants resemble *M. pinnatum*. Such plants are the source of nearly all inland records of *M. pinnatum* in the VA-NC-SC-GA area. *M. heterophyllum* usually flowers and fruits when stranded and may be distinguished from *M. pinnatum* by its much denser disposition of leaves and bracts, and by its dull red fruits obscurely tuberculate (vs. tan or pale brown fruits strongly tuberculate). From stranded *M. humile*, *M. heterophyllum* may be distinguished by leaves and bracts which are clearly whorled and much more densely disposed. *M. humile* differs from *M. pinnatum* by its wholly alternate leaves and bracts, and by its smooth fruits.

1 Leaves reduced to small scales or absent; stems short, erect from substrate; [subgenus *Brachytheca*; section *Tessaronia*; subsection *Spondylastrum*] ..... ***M. tenellum***
1 Leaves well-developed, pinnately divided with filiform segments; stems elongate, suspended in the water column and/or floating.
  2 Flowers/fruits absent and emersed shoots with leaves closely similar in size and shape to submersed ones; widespread alien; [subgenus *Myriophyllum*; section *Pectinatum*] ..... ***M. aquaticum***
  2 Flowers/fruits present; emersed shoots present or not.
    3 Flowers/fruits in axils of leaves.
      4 Leaves whorled; emersed stems present and with feathery leaves; [subgenus *Myriophyllum*; section *Pectinatum*] ..... ***M. aquaticum***

4 Leaves strictly alternate; flowers/fruits on submersed stems (forma *capillaceum*) or on emersed stems with pinnatifid or pectinate leaves (forma *natans*) ; [subgenus *Brachytheca*; section *Tessaronia*; subsection *Spondylastrum*] ..... ***M. humile***

3 Flowers/fruits in erect spikes emersed from water, flowers/fruits subtended by bracts much smaller than the normally submersed leaves.

5 Uppermost flowers/fruits alternate; leaves alternate or whorled or both; [subgenus *Brachytheca*; section *Tessaronia*; subsection *Spondylastrum*].

6 Bracts much shorter than floral internodes, varying from pectinate to entire; fruit surface smooth or papillose ..... ***M. laxum***

6 Bracts usually longer than floral internode, pinnatifid to pectinate; fruit surface strongly tuberculate ..... ***M. pinnatum***

5 Uppermost flowers/fruits opposite; leaves whorled (technically pseudo-whorled in many *M. heterophyllum*) (note that early season plants of *M. pinnatum* may have flowers opposite, but at least some leaves will be alternate).

7 Bracts usually > 2× as long as pistillate flowers; stems drying brown, pale brown, or reddish.

8 Bracts throughout inflorescence pectinate to pinnatifid; winter buds scattered along stem, clavate, falling by early winter; [of DE and northward]; [subgenus *Myriophyllum*; section *Myriophyllum*; subsection *Isophylleae*] ..... ***M. verticillatum***

8 Distal bracts subentire to serrate, proximal bracts pectinate to serrate; winter buds developed only at base of stem or on rhizomes, usually persisting; [widespread]; [subgenus *Brachytheca*; section *Tessaronia*; subsection *Spondylastrum*] ..... ***M. heterophyllum***

7 Bracts usually < 2× as long as pistillate flowers; stems drying pale tan or whitish]; [subgenus *Myriophyllum*; section *Myriophyllum*; subsection *Myriophyllum*].

9 Midstem leaves with 11 or fewer segments on each side of rachis; leaves rounded at apex; stem diameter more-or-less uniform; stem tips usually green; winter buds produced; [native, of DE and northward] ..... ***M. sibiricum***

9 Midstem leaves with 12 or more segments on each side of rachis; many leaves appear truncate or clipped at apex; stem diameter below inflorescence is up to 2× diameter of lower stem; stem tips usually reddish; no winter buds; [widespread alien] ..... ***M. spicatum***

Alternate key

1 Leaves reduced to small scales or absent; stems short, erect from substrate; [subgenus *Brachytheca*; section *Tessaronia*; subsection *Spondylastrum*] ..... ***M. tenellum***

1 Leaves well-developed, pinnately divided with filiform segments; stems elongate, suspended in the water column and/or floating.

2 Flowers/fruits produced in axils of submersed leaves; [subgenus *Brachytheca*; section *Tessaronia*; subsection *Spondylastrum*] ... ***M. humile***

2 Flowers/fruits produced in axils of emersed leaves or on emersed shoots with bracts (reduced bracteal leaves).

3 Emersed shoots with feathery leaves about same size and shape as submersed leaves; flowers/fruits rarely produced; [widespread alien] [subgenus *Myriophyllum*; section *Pectinatum*] ..... ***M. aquaticum***

3 Emersed shoots with bracts subtending flowers/fruits; these bracts much different in shape than submersed leaves. [stranded plants may produce bracts and leaves of similar size and shape, but these not feathery].

4 All flowers/fruits alternate; fruits smooth; [subgenus *Brachytheca*; section *Tessaronia*; subsection *Spondylastrum*] ..... ***M. humile***

4 All flowers/fruits opposite or whorled (or the lower opposite and the upper alternate in *M. pinnatum*).

5 Bracts usually longer than the internodes; [subgenus *Brachytheca*; section *Tessaronia*; subsection *Spondylastrum*].

6 Leaves whorled or pseudo-whorled; fruits with low bumps ..... ***M. heterophyllum***

6 Leaves strictly alternate; fruits strongly tuberculate ..... ***M. pinnatum***

5 Bracts usually shorter than the internodes.

7 All bracts pectinate to pinnatifid; [subgenus *Myriophyllum*; section *Myriophyllum*; subsection *Isophylleae*] ..... ***M. verticillatum***

7 Bracts vary from entire to pectinate.

8 Leaves alternate, pseudo-whorled, or both; plain green; [of se. VA and southward] ; [subgenus *Brachytheca*; section *Tessaronia*; subsection *Spondylastrum*] ..... ***M. laxum***

8 All leaves whorled, grayish green; [collectively widespread]; [subgenus *Myriophyllum*; section *Myriophyllum*; subsection *Myriophyllum*].

9 Midstem leaves with 11 or fewer segments on each side of rachis; leaves rounded at apex; stem diameter more-or-less uniform; stem tips usually green; winter buds produced; [native, of DE and northward] ..... ***M. sibiricum***

9 Midstem leaves with 12 or more segments on each side of rachis; many leaves appear truncate or clipped at apex; stem diameter below inflorescence is up to 2× the diameter of the lower stem; stem tips usually reddish; no winter buds; [widespread alien] ..... ***M. spicatum***

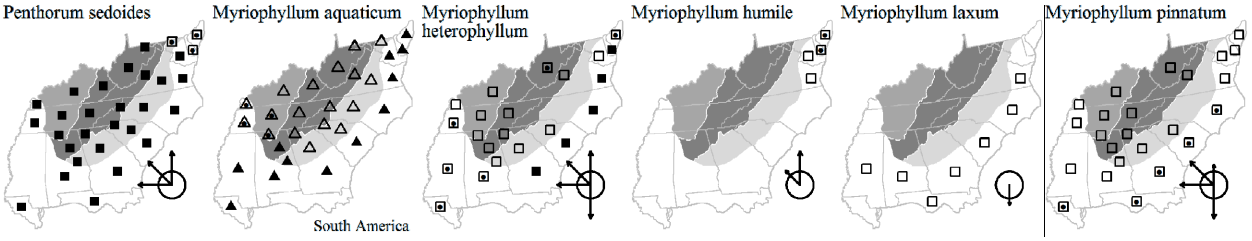
* ***Myriophyllum aquaticum*** (da Conceição Vellozo) Verdcourt, Parrot-feather. Ditches, slow-moving rivers, pools, ponds; native of South America. April-June. An introduced species now widespread in se. United States, north to NY, WV, and MO. [= C, GW, K, W, X, Y, Z; = *M. brasiliense* Cambessedes – RAB, F, G, WV; = *M. proserpinacoides* Gillies ex Hooker & Arnott – S]

Myriophyllum heterophyllum Michaux, Southern Water-milfoil. Ditches, slow-moving waters of rivers and streams, pools, ponds. April-July. NY west to ON and MN, south to FL and TX. [= RAB, C, F, G, GW, K, S, WV, X, Y, Z]

Myriophyllum humile (Rafinesque) Morong. Millponds, slow-moving water of streams. NS west to MN, south to DE, MD, VA, and IL. [= C, F, G, K, X, Y, Z]

Myriophyllum laxum Shuttleworth ex Chapman, Loose Water-milfoil. Limesink depression ponds (dolines), spring-runs, rarely also in lakes. June-October. Se. VA south to n. FL, s. AL, and s. MS (Sorrie & Leonard 1999). *M. laxum* and *M. heterophyllum* both have reddish submersed stems and present difficulties in identification when in sterile condition. *M. laxum* has a total of 7-15 (-17) segments per leaf, vs. (15-) 17-31 (-37) segments in *M. heterophyllum*. Documented for VA by a 1922 specimen from Princess Anne County at GH (Sorrie, pers. comm.). [= RAB, GW, K, X, S, Y]

Myriophyllum pinnatum (Walter) Britton, Sterns, & Poggenburg, Alternate-leaved Water-milfoil. Pools, ditches. June-October. MA west to IA and SD, south to GA and TX. [= RAB, C, F, G, GW, K, S, W, WV, X, Y, Z]



Myriophyllum sibiricum Komarov, Common Water-milfoil. Quiet circumneutral to alkaline waters. NL (Labrador) west to AK, south to VA, WV, IL, MO, NM, and CA; also in n. Eurasia. [= C, G, K, X, Z; > *M. exalbescens* Fernald – F, Y]

* ***Myriophyllum spicatum*** Linnaeus, Eurasian Water-milfoil. Ponds and impoundments. {habitat and range in our area uncertain}, native of Eurasia. Confused with *M. sibiricum.* An introduced species, now widespread in e. United States. Reported for South Carolina by Hill & Horn (1997). [= C, GW, K, W, X, Y, Z]

Myriophyllum tenellum Bigelow, Leafless Water-milfoil. Natural lakes (Carolina bay lakes), typically growing on the sandy bottoms in water 1-2 meters deep. NL (Newfoundland) west to MN, south to PA and NJ, and disjunct south to a few occurrences in NC; report from Virginia Beach, VA is false. [= C, F, G, K, X, Y, Z]

Myriophyllum verticillatum Linnaeus. Quiet waters. A circumboreal species, south in North America to DE, MD, n. WV, IN, NE, TX, and CA. [= C, G, K, X, Y, Z; > *M. verticillatum* var. *pectinatum* Wallroth – F]

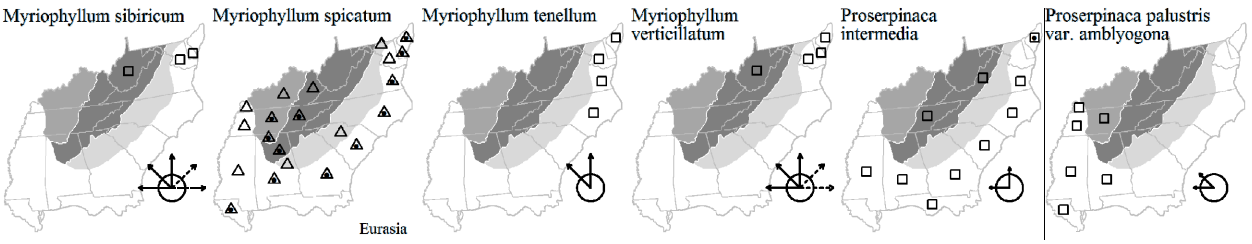
Proserpinaca Linnaeus 1753 (Mermaid-weed)

A genus of 2-3 species, aquatic and wetland herbs, of e. North America and the West Indies. References: Catling (1998)=Z.

1 Bracteal (emersed) leaves serrate; submersed pectinate leaves with 8-14 pairs of divisions 5-30 mm long; fruits 2.3-6.0 mm wide.
  2 Fruit 2.3-4.0 mm wide, acutely angled, not winged, the sides of the capsule more-or-less planar..... ***P. palustris*** *var.* ***crebra***
  2 Fruit (3.5-) 4.0-6.0 mm wide, sharply angled (to somewhat winged), the sides of the capsule concave.....***P. palustris*** *var.* ***palustris***
1 Bracteal (emersed) leaves pinnatifid to pectinate; submersed pectinate leaves with 4-12 pairs of divisions 2-7.5 mm long; fruits 2.0-3.6 mm wide.
  3 Leaves with a flattened rachis 1-4 mm wide, the 7-12 pairs of divisions 2.0-3.5 mm long; fruits 2.3-3.6 mm wide.....***P. intermedia***
  3 Leaves with a filiform rachis (midrib) 0.2-1.0 mm wide, the 4-9 pairs of divisions 2.0-7.5 mm long; fruits 2.0-2.8 mm wide..... ***P. pectinata***

Proserpinaca intermedia Mackenzie, Intermediate Mermaid-weed. Wet places. July-September. NS to SC on the Coastal Plain; disjunct in sc. TN. This taxon is intermediate in morphology between *P. palustris* and *P. pectinata*; whether it warrants species status is unclear. If merely a rarely produced first-generation hybrid, it should be treated as a hybrid binomial (*P.* ×*intermedia*); if it forms independent, self-reproducing populations, it should probably be treated as a species. [= RAB, C, F, G, K, Z; < *P. palustris* – GW]

Proserpinaca palustris Linnaeus *var.* ***amblyogona*** Fernald. Swamps. Occurs east to KY, TN, and GA. [= C, F, G, K; < *P. palustris* – GW, S] {not yet keyed}



Proserpinaca palustris Linnaeus *var.* ***crebra*** Fernald & Griscom, Common Mermaid-weed. Wet places, swamp forests. June-October. Throughout e. North America and south to the Caribbean and Central America. [= C, F, G, K, WV, Z; < *P. palustris* – RAB, S, W, WH; < *P. palustris* – GW (also including *P. intermedia)*]

Proserpinaca palustris Linnaeus *var.* ***palustris***, Coastal Mermaid-weed. Wet places, swamp forests. June-October. MA (?) to FL and west to LA, on the Coastal Plain. [= C, F, G, K, Z; < *P. palustris* – RAB, S, W, WH; < *P. palustris* – GW (also including *P. intermedia)*]

Proserpinaca pectinata Lamarck, Feathery Mermaid-weed. Bogs, savannas, ditches, other wet places. June-October. NS south to s. FL and west to w. LA, mostly on the Coastal Plain, but scattered inland as well, as in c. TN. [= RAB, C, F, G, GW, K, S, WH, Z]

140. VITACEAE A.L. de Jussieu 1789 (Grape Family) [in VITALES]

A family of about 14 genera and 750-850 species, vines (rarely small trees or herbs), of tropical, subtropical, and temperate regions of the Old and New Worlds. References: Soejima & Wen (2006); Wen in Kubitzki, Bayer, & Stevens (2007).

1 Branches and leaves distinctly fleshy, the leaves > 1 mm thick when fresh; leaves 3-foliolate ..... ***Cissus***
1 Branches and leaves herbaceous; leaves simple, 3-, 5-, or many-foliolate.
2 Leaves simple, sometimes shallowly or deeply 3-5 (-7)-lobed.
3 Tendrils not twining, terminating in adhesive disks ..... ***Parthenocissus***
3 Tendrils twining, lacking adhesive disks.
4 Petals separate at their tips, falling individually; pith continuous through the node ..... ***Ampelopsis***
4 Petals connate at their tips, falling together; pith interrupted by a diaphragm at each node (except continuous in *V. rotundifolia*) ..... ***Vitis***
2 Leaves compound with (3-) 5-numerous leaflets.
5 Leaves bipinnate to tripinnate.
6 Leaflets 2-6 cm long; [common native species of mesic to wet habitats] ..... ***Ampelopsis arborea***
6 Leaflets 5-12 cm long (at least the larger > 8 cm long); [introduced species, rarely escaped] ..... ***[Ampelopsis megalophylla]***
5 Leaves 3-5 (-7)-foliolate.
7 Leaves pedately 5-foliolate (the lateral 2 leaflets on either side borne on a common stalk) ..... ***Cayratia***
7 Leaves palmately 3-5 (-7)-foliolate.
8 Leaflets pinnately lobed; tendrils twining, lacking adhesive tips; berries yellow to orange when ripe ..... ***Ampelopsis aconitifolia***
8 Leaflets toothed or entire; tendrils not twining, usually terminating in adhesive tips; berries dark blue when ripe ..... ***Parthenocissus***

Ampelopsis Michaux 1803 (Peppervine)

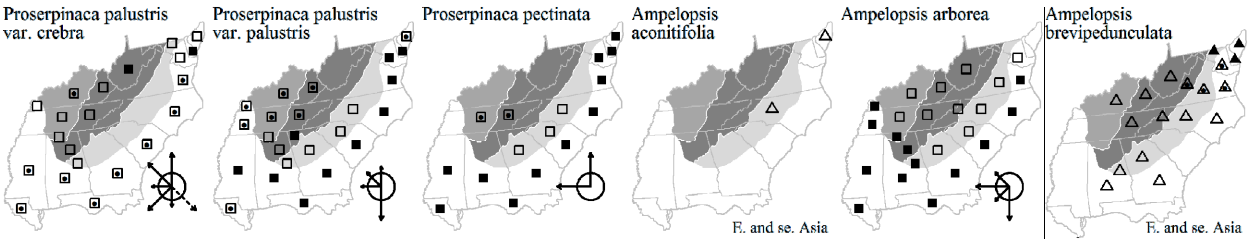
A genus of about 25 species, woody vines, of temperate and subtropical America and Asia. Perhaps to be split based on molecular phylogenetics, with section *Leeaceifoliae* (*A. arborea* and *A. megalophylla*) elevated to a new genus (Soejima & Wen 2006). References: Soejima & Wen (2006); Wen in Kubitzki, Bayer, & Stevens (2007).

1 Leaves bipinnate to tripinnate, with > 11 leaflets; [native and alien species]; [section *Leeaceifoliae*].
2 Leaflets 2-6 cm long; [common native species of mesic to wet habitats] ..... ***A. arborea***
2 Leaflets 5-12 cm long (at least the larger > 8 cm long); [introduced species] ..... ***[A. megalophylla]***
1 Leaves simple and palmately veined (grape-like), or palmately 5-foliolate (the leaflets additionally pinnately lobed); [alien species]; [section *Ampelopsis*].
3 Leaves palmately 5-foliolate, the leaflets additionally pinnately lobed ..... ***A. aconitifolia***
3 Leaves simple, grape-like, to 12 cm long and 9 cm wide.
4 Leaves 3 (-5) lobed; young twigs pubescent ..... ***A. brevipedunculata***
4 Leaves not lobed; young twigs glabrous ..... ***A. cordata***

* ***Ampelopsis aconitifolia*** Bunge. Planted as an ornamental, rarely escaping to suburban woodlands; native of n. China. [= K]

Ampelopsis arborea (Linnaeus) Koehne, Peppervine. Swamp forests, marshes, wet thickets, moist to wet maritime forests. June-October. Se. VA (and MD?) south to s. FL, west to TX and n. Mexico, north in the interior to s. IL and sw. WV. [= RAB, C, F, G, GW, K, S, W, WH, WV]

* ***Ampelopsis brevipedunculata*** (Maximowicz) Trautvetter, Porcelain-berry. Thickets and disturbed areas, native of ne. Asia. June-July; September. [= RAB, C, F, K; < *A. heterophylla* (Thunberg) Siebold & Zuccarini – S; = *A. heterophylla* (Thunberg) Siebold & Zuccarini var. *brevipedunculata* (Maximowicz) C.L. Li]



Ampelopsis cordata Michaux, Raccoon-grape, False-grape. Moist forests, bottomlands, and thickets, particularly where disturbed. May-July. E. VA south to Panhandle FL, west to TX, north in the interior to s. OH, s. IN, s. IL, MO, and NE; also introduced at scattered sites inland. [= RAB, C, F, G, GW, K, S, W, WH]

* *Ampelopsis megalophylla* Diels & Gilg, Bigleaf Peppervine. Planted in the Southeast, and has the potential to naturalize; native of China. Reports of its occurrence as naturalized in MS are based on *Cayratia* (S.W. Leonard, pers. comm.. 2006). [not mapped; rejected as a component of our flora}

Cayratia A.L. de Jussieu 1818 (Bushkiller)

A genus of 50-63 species, woody and herbaceous vines, of the Old World tropics and subtropics. References: Krings & Richardson (2006); Wen in Kubitzki, Bayer, & Stevens (2007).

* ***Cayratia japonica*** (Thunberg) Gagnepain, Bushkiller, Sorrel Vine. Disturbed areas, suburban woodlands; native of temperate and subtropical se. Asia. July-August. Reported for NC from several suburban areas, as in Forsyth County (Krings &

Richardson 2006) and Mecklenburg County (J. Matthews, pers. comm., 2007). Also reported as naturalized in AL (Hansen & Goertzen 2006), MS, LA, and TX. [= K]

Cissus Linnaeus 1753

A genus of about 350 species, woody vines, herbaceous vines, and rarely shrubs, of tropical and rarely warm temperate areas. References: Wen in Kubitzki, Bayer, & Stevens (2007).

Cissus trifoliata (Linnaeus) Linnaeus, Marine-ivy. Coastal hammocks, dunes, disturbed coastal areas, the more northerly occurrences introduced. Se. SC (Jasper County) south through GA, FL, and west along the Gulf Coast to TX, AR, and Mexico. [= K, S, WH; > *C. incisa* (Nuttall) Des Moulins – GW, S]

Parthenocissus Planchon 1887 (Virginia-creeper, Woodbine)

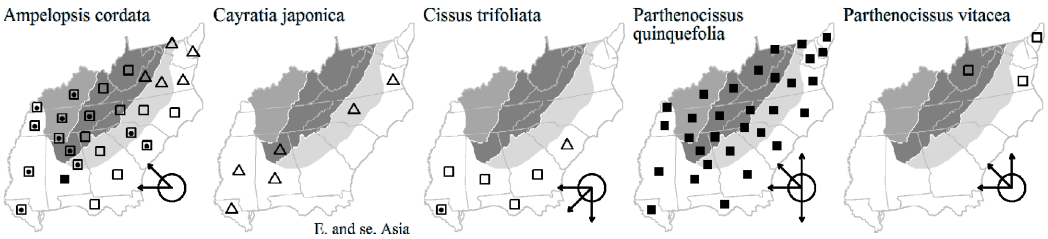
A genus of about 15 species, woody vines, of temperate Asia and North America. References: Wen in Kubitzki, Bayer, & Stevens (2007).

1 Leaves 3-lobed to 3-foliolate; [introduced ornamental, rarely escaped] ..... ***P. tricuspidata***
1 Leaves (3-) 5 (-7)-foliolate (only a few leaves on a plant 3-foliolate); [native].
2 Inflorescence with a well-developed (zigzag) central axis, the dichotomous branches very unequal, the inflorescence therefore paniculiform; tendrils many-branched, usually with numerous adhesive disks (though young shoots may not have the disks yet formed); leaves usually dull above; [widespread in our area] ..... ***P. quinquefolia***
2 Inflorescence without a well-developed central axis, the dichotomous branches relatively equal, the inflorescence therefore corymbiform, as wide or wider than long, with 2-3 main branches; tendrils few-branched, usually lacking adhesive disks (though sometimes swollen at the tip); leaves usually glossy above; [from e. VA and n. WV northward] ..... ***P. vitacea***

Parthenocissus quinquefolia (Linnaeus) Planchon, Virginia-creeper. Swamp forests, bottomlands, maritime forests and thickets, rock outcrops, mesic forests. May-July; July-August. ME west to IA and NE, south to s. FL and TX. [= RAB, C, F, G, K, W, WH, WV; > *P. quinquefolia* – S; > *P. hirsuta* (Pursh) Graebner – S]

* ***Parthenocissus tricuspidata*** (Siebold & Zuccarini) Planchon, Boston-ivy. Frequently grown for ornament, rarely persisting or escaped; native of Japan and China. [= C, F, G, K]

Parthenocissus vitacea (Knerr) A. Hitchcock. Maritime thickets, rich alluvial forests, roadsides, and dumps. QC west to MB, WY, and CA, south to e. VA, n. WV, OH, MO, TX, and AZ. [= C, G, K; = *P. inserta* (Kerner) Fritsch – F, probably misapplied; = *Cissus verticillata* (Linnaeus) Jarvis]



Vitis Linnaeus 1753 (Grape)

A genus of about 60-65 species, vines, of temperate regions of Eurasia and North America. Rossetti et al. (2002) conducted a molecular phylogenetic study of Vitaceae and suggested that recognition of *Muscadinia* as a genus may be warranted; Soejima & Wen (2006) conclude that *Vitis* s.l. (including *Muscadinia*) is monophyletic, the muscadines apparently basal to the rest of the genera. References: Moore (1991)=Z; Ward (2006b)=Y; Wen in Kubitzki, Bayer, & Stevens (2007). Key adapted with little modification from Moore (1991).

1 Tendrils simple; bark adherent (on all but the largest stems), with prominent lenticels; pith continuous through nodes; leaves relatively small and coarsely toothed, never deeply lobed; [subgenus *Muscadinia*].
2 Mature fruits < 10 mm in diameter; infructescences with 12-30 berries; leaf blades 4-8 cm long; [of s. GA southward] ..... ***V. rotundifolia*** *var.* ***munsoniana***
2 Mature fruits > 12 mm in diameter; infructescences with 2-8 (-12) berries; leaf blades usually > 6 cm long; [widespread in our area] ..... ***V. rotundifolia*** *var.* ***rotundifolia***
1 Tendrils bifid to trifid; bark shedding, the lenticels inconspicuous; pith interrupted by diaphragms at nodes; leaves relatively large and finely toothed, often deeply lobed; [subgenus *Vitis*].
3 Mature leaves glaucous beneath (the glaucescence sometimes rather obscured by pubescence); nodes often glaucous; [series *Aestivales*].
4 Mature 3-4 seeded berries > 9 mm in diameter; mature leaves slightly to strongly arachnoid-pubescent beneath; nodes usually not glaucous; nodal diaphragms usually > 2 mm in diameter ..... ***V. aestivalis*** *var.* ***aestivalis***

4 Mature 3-4 seeded berries < 9 mm in diameter; mature leaves glabrous to glabrate beneath; nodes usually glaucous; nodal diaphragms usually < 2 mm in diameter..... ***V. aestivalis*** *var.* ***bicolor***

3 Mature leaves not glaucous beneath; nodes not glaucous.

5 Tendrils or inflorescences present at 3 or more consecutive nodes; leaves densely pubescent beneath; [series *Labruscae*]..... ***V. labrusca***

5 Tendrils or inflorescences present at only 2 consecutive nodes; leaves glabrous or moderately pubescent beneath.

6 Leaves reniform, glabrous beneath at maturity; tendrils absent, present only opposite the uppermost nodes, or sometimes extending down the stem; [section *Ripariae*]..... ***V. rupestris***

6 Leaves cordate to cordate-ovate, glabrous to pubescent beneath at maturity; tendrils present opposite most nodes.

7 Nodal diaphragms < 1 mm wide, usually < 0.5 mm wide; growing shoot tips enveloped by enlarging, unfolded leaves; [section *Ripariae*]..... ***V. riparia***

7 Nodal diaphragms > 1 mm wide; growing shoot tips not enveloped by enlarging, unfolded leaves.

8 Branchlets of the season more or less terete, glabrous or arachnoid-pubescent; mature 3-4 seeded berries usually > 8 mm in diameter; nodes usually not banded with red pigmentation; [series *Cordifoliae*].

9 Nodal diaphragms > 2.5 mm wide; leaves strongly 3-lobed, the tips usually long-acuminate; branchlets of the season with a red or purplish cast..... ***V. palmata***

9 Nodal diaphragms < 2.5 mm wide; leaves unlobed or shallowly lobed, the tips acute to short-acuminate; branchlets of the season gray, green, or brown (sometimes purple only on one side)..... ***V. vulpina***

8 Branchlets of the season angled, arachnoid-pubescent and/or hirtellous-pubescent (or nearly glabrous); mature 3-4 seeded berries < 8 mm in diameter; nodes frequently banded with red pigmentation; [series *Cinerescentes*].

10 Branchlets of the season sparsely to densely hirtellous pubescent, often with arachnoid pubescence as well; leaf undersurfaces usually more-or-less uniformly hirtellous on the veins; [western, east to w. KY, w. TN, sc. AL, and Panhandle FL]..... ***V. cinerea*** *var.* ***cinerea***

10 Branchlets of the season lacking evident hirtellous trichomes (if present, obscured by the arachnoid pubescence; leaf undersurfaces lacking hirtellous pubescence, or only very sparsely so; [collectively widespread in our area].

11 Branchlets glabrate to only slightly arachnoid-pubescent; nodes usually banded with red pigmentation; leaves glabrous to very slightly arachnoid-pubescent beneath; [mostly of the Piedmont and Mountains]..... ***V. cinerea*** *var.* ***baileyana***

11 Branchlets slightly to densely arachnoid-pubescent; nodes usually not banded with red pigmentation; leaves slightly to densely arachnoid-pubescent beneath; [mostly of the Coastal Plain]..... ***V. cinerea*** *var.* ***floridana***

Vitis aestivalis Michaux *var.* ***aestivalis***, Summer Grape. Forests and woodlands, mostly upland. May-June; September-October. MA west to MO and IA, south to s. FL and e. TX. [= RAB, C, F, G, K, WV, Y, Z; = *V. aestivalis* – S; < *V. aestivalis* – GW, W, WH; > *V. rufotomentosa* Small; > *V. simpsonii* Munson]

Vitis aestivalis Michaux *var.* ***bicolor*** Deam, Silverleaf Grape. Forests and woodlands, mostly upland. May-June; September-October. ON and MN south to n. GA and n. AL. [= Z; = *V. aestivalis* var. *argentifolia* (Munson) Fernald – RAB, C, F, G, K, WV; = *V. bicolor* Le Conte – S; < *V. aestivalis* – GW, W]

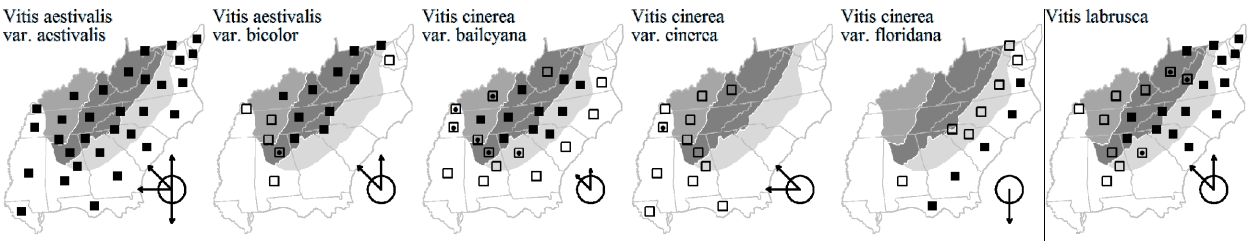
Vitis cinerea (Engelmann in A. Gray) Engelmann ex Millardet *var.* ***baileyana*** (Munson) Comeaux, Possum Grape. Forests and woodlands, mostly bottomlands. Late May-June; September-October. S. PA, s. OH, and se. IN south to c. SC, c. GA, and AL. [= K, Z; = *V. baileyana* – RAB, C, F, G, S; < *V. vulpina* – GW; < *V. cinerea* – W, WV]

Vitis cinerea (Engelmann in A. Gray) Engelmann ex Millardet *var.* ***cinerea***, Graybark Grape, Pigeon Grape. Hammocks, most forests. VA (?), w. KY, wc. TN, IN, and WI, south to Panhandle FL (Okaloosa County), sc. AL and TX. [= RAB, C, F, G, K, WH, Z; = *V. cinerea* – S; < *V. cinerea* – GW, W]

Vitis cinerea (Engelmann in A. Gray) Engelmann ex Millardet *var.* ***floridana*** Munson, Florida Grape. Hammocks, floodplain and other moist forests. Late May-June; August-October. Se. VA south to s. FL, west to s. MS. [= RAB, C, F, G, K, WH, Z; = *V. simpsonii* Munson – S, Y; < *V. cinerea* – GW, W]

Vitis labrusca Linnaeus, Fox Grape. Forests and woodlands, wet, moist, and dry. May-June; September-October. ME west to s. MI, south to n. GA, n. AL, and n. MS. [= RAB, C, GW, K, S, W, Z; > *V. labrusca* var. *labrusca* – F, G; > *V. labrusca* var. *subedentata* Fernald – F, G]

* *Vitis* ×*labruscana* L.H. Bailey [*aestivalis* × *labrusca*], Concord Grape. Commonly cultivated as a table grape. It is sometimes persistent after cultivation. [= K; = *V. labruscana* L.H. Bailey – F] {not keyed; not mapped}



Vitis mustangensis Buckley, Mustang Grape. {habitats}. {Dates}. AR and s. OK south to s. LA and s. TX; disjunct in sc. AL. [= K] {add to synonymy; not yet keyed}

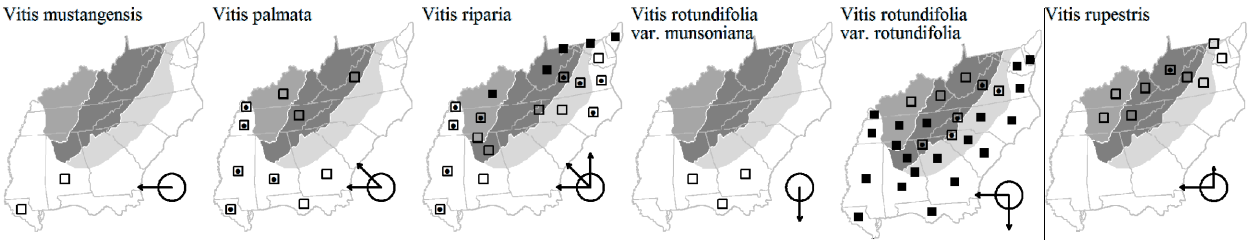
Vitis palmata Vahl, Red Grape, Cat Grape, Catbird Grape. Floodplain forests, riverbanks. Mid June-late June; late July-October. IN, sw. VA (Townsend, pers. comm.. 2009), c. TN (Chester, Wofford, & Kral 1997), sc. GA (Jones & Coile 1988), and FL Panhandle west to MO, OK, and TX. [= C, F, G, GW, K, S, WH, Y, Z]

Vitis riparia Michaux, Riverbank Grape. Forests and woodlands, mostly moist to wet. April-June; August-September. NB west to se. SK, south to VA, NC, c. and w. TN, n. MS, LA, and e. TX, and in the Pacific Northwest. [= RAB, C, G, GW, K, Z, W, WV; > *V. riparia* var. *riparia* – F]

Vitis rotundifolia Michaux *var.* ***munsoniana*** (Simpson ex Munson) M.O. Moore, Munson Grape, Bullace Grape. Floodplain forests, banks of blackwater rivers. Late April-May; late July-September. Sc. GA and s. AL south to s. FL. [= K, Y, Z; = ***Muscadinia munsoniana*** (Simpson ex Munson) Small – S; < *V. rotundifolia* – WH; = *Vitis munsoniana* Simpson ex Munson]

Vitis rotundifolia Michaux *var.* ***rotundifolia***, Muscadine, Scuppernong. Forests, swamps, dunes. May-June; August-October. DE west to s. WV, KY, and MO, south to FL and TX. Cultivars of this species are popular in the Southeastern United States as table grapes and the source of a distinctive wine. [= K, Y, Z; = *V. rotundifolia* – RAB, C, F, GW, W, WV; = ***Muscadinia rotundifolia*** (Michaux) Small – S; < *V. rotundifolia* – WH]

Vitis rupestris Scheele. Along streams and in riverbank scour areas, especially in calcareous areas. April-June; August-September. MD, WV, sw. PA west to MO, south to VA, c. TN, and n. AR. [= C, F, K, W, S, WV, Z]



* *Vitis vinifera* Linnaeus, European Wine Grape. Increasingly cultivated in our area, especially in VA and NC, now significant wine-producing areas. [= K] {not keyed}

Vitis vulpina Linnaeus, Frost Grape, Winter Grape, Chicken Grape. Forests and woodlands, primarily upland, but also in bottomlands. May-June; July-November. Se. NY west to MO and e. KS, south to c. peninsular FL and nc. TX. [= RAB, C, F, G, K, W, WH, WV, Y, Z; < *V. vulpina* – GW; > *V. vulpina* – S; > *V. cordifolia* Michaux – S]

141. KRAMERIACEAE Dumortier 1829 (Krameria Family) [in ZYGOPHYLLALES]

A family of a single genus and about 15-18 species, herbs, shrubs, and trees, of warm (and usually dry) parts of s. North America, Central America, South America, and the West Indies. References: Robertson (1973); Simpson et al. (2004); Simpson in Kubitzki, Bayer, & Stevens (2007).

Krameria Loefling 1758 (Ratany)

A genus of 15-18 species, herbs, shrubs, and trees, hemiparasitic by haustoria. References: Robertson (1973)=Z; Simpson in Kubitzki, Bayer, & Stevens (2007).

Krameria lanceolata Torrey, Trailing Ratany, Sandspur. Sandhills. AR, TX, and s. KS west to se. CO, se. AZ, Chihuahua, and Coahuila; disjunct eastward in the Coastal Plain of Panhandle FL, peninsular FL, and GA (east to Bulloch, Bryan, Evans, and Emanuel counties, GA). [= K, WH, Z; > *K. spathulata* Small – S]

142. ZYGOPHYLLACEAE R. Brown 1814 (Creosote-bush Family) [in ZYGOPHYLLALES]

A family of about 22-27 genera and 230-285 species, trees, shrubs, and (rarely) herbs, of tropical and subtropical regions of the Old and New Worlds. References: Sheahan in Kubitzki, Bayer, & Stevens (2007).

1 Fruit with tubercles, at maturity separating into 10 mericarps ..... ***Kallstroemia***
1 Fruit with spines, at maturity separating into 5 mericarps ..... ***Tribulus***

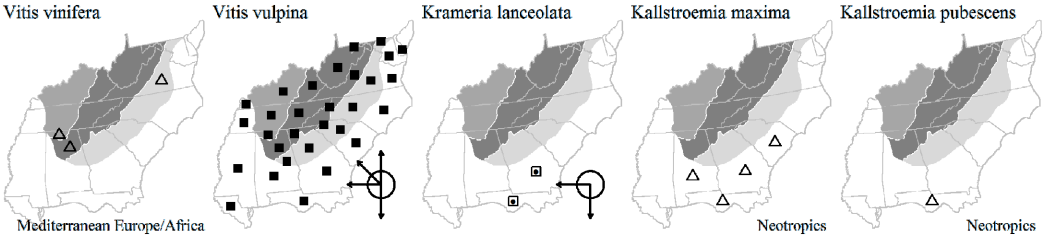
Kallstroemia Scopoli 1777

A genus of about 17 species, herbs, of tropical and subtropical America. References: Porter 1969)=Z; Sheahan in Kubitzki, Bayer, & Stevens (2007)

1 Ovary and fruit glabrous (rarely strigose) ..... ***K. maxima***
1 Ovary and fruit pubescent ..... ***K. pubescens***

Kallstroemia maxima (Linnaeus) Hooker & Arnott, Greater Caltrop. Disturbed areas, dunes; native status uncertain. SC south to FL; West Indies; Mexico (Sinaloa and Tamaulipas) south through Central America to northern South America (Venezuela, Colombia). Early collections from Charleston (Stephen Elliott) and Savannah suggest the likelihood of introduction via ballast. [= RAB, K, S, WH, Z]

* ***Kallstroemia pubescens*** (G. Don) Dandy, Caribbean Calktrop. Disturbed areas; native of tropical America. [= WH]



Tribulus Linnaeus 1753

A genus of about 25 species, herbs, of tropical and subtropical parts of the Old World (introduced in the New World). References: Sheahan in Kubitzki, Bayer, & Stevens (2007).

1 Petals 8-22 mm long; peduncle > 2 cm long; perennial ..... ***T. cistoides***
1 Petals 3-5 mm long; peduncle < 1 cm long; annual ..... ***T. terrestris***

* ***Tribulus cistoides*** Linnaeus, Jamaican Fever-plant. Cp (FL, GA): disturbed areas; rare, native of Africa. Introduced in GA, FL, LA, and TX (Kartesz 1999). [= K, S, WH]
* ***Tribulus terrestris*** Linnaeus, Puncture-weed, Caltrop, Devil's-thorn. Cp (DE, FL, GA, NC, SC): dunes, sandy roadsides, ballast; rare, native of Mediterranean Europe. June-December. [= RAB, C, F, G, K, S, WH]

144. FABACEAE Lindley 1836 *or LEGUMINOSAE* A.L. de Jussieu 1789 (Legume Family) [in FABALES]

A family of about 730 genera and 20,000 species, trees, shrubs, and herbs, cosmopolitan. References: Isely (1990)=SE (throughout the family treatment); Isely (1998)=I; Lewis et al. (2005); Wojciechowski, Lavin, & Sanderson (2004); Wilbur (1963a); Robertson & Lee (1976).

1 Trees, shrubs, or woody vines ..... **Key A**
1 Herbs (including herbaceous vines).
  2 Leaves 4-many-foliolate.
    3 Leaves palmately compound, with 4 or more leaflets ..... **Key B**
    3 Leaves pinnately or bipinnately compound.
      4 Leaves bipinnately compound ..... **Key C**
      4 Leaves pinnately compound ..... **Key D**
  2 Leaves 1-3-foliolate.
    5 Leaves unifoliolate ..... **Key E**
    5 Leaves trifoliolate.
      6 Leaves pinnately trifoliolate ..... **Key F**
      6 Leaves palmately trifoliolate ..... **Key G**

Key A – woody legumes (trees, shrubs, or woody vines)

1 Leaves unifoliolate or trifoliolate, or reduced to phyllodial spines.
  2 Tree; leaves unifoliolate and > 5 cm wide; [subfamily *Caesalpinioideae*, tribe *Cercideae*] ..... ***Cercis***
  2 Shrubs or woody vines (rarely tree in *Erythrina*); leaves trifoliolate, unifoliolate, or reduced to phyllodial spines (if unifoliolate, < 2 cm wide); [subfamily *Papilionoideae*].
    3 Woody vine.
      4 Calyx 4.5-6 mm long; leaflets unlobed; [tribe *Phaseoleae*, subtribe *Diocleinae*] ..... ***Lackeya***
      4 Calyx 10-12 mm long; leaflets generally lobed; [tribe *Phaseoleae*, subtribe *Glycininae*] ..... ***Pueraria***
    3 Shrub or tree.
      5 Shrub or tree with twigs various, but not conspicuously green or flanged; leaves pinnately trifoliolate.
        6 Corolla 30-50 mm long, scarlet; legume with several seeds; leaflets lobed or not; [tribe *Phaseoleae*, subtribe *Erythrininae*] ..... ***Erythrina***
        6 Corolla 8-15 mm long, purplish, pink, or white; legume 1-seeded; leaflets not lobed; [tribe *Desmodieae*, subtribe *Lespedezinae*] ..... ***Lespedeza***
      5 Shrub with angled or flanged green twigs; leaves palmately trifoliolate, unifoliolate, or reduced to spine-tipped phyllodes; flowers bright yellow; [introduced, usually of roadsides or as remnants of cultivation]; [tribe *Genisteae*, subtribe *Genistinae*].
        7 Leaves all reduced to phyllodial spines; flowers axillary; calyx 10-15 mm long ..... ***Ulex***
        7 Leaves with normal lamina, either unifoliolate or trifoliolate; flowers in terminal racemes; calyx 3-6 mm long.
          8 Leaves trifoliolate lower on the stem, often unifoliolate above; corolla 15-22 mm long ..... ***Cytisus***
          8 Leaves unifoliolate throughout; corolla 10-14 mm long ..... ***Genista***
1 Leaves pinnate.
  9 Woody vines; [subfamily *Papilionoideae*].
    10 Leaves even-pinnate; legume 3.5-4 cm long; seeds shiny scarlet and black; [tribe *Abreae*] ..... ***[Abrus]***
    10 Leaves odd-pinnate; legume 4-15 cm long; seeds brown; [tribe *Milletieae*] ..... ***Wisteria***

9 Trees or shrubs.
11 Leaves 2×-even-pinnate; [subfamily *Mimosoideae*]
12 Inflorescence cylindrical, elongate, bicolored (the basal flowers sterile, with pink staminodes, the upper fertile, yellowish); [tribe *Mimoseae*] ..... ***Dichrostachys***
12 Inflorescence spherical or hemispheric, as wide as long, all the flowers fertile and of the same color.
13 Stamens connate at the base; inflorescence pink, 2.5-5 cm in diameter; [tribe *Ingeae*]
14 Petioles with glands; leaves with >4 pinnae pairs, each pinna with >10 pinnule pairs; inflorescence 2.5-5 cm in diameter ..... ***Albizia***
14 Petioles lacking glands; leaves with 2 pinnae pairs, each pinna with <8 pinnule pairs; inflorescence 5-7 cm in diameter ..... ***Calliandra***
13 Stamens free; inflorescence orange or yellowish-white, 1.0-2.2 cm in diameter.
15 Inflorescence yellowish-white, 1.8-2.2 cm in diameter; stamens 10; [tribe *Mimoseae*] ..... ***Leucaena***
15 Inflorescence orange, 1.0-1.3 cm in diameter; stamens many; [tribe *Acacieae*] ..... ***Vachellia***
11 Leaves otherwise.
15 [subfamily *Papilionoideae*].
16 Leaves glandular-punctate; corolla of only 1 petal; inflorescence a spike; shrubs; [tribe *Amorpheae*] ..... ***Amorpha***
16 Leaves not glandular-punctate; corolla of 5 petals; inflorescence a raceme or panicle; trees or shrubs.
17 Leaflets alternate on the rachis; leaflets 4-15 (-20) cm long; [tribe *Sophoreae*] ..... ***Cladrastis***
17 Leaflets opposite on the rachis, leaflets (1-) 2-5 (-6) cm long.
18 Flowers in an upright, stiff raceme or panicle; flowers creamy white with some blue; [tribe *Sophoreae*] ..... ***Maackia***
18 Flowers in dangling racemes; flowers white or pink.
19 Leaflets with persistent linear stipels; [tribe *Robinieae*] ..... ***Robinia***
19 Leaflets lacking stipels; [tribe *Sophoreae*] ..... ***Styphnolobium***
15 [subfamily *Caesalpinioideae*].
20 Leaves all 2-pinnate, or a mixture of 2-pinnate and 1-pinnate on the same plant; shrub or tree; [tribe *Caesalpineae*].
21 Leaves a mixture of 1-pinnate and 2-pinnate ..... ***Gleditsia***
21 Leaves all 2-pinnate.
22 Leaves petiolate; leaflets 20-70 mm long ..... ***Gymnocladus***
22 Leaves subsessile (the pinnae simulating 1-pinnate leaves); leaflets 1-5 mm long ..... ***Parkinsonia***
20 Leaves all 1-pinnate (or appearing so in *Parkinsonia*); herb, shrub or tree.
23 Shrub with prominent glands on the leafstalk; [tribe *Cassieae*] ..... ***Senna***
23 Tree or shrub (if a shrub, then lacking prominent glands on the leafstalk); [tribe *Caesalpineae*].
24 Leaflets 13-45 mm long; tree; leaves 1-pinnate ..... ***Gleditsia***
24 Leaflets 1-5 mm long; shrub; leaves actually 2-pinnate, but subsessile, the pinnae simulating 1-pinnate leaves .... ***Parkinsonia***

Key B – herbaceous legumes with palmate leaves with 4 or more leaflets

Lupinus, Orbexilum, Pediomelum, Psoralidium, Zornia

Key C – herbaceous legumes with bipinnate leaves

1 Stamens > 10 ..... ***Acaciella***
1 Stamens 10 or fewer,
2 Petiole with 1-several glands; stems ascending to erect; flowers greenish-white ..... ***Desmanthus***
2 Petiole without glands; stems prostrate to weakly arching; flowers pink-purple, yellow, or greenish-yellow.
3 Flowers pink-purple; legume ribbed, the ribs with prickles ..... ***Mimosa***
3 Flowers yellow to greenish-yellow; legume not ribbed or prickly ..... ***Neptunia***

Key D – pinnate plus

Aeschynomene, Apios, Arachis, Astragalus, Chapmannia, Chamaecrista, Cicer, Clitoria, Dalea, Galactia, Glottidium, Glycyrrhiza, Lathyrus, Lens, Lotus, Pisum, Securigera, Sesbania, Tephrosia, Vicia

Key E – unifoliolate

Alysicarpus, Baptisia, Crotalaria, Lupinus, Orbexilum, Pediomelum, Rhynchosia, Scorpiurus

Key F – pinnately trifoliolate

Acmispon, Amphicarpaea, Canavalia, Centrosema, Clitoria, Cullen, Dalea, Desmodium, Erythrina, Galactia, Glycine, Indigofera, Lablab, Lespedeza, Lotus, Macroptilium, Medicago, Melilotus, Mucuna, Orbexilum, Pediomelum, Phaseolus, Rhynchosia, Stylosanthes, Strophostyles, Trifolium, Vigna

Key G – palmately trifoliolate

Abrus Adanson 1763 (Precatory Bean)

A genus of about 17 species, woody vines and shrubs, of the Old World tropics, now pantropical. References: Isely (1998)=I.

* *Abrus precatorius* Linnaeus, Precatory Bean, Rosary Pea, Crab's Eye, Jequirity. Native of the Paleotropics, and apparently reported for GA, AL, and AR by Isely (1998) and Kartesz (1999), but this is actually based on mislabeling in Map 64 in Isely (1998). The species does occur in peninsular FL, south of our area. The beautiful black-and-red beans have been traditionally used for jewelry and rosaries; they are extremely poisonous, though, and should be used with caution. [= I, K, WH; = *Abrus abrus* (Linnaeus) L.F. Wight – S] {not keyed; not mapped; rejected as a component of our flora}

Acaciella Britton & Rose 1928 (Acacia)

A genus of about 15 species, of sc. and se. United States south to Argentina. References: Isely (1998)=I.

Acaciella hirta Britton & Rose, Prairie Acacia. Sandhills, disturbed sandy areas. W. LA, AR, and MO west to KS, OK, and TX; disjunct in e. Panhandle FL and n. peninsular FL. [= S; = *Acacia angustissima* (P. Miller) Kuntze var. *hirta* (Nuttall) B.L. Robinson – I, K, SE, WH; = *Acacia hirta* Nuttall]

Acmispon Rafinesque 1832 (American Bird's-foot-trefoil, Prairie-trefoil)

A genus of about 8 species, annual and perennial herbs, of temperate North America and South America. New World taxa often referred to *Lotus* are not closely related to *Lotus*, and should be segregated (Degtjareva et al 2006; Allan & Porter 2000). References: Isely (1981)=Z; Isely (1998)=I; Degtjareva et al. (2006); Allan & Porter (2000); Grant & Small (1996).

1 Leaflets 3-3.5× as long as wide; plants pubescent, the hairs long; [alien] ..... ***A. americanum***
1 Leaflets 4-5× as long as wide; plants glabrate, the hairs short; [native of Piedmont of sc. VA, NC, SC, and e. GA] ..... ***A. helleri***

* ***Acmispon americanum*** (Nuttall) Rydberg, Western Prairie-trefoil. Disturbed areas, waste-combing mills. [= S; < *L. americanus* (Nuttall) Bischoff – F; < *L. purshianus* F.E. & E.G. Clements – G; = *L. unifoliolatus* (Hooker) Bentham var. *unifoliolatus* – K; = *L. purshianus* F.E. & E.G. Clements var. *purshianus* – C, I, SE, Z]

Acmispon helleri (Britton) A.A. Heller, Carolina Prairie-trefoil. Dry woodlands and openings, originally probably limited to prairie-like sites (fire-maintained, post oak-blackjack oak savannas), generally on clayey soils, now primarily seen on roadbanks, along railroads, and in powerline rights-of-way, where mowing and bush-hogging have replaced fire as the force keeping the habitat open, sunny, and suitable for this plant of prairie affinities. (June-) July-August (-September). *A. helleri* is endemic to the Piedmont of extreme sc. VA, NC, SC, and ne. GA. *A. helleri* is clearly closely related to *A. americanus* (= *Lotus unifoliolatus*, = *Lotus purshianus*, = *Lotus americanus*), of prairies of the midwestern states and various habitats further west, which ranges east to LA, AR, MO, IL, IN, and WI. Isely (1981) reduced *A. helleri* to a variety (in *Lotus*), because it "is but one of many elements within the *L. purshianus* complex and its differences from the rest are less than among the California races," while also stating "since it has no breeding contact with var. *purshianus*, it is reasonably maintained as a species." Since *A. helleri* seems adequately separated from *A. americanus* by its narrower leaflets, glabrate vestiture, and allopatric distribution, I choose to reasonably maintain it as a species. [= S; = *Lotus helleri* Britton – RAB; < *L. americanus* (Nuttall) Bischoff – F; < *L. purshianus* F.E. & E.G. Clements – G; = *L. unifoliolatus* (Hooker) Bentham var. *helleri* (Britton) Kartesz & Gandhi – K; = *L. purshianus* F.E. & E.G. Clements var. *helleri* (Britton) Isely – C, I, SE, Z]

Aeschynomene Linnaeus 1753 (Joint-vetch)

A genus of about 175 species, herbs and shrubs, pantropical and warm temperate. References: Carulli, Tucker, & Dill (1988)=Z; Rudd (1955)=Y; Isely (1998)=I. Key adapted in part from SE.

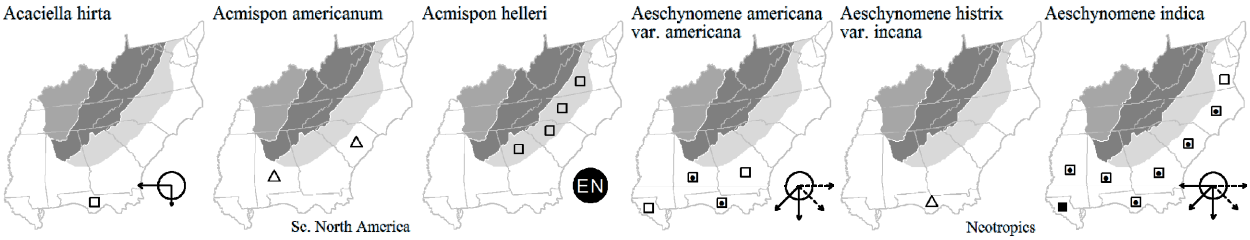
1 Prostrate perennial; leaves with 3-18 leaflets [of dry, sandy or disturbed areas].
  2 Leaves with 8-18 leaflets; leaflets 3-4 mm long; [rare alien, of disturbed areas] ..... ***A. hystrix*** *var.* ***incana***
  2 Leaves with 3-7 (-9) leaflets; leaflets 4-12 mm long; relatively common native, of dry sandy pinelands] ..... ***A. viscidula***
1 Erect or ascending annual; leaves with 20-50 or more leaflets; [of moist to wet habitats].
  3 Leaflets with 2-4 longitudinal nerves; mature fruit stipe 1.5-3 mm long ..... ***A. americana*** *var.* ***americana***
  3 Leaflets with 1 longitudinal nerve; mature fruit stipe 4-25 mm long.
    4 Mature fruit stipe 12-25 mm long; corolla (10-) 12-15 mm long; fruit segments 5-7 mm long, 4.5-6.5 mm wide; paired bracts subtending each flower toothed (rarely entire); standard greenish-yellow with distinct dark-red veins; leaflets 6-25 mm long, 2-5 mm wide ..... ***A. virginica***
    4 Mature fruit stipe 4-8 (-10) mm long; corolla 7-13 (-15) mm long; fruit segments 4-6 mm long, 3.5-6 mm wide; paired bracts subtending each flower toothed or entire; standard pale orange or reddish-orange, the veins usually indistinct; leaflets 2.5-25 mm long, 1-4 mm wide.

5 Paired bracts subtending each flower entire (rarely toothed); leaflets 2.5-13 mm long, 1-2.5 mm wide; fruit segments 4-5 mm wide, 3.5-5 mm wide ..... ***A. indica***
5 Paired bracts subtending each flower toothed (rarely entire); leaflets 6-25 mm long, 1.5-4 mm wide; fruit segments 5-6 mm wide, 5-6 mm wide ..... ***A. rudis***

Aeschynomene americana Linnaeus *var.* ***americana***, Shyleaf. Moist, disturbed sites. S. GA (Jones & Coile 1988, SE), s. AL, s. LA south to Central America; West Indies; se. Asia. [= I, SE, Y; < *A. americana* – K, S, WH]

* ***Aeschynomene histrix*** Poiret *var.* ***incana*** (Vogel) Bentham. Disturbed areas; native of tropical America. Probably introduced on ship's ballast at Pensacola in the 19th century, but seemingly established as it was recollected in Escambia County, FL, in 1985 (Isely 1990). [= K, WH; = *A. hystrix* var. *incana* – SE, orthographic variant]

Aeschynomene indica Linnaeus, Southern Joint-vetch Marshes, ditches, disturbed wetlands. July-October. Apparently native to se. North America, from NC west to AR, south to s. FL and TX, now widespread in the tropics and subtropics of the Old World and New World. Perry, Ware, & McKenney-Mueller (1998) discuss the occurrence of this species in VA. [= GW, I, K, SE, WH, Y, Z; < *Ae. virginica* – S]



* ***Aeschynomene rudis*** Bentham, Frisolillo. Roadside ditches, rice fields, disturbed wetlands; native of South America. July-October. Native to South America, introduced in se. United States, recently becoming a weed. [= I, K, SE, WH, Y, Z]

Aeschynomene virginica (Linnaeus) Britton, Sterns, & Poggenburg, Northern Joint-vetch, Sensitive Joint-vetch. Fresh to brackish tidal marshes and adjacent ditches, fields, and disturbed areas. July-October. NJ to ne. NC. Generally not weedy in most of its range, but in NC (now) found mostly in weedy situations, such as ditches or fields hydrologically connected to tidal waters. See Tyndall, Holt, & Lam (1996) and Belden & Van Alstine (2003) for additional information on habitat, population biology, and survey techniques. See Baskin et al. (1998) for additional information about seed germination and viability. [= RAB, C, F, G, I, K, SE, Y, Z; < *A. virginica* – S (also see *A. indica*)]

Aeschynomene viscidula Michaux, Sticky Joint-vetch. Dry sandy areas, such as sandhills, dry pinelands, and barrier islands. From s. GA (Jones & Coile 1988; Carter, Baker, & Morris 2009; SE), panhandle FL, s. AL, s. MS, and s. TX south to s. FL; tropical America. [= I, K, SE, WH, Y; = *Secula viscidula* (Michaux) Small – S]

Albizia Durazzini 1772 (Silktree)

A genus of about 100-120 species, trees, shrubs, and vines, of tropical, subtropical, and warm temperate Asia, Africa, and America. References: Isely (1973)=Z; Isely (1998)=I.

1 Leaflets 7-15 mm long; bark of mature trees smoothish, with small wart-like bumps ..... ***A. julibrissin***
1 Leaflets 15-30 mm long; bark of mature trees rough, with plates ..... ***A. kalkora***

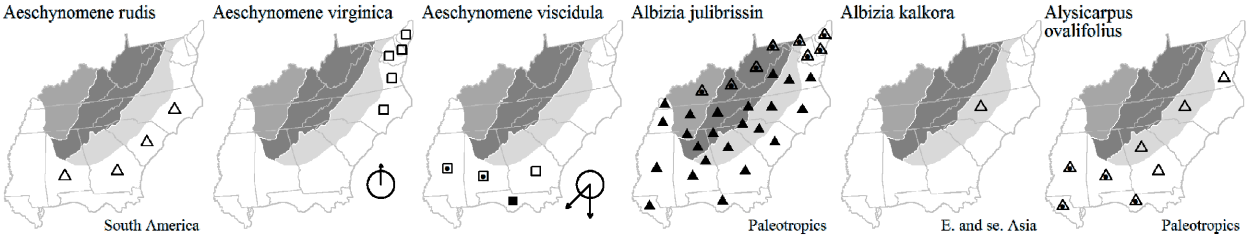
* ***Albizia julibrissin*** Durazzini, Mimosa, Silktree. Disturbed areas, suburban woodlots, escaped and persistent in forests and woodlands; native of tropical Asia. May-August; July-November. Becoming a serious weed; "literally almost everywhere in the 'Dixie' south" (Isely 1973). [= RAB, C, I, K, SE, W, WH, Z; = *Albizzia julibrissin* – F, G, S, orthographic variant]

* ***Albizia kalkora*** (Roxburgh) Prain, Kalkora Mimosa. Naturalizing in suburban areas; native of e. Asia (Japan, Korea, Taiwan). Documented by herbarium specimens at DUKE and NCU. Apparently hybridizing with *A. julibrissin* (W. Cook, pers. comm.).

Alysicarpus Necker ex Desvaux 1813 (Alyce Clover)

A genus of about 25-30 species, herbs, native of the Old World tropics. References: Isely (1998)=I.

* ***Alysicarpus ovalifolius*** (Schumacher) J. Léonard, Alyce Clover. Disturbed areas; native of the Old World Tropics, planted as a forage crop (at least formerly), and rarely naturalized. The VA occurrence is from chrome ore piles in Newport News – presumably a waif. It is possible that *A. vaginalis* (in the strict sense) is represented in our area as well. It differs from *A. ovalifolius* in having a densely congested inflorescence (with rachis internodes shorter than the flowers) vs. a lax inflorescence with the flowers much shorter than the rachis internodes. [= WH; < *Alysicarpus vaginalis* (Linnaeus) A.P. de Candolle – I, K, SE]



Amorpha Linnaeus 1753 (Indigo-bush, Leadplant)

A genus of about 15 species, shrubs, of temperate North America. References: Straub, Sorrie, & Weakley (2009)=X; Wilbur (1964)=Z; Wilbur (1975)=Y; Isely (1998)=I.

1 Short shrubs, usually 0.3-1 (-1.5) m tall; petioles 1-15 (-20) mm long, usually shorter than the width of the contiguous leaflets (except in *A. confusa*); leaflets usually slightly or conspicuously revolute.
  2 Leaflet mucros mostly swollen apically; plant usually evidently and rather densely pubescent or puberulent (except *A. herbacea* var. *floridana*, of s. GA and FL).
    3 Upper portions of the plant (stems and leaves) glabrescent; calyx tube glabrous to sparsely or densely minutely strigillose; fruit glabrous; [of s. GA southward] ..... ***A. herbacea*** *var.* ***floridana***
    3 Upper portions of the plant (stems and leaves) conspicuously pubescent; calyx tube densely puberulent to short pilose; fruit densely to sparsely puberulent (rarely glabrate); [widespread in our area] ..... ***A. herbacea*** *var.* ***herbacea***
  2 Leaflet mucros mostly tapered apically; plant usually glabrous or sparsely pubescent.
    4 Leaflets (10-) 15-25 (-35) mm long, (7-) 9-15 (-18) mm wide; standard intense (rarely light) bright blue; petiole (6-) 8-15 (-20) mm long; racemes mostly panicled, (1-) 3-5 (-8) per flowering branch, 10-20 (-45) cm long; flowering June-July ..... ***A. confusa***
    4 Leaflets (3-) 6-10 (-15) mm long, (2-) 3-5 (-8) mm wide; standard reddish-purple; petiole 1-3 (-5) mm long; racemes solitary (less commonly panicled), 1 (-4) per flowering branch, (2-) 3-5 (-6) cm long; flowering April-May ..... ***A. georgiana***
1 Taller shrubs, usually 1-3 (-4) m tall, petioles 10-30 mm long, usually exceeding the width of the contiguous leaflets; leaflets not revolute, or slightly so.
  5 Calyx lobes (1.2-) 2.0-3.5 mm long (thus approaching, equal to, or exceeding the length of the calyx tube); racemes 3-8 (-15) cm long ..... ***A. schwerinii***
  5 Calyx lobes (0-) 0.2-1.2 mm long (thus distinctly shorter than the calyx tube); racemes 5-20 (-25) cm long.
    6 Calyx lobes obsolete to very small, (0-) 0.2-0.6 (-0.8) mm long; plants glabrous to glabrate; leaflets usually not mucronate, the midrib commonly terminating in a sessile or shortly exserted (0.2-0.4 mm), slightly enlarged, glandular tip; leaflets relatively few, (9-) 11-15 (-19) ..... ***A. glabra***
    6 Calyx lobes small, 0.2-1.2 mm long (the abaxial lobe usually 0.8-1.2 mm long); plants pubescent or puberulent, usually conspicuously so; leaflets usually mucronate, the midrib usually slender, exserted, 0.5-1.5 mm long and tapering; leaflets relatively many, 9-23 (-31).
      7 Foliage remaining green when dried; leaflets (7-) 9-23 (-31) per leaf, dull to somewhat shiny above; [widespread in our area] ..... ***A. fruticosa***
      7 Foliage blackening when dried; leaflets (7-) 9-15 (-19) per leaf, usually shiny above; [of s. SC and southward] ..... ***A. nitens***

Amorpha confusa (Wilbur) S.C.K. Straub, Sorrie, & Weakley, Savanna Indigo-bush. Pine savannas. (May-) June-July; August-October. *A. confusa* is a narrow endemic of the se. Coastal Plain of NC (Brunswick, Columbus, and Bladen counties) and immediately adjacent SC (Horry County). It is restricted to moist loamy savannas, especially on the Foreston soil series, a habitat now largely destroyed by fire suppression, real estate development, and conversion of savannas to pine tree farms. [= X; = *Amorpha georgiana* Wilbur var. *confusa* Wilbur – I, K, SE, Y, Z; < *A. georgiana* – RAB, GW; ? *A. cyanostachya* auct. non M.A. Curtis – S, in part]

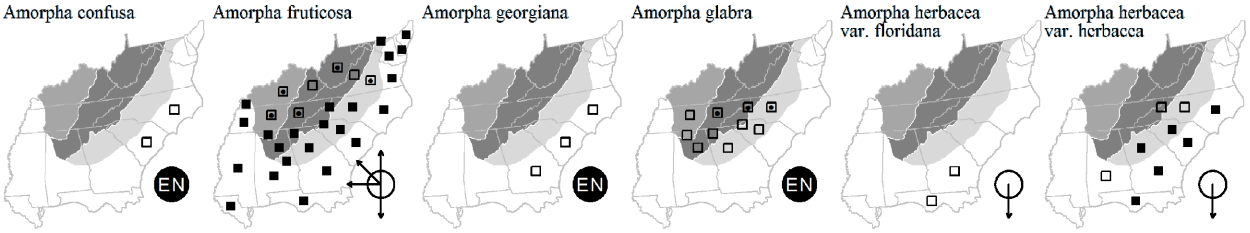
Amorpha fruticosa Linnaeus, Tall Indigo-bush. Riverbanks, forests, woodlands, marsh edges, sometimes in disturbed sites. April-June; June-October. [= RAB, C, G, GW, I, K, SE, W, WH, Y; > *A. fruticosa* var. *fruticosa* – F; > *A. fruticosa* var. *tennessensis* (Shuttleworth) E.J. Palmer – F; > *A. curtissii* Rydberg – S; > *A. fruticosa* – S; > *A. tennesseensis* Shuttleworth – S; > *A. virgata* Small – S]

Amorpha georgiana Wilbur, Georgia Indigo-bush. Pine savannas, sandy river terraces. Late April-June; July-October. *A. georgiana* is endemic to the Coastal Plain of sc. NC, SC, and se. GA, primarily in the fall-line Sandhills region, but rarely found on younger terraces (as far east as Pender County, NC). Much of its habitat has been destroyed. [= X; = *Amorpha georgiana* Wilbur var. *georgiana* – I, K, SE, Y, Z; < *A. georgiana* – RAB, GW]

Amorpha glabra Desfontaines ex Poiret, Appalachian Indigo-bush, Mountain Indigo. Dry to dry-mesic ridgetop and slope forests, primarily in the Blue Ridge escarpment. May-July; July-October. Endemic to the Southern Appalachian mountains (and nearby provinces) of n. AL, ne. GA, w. NC, nw. SC, and e. and c. TN. [= RAB, I, K, S, SE, W, Y]

Amorpha herbacea Walter *var.* ***floridana*** (Rydberg) Wilbur, Florida Indigo-bush. Pine flatwoods and sandy river terraces. Se. GA (Echols County) south into FL (Sorrie 1998b). [= Y, Z; < *A. herbacea* var. *herbacea* – I, K, SE; = *A. floridana* Rydberg – S; < *A. herbacea* – WH]

Amorpha herbacea Walter *var.* ***herbacea***, Dwarf Indigo-bush. Pine savannas, pine flatwoods, sandhills, other open forests and disturbed sites. May-July; July-October. Endemic to FL, GA, SC, and NC, mostly limited to the Coastal Plain. [= Y, Z; < *A. herbacea* – RAB, W, WH; = *A. herbacea* – S; < *A. herbacea* var. *herbacea* – I, K, SE]



Amorpha nitens Boynton, Dark Indigo-bush. Sandy woodlands, rocky slopes, bottomland forests. April-June. S. SC south to GA, west to LA, north in the interior to w. KY, s. IL, AR, and e. OK. First reported for SC by Nelson & Kelly (1997). [= I, K, S, SE, Y]

Amorpha schwerinii C. Schneider, Piedmont Indigo-bush. Forests and woodlands, primarily rather xeric and rocky (though not exclusively so). April-June; June-October. Endemic to the Piedmont (rarely adjacent provinces) of sc. NC, c. SC, nc. GA, e. AL, and ne. MS. [= RAB, I, K, S, SE, Y]

Amphicarpaea Elliott ex Nuttall 1818 (Hog-peanut)

A genus of 5-6 species, of e. and se. Asia, North America, and montane Africa. It now appears that 2-3 semi-cryptic taxa should be recognized in what has traditionally been considered a single species of *Amphicarpaea* (Callahan 1997, Parker 1996). The genus name has been corrected to *Amphicarpaea* from the frequently used *Amphicarpa*. References: Callahan (1997)=Y; Parker (1996)=Z; Isely (1998)=I.

Identification notes: Producing inflorescences of two types, one with chasmogamous flowers and aerial legumes, the other with cleistogamous flowers and subterranean legumes.

1 Petiole 3.5-5.3 cm long; petiolule of the terminal leaflet (not including the rachis extending from the point of connection of the lateral leaflets to the joint marking the beginning of the petiolule of the terminal leaflet) 1.0-1.4 mm long; terminal leaflet 4.2-5.2 cm long ..... ***A. bracteata*** *var.* ***bracteata***

1 Petiole 6.0-6.8 cm long; petiolule of the terminal leaflet 1.7-1.9 mm long; terminal leaflet 5.5-6.1 cm long ..... ***A. bracteata*** *var.* ***comosa***

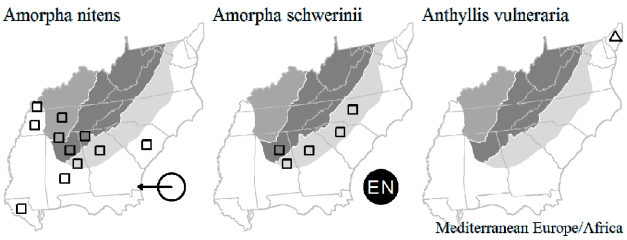
Amphicarpaea bracteata (Linnaeus) Fernald *var.* ***bracteata***, Hog-peanut. {Mt, Pd, Cp (DE, GA, NC, SC, VA, WV) {FL}: dry to moist forests, thickets; common (rare in FL?). July-September; August-October. {The distributions and habitats of the two varieties in our area require herbarium and field investigation}. [= K; = *Amphicarpa bracteata* var. *bracteata* – F, G, orthographic variant; < *Amphicarpaea bracteata* – C, I, SE, WH; < *Amphicarpa bracteata* – RAB, orthographic variant; < *Falcata comosa* (Linnaeus) Kuntze – S]

Amphicarpaea bracteata (Linnaeus) Fernald *var.* ***comosa*** Fassett, Hog-peanut. {Mt, Pd, Cp (DE, GA, NC, SC, VA, WV): dry to moist forests, thickets; common. July-September; August-October. {The distributions and habitats of the two varieties in our area require herbarium and field investigation}. [= K; = *Amphicarpa bracteata* var. *comosa* – F, G, orthographic variant; < *Amphicarpaea bracteata* – C, I, SE, WH; < *Amphicarpa bracteata* – RAB, orthographic variant; < *Falcata comosa* (Linnaeus) Kuntze – S]

Anthyllis Linnaeus 1753 (Kidney-vetch)

A genus of about 20 species, annual and perennial herbs, of the Mediterranean region. References: Isely (1998)=I.

Anthyllis vulneraria Linnaeus, Kidney-vetch. Disturbed areas; native of Mediterranean Europe. June-August. [=I, K2]



Apios Fabricius 1759 (Groundnut)

A genus of about 7-10 species, perennial vines, of temperate e. Asia and e. North America. References: Woods (2005)=Z; Isely (1998)=I. Key based on Z.

1 Petiole 20-58 mm long; flower deep maroon to pale maroon and white; style glabrous; legume 6-10 (-12) cm long; seed 5-6 mm long; tubers several in a chain, each 2-10 cm in diameter ..... ***A. americana***

1 Petiole 70-75 mm long; flower pale green and rose-purple; style bearded; legume 12-15 (-18) cm long; seed 7.2-11.0 mm long; tuber 1, 15-20 cm in diameter ..... ***A. priceana***

Apios americana Medikus, Common Groundnut. Marshes, wet thickets, streambanks, bottomland forests. June-August; July-September. NS, NB, and QC west to MN and SD, south to s. FL and TX. [= RAB, C, GW, I, K, SE, W, WH, Z; > *A. americana* var. *americana* – F, G; > *A. americana* var. *turrigera* Fernald – F, G; = *Glycine apios* Linnaeus – S]

Apios priceana B.L. Robinson, Kentucky Groundnut, Price's Potato-bean. Mixed oak woods, especially over limestone. Sw. KY, c. TN, ne. MS, and n. and c. AL. [= C, F, G, I, K, SE, Z; = *Glycine priceana* (B.L. Robinson) Britton – S]

Arachis Linnaeus 1753 (Peanut)

A genus of about 60 species, annual and perennial herbs, native of South America (especially Brazil). References: Isely (1998)=I.

1 Petiole 5-10 cm long; corolla 1.1.5 cm long; annual ..... ***A. hypogaea***
1 Petiole 2.5-3.5 cm long; corolla 1.8-2 cm long; perennial ..... ***A. prostrata***

* ***Arachis hypogaea*** Linnaeus, Peanut. Fields; commonly cultivated, rarely persistent; native of South America. July-October. This remarkable plant bears normal aerial flowers, but following pollination the pedicels elongate and arch downward, the legume soon buried and developing underground. [= RAB, C, F, I, K, S, SE, WH]

* ***Arachis prostrata*** Bentham, Grassnut. Disturbed areas; native of South America, planted on raodsides and spreading. July-October. Anderson (2007) states that this is "naturalized and spreading;" the species is reported for Charlton County, GA (Carter, Baker, & Morris 2009). [= K, WH; ? *A. glabrata* Bentham – I, SE, misapplied] {add to synonymy S}

Astragalus Linnaeus 1753 (Milkvetch)

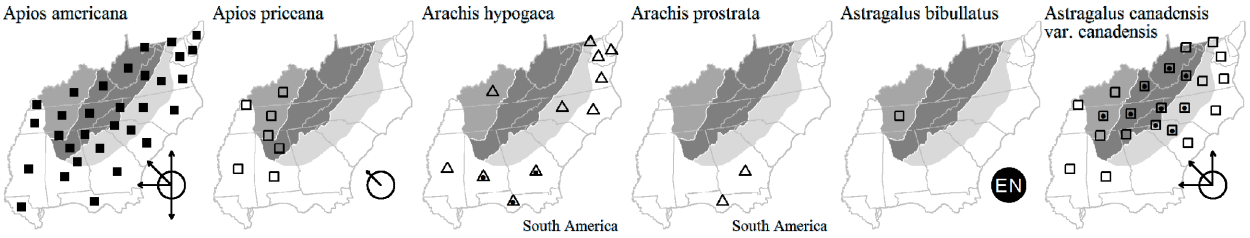
A grenus of 2300-2500 species, herbs and shrubs, most diverse in arid regions of w. North America and w. and c. Asia. The habitats of the southeastern species may be characterized as rocky or sandy, "relictual islands" of aridity in the generally moist landscape of eastern North America. References: Barneby (1964)=Z; Isely (1998)=I.

1 Legume pilose with > 1 mm or more long; stems conspicuously pubescent, the hairs spreading and simple; plants decumbent, spreading, or ascending, the stems 0.5-4 dm long.
  2 Corolla 14-19 mm long; leaflets 17-29; legume bilocular; calyx lobes shorter than the calyx tube; [of calcareous habitats of the interior] ..... ***A. tennesseensis***
  2 Corolla 8-12 mm long; leaflets (5-) 7-15; legume unilocular; calyx lobes equaling or longer than the calyx tube [of dry sandy habitats from SC south] ..... ***A. villosus***
1 Legume glabrous; stems glabrous or inconspicuously pubescent, the hairs appressed, simple or dolabriform; plants erect with stems (3-) 4-15 dm long, or decumbent with stems 1-3 dm long (*A. distortus* var. *distortus* and *A. bibullatus*).
  3 Plants erect, stems (3-) 4-15 dm long; legume straight to moderately curved.
    4 Lower stipules connate; pubescence dolabriform; legumes 1-1.5 cm long, 4-5 mm in diameter; [typically of dry to mesic soils] ..... ***A. canadensis*** *var.* ***canadensis***
    4 Lower stipules free; pubescence simple; legumes either longer or wider (2-3 cm long and 4-6 mm in diameter in *A. michauxii*, 1.5-2.0 cm long and 8-18 mm in diameter in *A. neglectus*); [typically of notably dry, either rocky or sandy, soils].
      5 Leaves with 21-31 coriaceous to somewhat fleshy leaflets, many of the leaflets alternate or subopposite; legumes 2-3 cm long, 4-6 mm in diameter; [of dry sandy habitats from NC south] ..... ***A. michauxii***
      5 Leaves with 11-23 thin-textured leaflets, all of the leaflets usually opposite; legumes 1.5-2 cm long, 8-18 mm in diameter; [of rocky calcareous habitats from VA north] ..... ***A. neglectus***
  3 Plants decumbent or ascending, stems 1-5 dm long; legume either dry and strongly curved (about 90 degrees), or globose and initially fleshy.
    6 Legume globose, 1.3-2 cm in diameter, initially fleshy; corolla 18-25 mm long; [of calcareous glades of c. TN] ..... ***A. bibullatus***
    6 Legume lanceolate, 1.2-2.5 cm long, 4-7 mm wide, strongly curved; corolla (7-) 8-15 mm long; [of shaley habitats from w. VA northward or of dry sandy sites in FL and possibly adjacent GA].
      7 Leaflets mostly 1-2× as long as wide, typically noticeably notched at the tip; mature legume reticulately textured; corolla 8-11 mm long; [of dry sandy sites in FL and possibly adjacent GA and s. MS] ..... ***A. obcordatus***
      7 Leaflets mostly 2-3.5× as long as wide, truncate or shallowly notched at the tip; mature legume lacking a reticulately textured surface; corolla 9-15 mm long; [**either** of shaley habitats from w. VA northward **or** of woodlands and prairies from MS westward]
        8 Keel 7-9.5 mm long; legume usually 3-4× as ling as wide, often curved 90°, grooved along sutures on both sides ..... ***A. distortus*** *var.* ***distortus***
        8 Keel 6-7 mm long; legume usually 2.5-3.5x as long as wide, nearly straight or curved < 90°, grooved only along one suture ..... ***A. distortus*** *var.* ***engelmannii***

Astragalus bibullatus Barneby & E.L. Bridges, Pyne's Ground-plum. Calcareous glades. Endemic to c. TN (Barneby & Bridges 1987). [= I, K, SE; = *Geoprumnon crassicarpum* (Nuttall) Rydberg ex Small – S, misapplied; = *A. crassicarpus* Nuttall, misapplied]

Astragalus canadensis Linnaeus *var.* ***canadensis***, Canada Milkvetch. Forests, woodlands, streambanks, rocky slopes and bluffs. June-August; July-October. Ranging through much of North America, from QC and Hudson Bay west to BC, south to GA, TX, CO, and Utah; also apparently in Siberia. The other varieties occur further west. See Barneby (1964) for a detailed

discussion of taxonomic and nomenclatural problems involving *A. canadensis*. Barneby comments that "the eastern mountain race [in the Appalachians] is commonly distinguished from var. *canadensis* of the Mississippi Valley and northward by a narrower and more open flowering and fruiting raceme, and the flowers at the same time are relatively small. There is something to be said in favor of recognizing an eastern montane variety, so long as we confine its distinguishing characteristic to a loose raceme." The distribution, as mapped by Barneby, is suggestive of a composite map of 2 (or more) different taxa, one of them being centered in the Southern and Central Appalachians (extending out into nearby provinces) . F and G separate var. *carolinianus*, basing the distinction, however, on a different set of characters, and considering var. *canadensis* to range south to VA (at least). Further study is needed; it seems we may have in our area 2 taxa worthy of distinction at the varietal level. [= I, K, SE, Z; < *A. canadensis* – RAB, C, W; > *A. canadensis* var. *canadensis* – F, G; > *A. canadensis* var. *carolinianus* (Linnaeus) M.E. Jones – F, G; > *A. carolinianus* Linnaeus – S]



Astragalus distortus Torrey & A. Gray *var.* ***distortus***, Ozark Milkvetch, Bent Milkvetch. Shale barrens and other dry, shaley places. May-July. *A. distortus* is interpreted by Z (and followed by C and SE) to consist of 2 varieties: var. *distortus*, occurring in the s. Midwest from IL, MO, and OK south to MS, LA, and AR, and disjunct in n. and sc. VA, e. WV, and w. MD, and var. *engelmannii* (Sheldon) M.E. Jones, of TX and ne. LA. The two varieties seem fairly readily distinguishable morphologically in the Midwest. Appalachian var. *distortus* complicates the issue, since it approaches var. *engelmannii* in flower size and matches it in ovule number. The Appalachian plant, with a combination of morphologic characters not matching the two named varieties and far allopatric from them might better be considered a distinct variety. Further study is needed. [= C, I, K, SE, Z; < *A. distortus* – F, G; = *Holcophacos distortus* (Torrey & A. Gray) Rydberg – S]

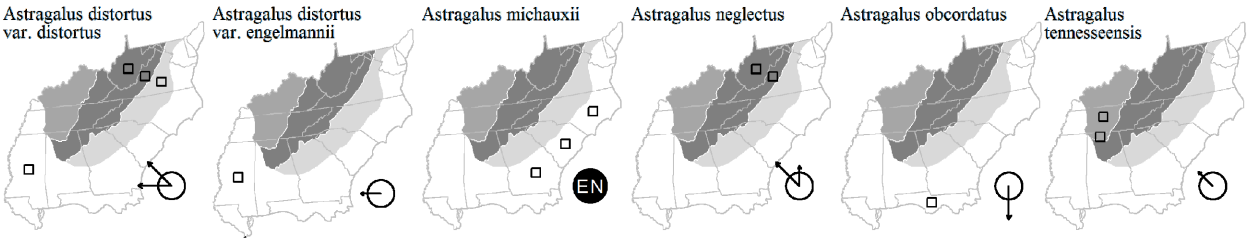
Astragalus distortus Torrey & A. Gray *var.* ***engelmannii*** (Sheldon) M.E. Jones. {habitats}. AR, TX, and w. LA; disjunct eastward in MS (NatureServe 2007). [= I, K, SE, Z]

Astragalus michauxii (Kuntze) F.J. Hermann, Sandhills Milkvetch, Michaux's Milkvetch. Sandhills. Late April-June; June-October (and persisting). Sc. NC south through SC to GA, a Southeastern Coastal Plain endemic (reports from AL and FL are in error). "The Michaux milk-vetch is greatly isolated from any member of the genus morphologically similar" (Barneby 1964). [= RAB, I, K, SE, Z; = *Tium michauxii* (Kuntze) Rydberg – S]

Astragalus neglectus (Torrey & A. Gray) Sheldon, Cooper Milkvetch. Dry calcareous woodlands and barrens, over dolostone and limestone. June-September. Se. ON west to se. SK and ne. ND, south to w. NY, ne. PA, c. PA, n. OH, s. MI, se. WI, and e. SD; disjunct in w. VA and e. WV (Wieboldt et al. 1998). [= C, F, G, I, K, SE, Z]

Astragalus obcordatus Elliott, Florida Milk-vetch. Sandhills. S. MS south to c. peninsular FL. Reported for s. GA, but no specimen documentation is known (Barneby 1964). [= I, K, SE, WH, Z; = *Phaca obcordata* (Elliott) Rydberg ex Small – S]

Astragalus tennesseensis A. Gray ex Chapman. Calcareous glades. C. TN, n. AL, IL (and formerly IN, and possibly MO). [= I, K, SE, Z; >< *A. tennessensis* – F; >< *A. plattensis* Nuttall – F; > *Geoprumnon tennesseense* (A. Gray ex Chapman) Rydberg – S; >< *Geoprumnon plattense* (Nuttall) Rydberg – S]



Astragalus villosus Michaux, Bearded Milkvetch, Southern Milkvetch. Sandhills and other dry, sandy places. May-June; June-August. A Southeastern Coastal Plain endemic: s. SC south to Panhandle FL, west to s. MS. This species is described by Barneby (1964) as "a lowly but delightful little astragalus." [= RAB, I, K, SE, WH, Z; = *Phaca intonsa* (Sheldon) Rydberg ex Small – S]

Baptisia Ventenat 1808 (Wild Indigo)

A genus of about 20 species, perennial herbs, of temperate e. and c. North America. References: Isely (1981)=Y; Larisey (1940a)=Z; Mendenhall (1994a, 1994b)=X; Turner (2006)=Q; Isely (1998)=I.

Identication notes: Many of our species hybridize when they grow in proximity. They are generally recognizable (especially in context with their parents) by their intermediate morphology. Additional hybrids have been created by plant breeders and may be found in cultivation.

1 Leaves 1-foliolate, sessile or perfoliate.

2 Leaves perfoliate; plant glabrous or nearly so; [widespread, from s. SC southward] ..... ***B. perfoliata***
2 Leaves sessile; plant glabrous or densely cobwebby pubescent; [narrow endemics of GA and FL].
3 Plant cobwebby-pubescent; leaves ca. 1× as long as wide, cordate at base; corolla 9-11 mm long, yellow; [of e. GA (Brantley and Wayne counties)] ..... ***B. arachnifera***
3 Plant glabrous; leaves 1.3-1.6× as long as wide, rounded to broadly cuneate at base; corolla 12-15 mm long, pale yellow to greenish; [of the FL Panhandle (Franklin, Gadsden, Leon, Liberty, and Wakulla counties)] ..... ***B. simplicifolia***

1 Leaves 3-foliolate, petiolate or sessile.
4 Flowering or fruiting pedicels bracteolate; corolla 11-14 mm long
5 Calyx lobes about as long as the calyx tube ..... ***B. lecontei***
5 Calyx lobes much > the calyx tube.
6 Plant glabrous; [of ne. FL (Clay and St. Johns counties)] ..... ***B. calycosa***
6 Plant tomentose to hirsute; [of FL Panhandle (Escambia, Holmes, Okaloosa, Santa Rosa, and Walton counties)] ..... ***B. hirsuta***
4 Flowering or fruiting pedicels lacking bracteoles; corolla larger (except *B. tinctoria*).
7 Plants in flower ..... **Key A**
7 Plants in fruit ..... **Key B**

Key A – flowering *Baptisia*

1 Flowers lavender or blue.
2 Leaflets 2-4 (-5) cm long, mostly < 10 mm wide (if wider, then < 4 cm long); leaflets mostly oriented in a vertical plane; fertile stems usually 0.4-1.0 m tall, the leafy branches horizontally spreading; racemes 1-2.5 (-4) dm long, rather densely flowered; petioles 0-4 (-12) mm long; [of diabase and limestone glades, barrens, and woodlands] ..... ***B. australis*** *var.* ***aberrans***
2 Leaflets 4-6 (-9) cm long, mostly > 12 mm wide; leaflets not oriented in a vertical plane; fertile stems usually 1-1.5 m tall, the leafy branches ascending; racemes 2-4 (-5) dm long, rather sparsely flowered; petioles 5-20 (-40) mm long; [of flood-scoured riverside cobblebars and rock outcrops, also frequently cultivated and sometimes persistent or escaped] ..... ***B. australis*** *var.* ***australis***

1 Flowers yellow, cream-white, or white.
3 Flowers white or cream-white.
4 Flowering pedicels 10-18 (-30) mm long, subtended by persistent bracts 10-25 mm long and 7-10 mm wide; flowers cream-white (to pale-yellow).
5 Petioles of median leaves 4-10 mm long ..... ***B. bracteata***
5 Petioles of median leaves 2-4 mm long
6 Leaves and stems glabrous; leaflets 1.5-2.5× as long as wide ..... ***B. leucophaea*** *var.* ***laevicaulis***
6 Leaves and stems pubescent; leaflets (1.5-) 2.5-5× as long as wide ..... ***B. leucophaea*** *var.* ***leucophaea***
4 Flowering pedicels 3-10 mm long, subtended by caducous bracts 4-7 mm long and 1-2 mm wide; flowers white.
7 Calyx 4.5-6.5 mm long; corolla 13-16 (-18) mm long; petioles 5-10 (-20) mm long ..... ***B. albescens***
7 Calyx 7-8 mm long; corolla 20-25 mm long; petioles (of the lower leaves at least) 10-20 mm long.
8 Legume usually 15-20 (-30) mm in diameter, thin-walled and brittle; [of NC south through GA to FL and AL] ..... ***B. alba***
8 Legume usually 10-12 (-15) mm in diameter, rigid and tough; [of c. TN, c. KY, and MS westward] ..... ***B. leucantha***
3 Flowers yellow.
9 Flowering pedicels 14-18 (-30) mm long, subtended by persistent bracts 10-25 mm long and 7-10 mm wide; flowers pale-yellow (to cream-white).
10 Petioles of median leaves 4-10 mm long ..... ***B. bracteata***
10 Petioles of median leaves 2-4 mm long.
11 Leaves and stems glabrous; leaflets 1.5-2.5× as long as wide ..... ***B. leucophaea*** *var.* ***laevicaulis***
11 Leaves and stems pubescent; leaflets (1.5-) 2.5-5× as long as wide ..... ***B. leucophaea*** *var.* ***leucophaea***
9 Flowering pedicels 2-10 mm long, subtended by caducous bracts 2-10 mm long and 1-2 mm wide; flowers bright yellow.
12 Leaflets mostly 1-2.5 (-4) cm long, 1-2.5× as long as wide, the petiolules 0-1 mm long; corolla 12-16 mm long; racemes numerous, terminating most of the branches ..... ***B. tinctoria***
12 Leaflets mostly 4-9 cm long, 1.5-4× as long as wide, the petiolules 2-10 mm long; corolla 20-28 mm long; racemes solitary (-3) (*B. cinerea*) or numerous (*B. lanceolata*).
13 Inflorescences of many-flowered cylindrical racemes; stipules persistent or caducous.
14 Plant persistently cinereous-pubescent stipules (some of them at least) persistent ..... ***B. cinerea***
14 Plant puberulent when young, soon glabrate to glabrous; stipules caducous; [of MS westward] ..... ***B. sphaerocarpa***
13 Inflorescence of solitary axillary flowers or flowers in clusters of 2-4 in axils or terminal racemes; stipules caducous.
15 Petiolules 2-3 mm long; leaflets 1-2.5× as long as wide; [of LA, AR, TX, and OK] ..... ***B. nuttalliana***
15 Petiolules 4-10 mm long; leaflets 1.7-5× as long as wide; [of SC, GA, FL, and AL].
16 Leaflets 3-5× as long as wide, usually < 1.5 cm wide; flowers usually solitary or in clusters of 2-3; fruits broadly ellipsoid or subspheroidal, < 2× as long as wide; [se. SC south through GA Coastal Plain to ne. FL] ..... ***B. lanceolata*** *var.* ***lanceolata***
16 Leaflets 1.7-3.2 (-5)× as long as wide, the larger typically > 2 cm wide; flowers in racemes of (1-) 3-10 flowers; fruits usually ellipsoid, often > 2× as long as wide; [FL Panhandle, s. AL, and c. peninsular FL] ..... ***B. lanceolata*** *var.* ***tomentosa***

{add *B. megacarpa* to key}

Key B – fruiting *Baptisia*

1 Legume 5-11 mm in diameter.
2 Legume cylindric, 20-30 (-35) mm long, 7-9 mm in diameter, yellow-brown, leathery in txture ..... ***B. albescens***
2 Legume globose or subspheroidal, 7-25 mm long, 5-11 mm in diameter, black, woody in texture.
3 Leaflets mostly 1-2.5 (-4) cm long ..... ***B. tinctoria***
3 Leaflets 3.5-10 cm long.

4 Leaflets 3-5× as long as wide, usually < 1.5 cm wide; infructescence nodes (fruits or aborted fruits) usually 1-3; fruits broadly ellipsoid or subspheroidal, <2× as long as wide; [se. SC south through GA Coastal Plain to ne. FL] ..... ***B. lanceolata*** *var.* ***lanceolata***

4 Leaflets 1.7-3.2 (-5)× as long as wide, the larger typically > 2 cm wide; infructescence nodes (1-) 3-10; fruits usually ellipsoid, often > 2× as long as wide; [FL Panhandle, s. AL, and c. peninsular FL] ..... ***B. lanceolata*** *var.* ***tomentosa***

1 Legume 8-25 mm in diameter.

5 Pod drying tan, thin-walled and brittle ..... ***B. megacarpa***

5 Pod drying black to blackish-brown, leathery or tough.

6 Stems puberulent (sometimes inconspicuously so) or villous.

7 Legume (20-) 30-40 (-50) mm long, 15-25 mm in diameter; pedicels 14-18 (-30) mm long, subtended by persistent bracts10-25 mm long and 7-10 mm wide ..... ***B. bracteata, B. leucophaea*** *var.* ***leucophaea***

7 Legume 10-35 mm long, 8-15 mm in diameter; pedicels 2-10 mm long, subtended by caducous bracts 2-10 mm long and 1-2 mm wide.

8 Petiolules 2-5 mm long; stipules (some of them at least) persistent ..... ***B. cinerea***

8 Petiolules 4-10 mm long; stipules caducous ..... ***B. lanceolata*** *var.* ***lanceolata***

6 Stems glabrous and generally glaucous as well ..... ***B. alba, B. leucantha, B. leucophaea*** *var.* ***laevicaulis, B. australis*** *var.* ***aberrans, B. australis*** *var.* ***australis***

{add *B. nuttalliana* to fruiting key}

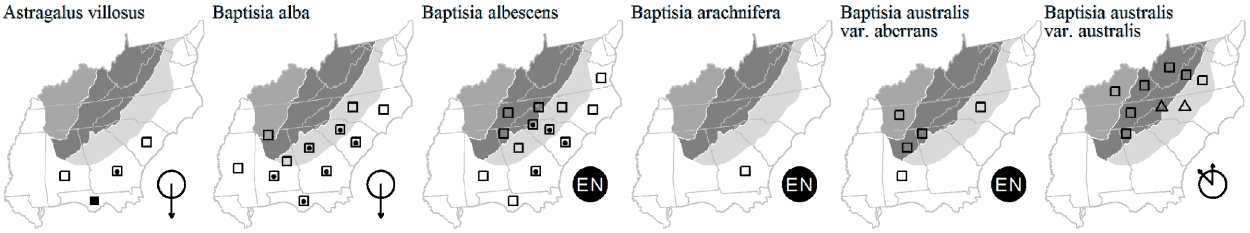
Baptisia alba (Linnaeus) Ventenat, Thick-pod White Wild Indigo. Dry woodlands, roadsides. May-July; June-October. NC south to n. peninsular FL, west to AL. *B. leucantha* (see below) is a western sibling, treated as either a species or a variety. In fruit, it is easily separated from *B. albescens* and other *Baptisia* by its nearly spheroidal legume. *B. alba* and *B. albescens* have been nomenclaturally confused; Isely (1986a) corrects the application of the epithet "*alba*." [= S, WH; = *B. alba* var. *alba* – I, K, SE; = *B. pendula* Larisey – RAB; = *B. lactea* (Rafinesque) Thieret var. *obovata* (Larisey) Isely – C (by implication), X, Y; = *B. lactea* var. *pendula* (Larisey) B.L. Turner – Q; > *B. pendula* var. *pendula* – Z; > *B. pendula* var. *obovata* Larisey – Z]

Baptisia albescens Small, Narrow-pod White Wild Indigo, Spiked Wild Indigo. Dry woodlands, pine flatwoods, roadsides. May-July; June-October. Se. VA south through NC, SC, and GA to n. FL, e. AL and e. TN. The fruits are unlike any of our other species in being cylindric, about 3× as long as the diameter, and yellowish-brown (rather than black) when mature. [= I, K, S, SE, WH; = *B. alba* – RAB, C, F, G, Q, W, X, Y, misapplied; > *B. alba* – Z; > *B. albescens* – Z]

Baptisia arachnifera Duncan, Hairy Rattleweed, Hairy Wild Indigo. Sandhills. Endemic to GA (Wayne and Brantley counties). Unmistakable for its simple leaves and dense "cobwebby" pubescence. [= I, K, Q, SE, X, Y]

Baptisia australis (Linnaeus) R. Brown *var.* ***aberrans*** (Larisey) M. Mendenhall, Eastern Prairie Blue Wild Indigo, Glade Wild Indigo. Glades, barrens, and open woodlands over limestone (or other calcareous rocks) and diabase (or other mafic rocks), in areas that were formerly prairies, barrens, glades, or oak savannas. April-May; June-August. C. and se. TN, nw. GA, and c. NC (and possibly also s. KY and sc. VA). Blue-flowered *Baptisia* from mafic glades, barrens, and former prairies and oak savannas in NC has proven problematic to taxonomists. Larisey (1940a) treated *B. australis* and *B. minor* as separate species, and placed eastern plants resembling *B. minor* in *B. minor* var. *aberrans* Larisey, but without providing very satisfying characters for separating it from typical *B. minor* of mw. North America. RAB apparently (though tacitly) included *B. minor* within *B. australis*. Isely (1981, 1990) treated blue-flowered *Baptisia* as *B. australis* var. *australis* and var. *minor*, regarding var. *minor* as reaching its eastern limit in MO (the two varieties thus allopatric), and stating that "sporadic collections within the range of var. *australis* have the pods and some of the vegetative characters of var. *minor*... most of these collections are from dry or sterile habitats, e.g., cedar glades, that var. *australis* typically does not inhabit" (Isely 1990). His treatment of *australis* and *minor* at the varietal level seems largely based on the existence of *minor*-like plants within his concept of the range of *australis*. NC plants from glade-like sites are morphologically more similar to midwestern prairie *B. minor*, occur in similar habitats, and grow with a large number of other plants with midwestern phytogeographic affinities, such as *Eryngium yuccifolium* var. *yuccifolium*, *Echinacea laevigata* (an eastern sibling of *E. purpurea*), *Solidago ptarmicoides*, *Solidago rigida* ssp. *glabrata* (an eastern sibling of *S. rigida* ssp. *rigida*), *Silphium terebinthinaceum*, and others. The affinities of these plants seem to be with *B. minor*; "shoehorning" them into the more eastern *B. australis*, which they do not resemble in morphology, habitat, or (indeed) range is not a desirable disposition. Eastern plants referrable to *B. minor* do, however, as noted by Larisey and Isely, differ from midwestern plants in leaflet size and shape, branching, and pod shape; they are best treated as an eastern, relictual variety in the complex, *B. australis* var. *aberrans* Larisey. Mendenhall (1994a, 1994b) found that the "*aberrans*" entity warranted taxonomic recognition, and indeed that it is less closely related to *B. australis s.s.* and *B. minor* than they are to one another; she chose to treat the three entities as varieties under *B. australis*. For now, the best treatment seems to be to follow Mendenhall, and acknowledge the existence of three varietal entities, with the phylogenetic affinities uncertain. The range of *B. australis* var. *minor* is thus largely midwestern, from se. NE, s. MO, and e. and c. KS south to w. AR, e. and c. OK, and ne. TX. [= K, X; = *Baptisia minor* Lehmann var. *aberrans* Larisey – Z; < *B. australis* (Linnaeus) R. Brown – RAB, S; < *B. australis* var. *australis* – I, Q, SE; < *B. australis* var. *minor* (Lehmann) Fernald – C, G; < *B. minor* – F]

Baptisia australis (Linnaeus) R. Brown *var.* ***australis***, Tall Blue Wild Indigo, Streamside Blue Indigo. Riverbank scour areas, gravel bars, and disturbed areas (where persisting from cultivation). April-June; June-August. Native to w. and n. VA, w. MD, WV, w. PA, e. and c. KY, ne. TN, se. IN, and s. OH, and possibly native to other states, the original range somewhat obscured by its frequent cultivation. [= C, G, K, X; = *B. australis* – F, W, Z; < *B. australis* – RAB, S; < *B. australis* var. *australis* – I, Q, SE]



Baptisia bracteata Elliott, Creamy Wild Indigo. Sandhills, other dry woodlands. March-April; May-June. Ne. AL northwest through n. GA and n. SC to w. NC. The more western *B. leucophaea* Nuttall is better treated as a species than as *B. bracteata* var. *leucophaea* (Nuttall) Kartesz & Gandhi (Mendenhall 1994b). [= RAB, Q, S, W, X, Z; = *B. bracteata* var. *bracteata* – C, I, K, SE]

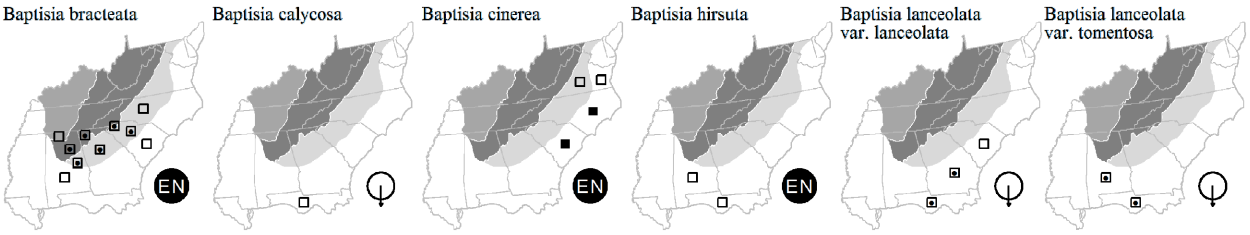
Baptisia calycosa Canby, Florida Wild Indigo. Dry pinelands. Endemic to ne. FL (Clay and St. Johns counties) and also reported for Lowdes County, GA (Kartesz 2010) (this record needing confirmation). [= Q, S, Z; = *B. calycosa* var. *calycosa* – I, K, SE, WH, Y] {synonymy incomplete: X}

Baptisia cinerea (Rafinesque) Fernald & Schubert, Carolina Wild Indigo. Sandhills, other dry sandy woods. Late April-June; June-July. Though common in the Coastal Plain of the Carolinas, *B. cinerea* is a narrow endemic, ranging only from s. VA south to s. SC. The large, yellow flowers are very showy. In fall, the leaves do not drop, but stay attached to the stems, the whole plant turning an ashy gray; these dried plants are conspicuous through the following winter. The report in Jones & Coile (1988) of *B. cinerea* in GA is in error; the specimen is of *B. lanceolata*. [= RAB, C, F, G, I, K, Q, SE, X; = *B. villosa* auct. non (Walter) Nuttall – S, Z]

Baptisia hirsuta Small, Hairy Wild Indigo, Panhandle Wild Indigo. Dry pinelands. Endemic to FL Panhandle (Escambia, Holmes, Okaloosa, Santa Rosa, and Walton counties) and adjacent AL (Covington County). May; June-September. [= Q, S, Z; = *B. calycosa* Canby var. *villosa* Canby – I, K, SE, WH, Y] {synonymy incomplete: X}

Baptisia lanceolata (Walter) Elliott *var.* ***lanceolata***, Gopherweed. Sandhills. April-May; June-November. S. SC south to ne. FL and sw. GA, a Southeastern Coastal Plain endemic. Small (1933) alleges that *B. lanceolata* ranges north to NC, but no documentation is known. The plant is reminiscent of *B. cinerea*, but forms larger, bushier plants and is separable by characters in the key. [= I, K, Q, SE, X; < *B. lanceolata* – RAB, S, WH; = *B. lanceolata* – Z]

Baptisia lanceolata (Walter) Elliott *var.* ***tomentosa*** (Larisey) Isely. Sandhills. Panhandle FL and adjacent s. AL; disjunct in c. peninsular FL. Two forms have been recognized, the "narrow-leaved form," endemic to the Apalachicola Lowlands portion of the FL Panhandle, and the "typical form", occupying the FL Panhandle, s. AL, and disjunct in c. peninsular FL (Isely 1981). Mendenhall (1994b) included broad-leaved and narrow-leaved forms of var. *tomentosa* in her study, which provided some support for the taxonomic recognition of these unnamed entities. [= I, K, SE, Y; = *B. lanceolata* var. *elliptica* (Small) B.L. Turner – Q; = *B. elliptica* Small – S; < *B. lanceolata* – WH; > *B. elliptica* var. *elliptica* – Z; > *B. elliptica* var. *tomentosa* Larisey – Z]



Baptisia lecontei Torrey & A. Gray, Leconte's Wild Indigo. Sandhills. Sc. GA south to e. Panhandle FL and s. peninsular FL. [= I, K, Q, S, SE, WH, X, Y, Z]

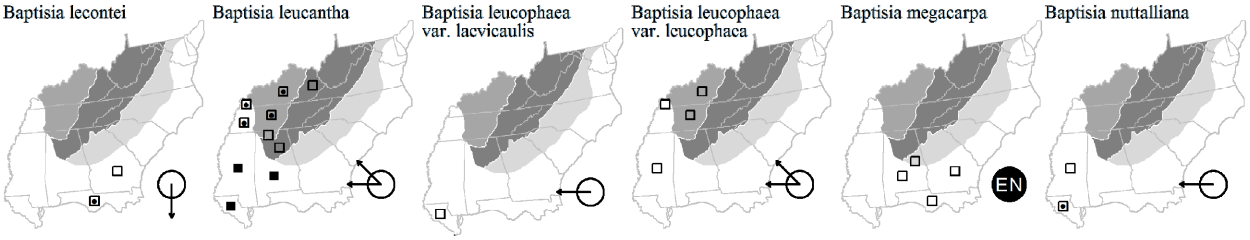
Baptisia leucantha Torrey & A. Gray. Woodlands, prairies, roadsides. W. MY, MI, WI, MN, and e, NE, south to AL, MS, LA, e. TX, and sw. OK; alleged by S to occur in NC, presumably based on misinterpreted material of *B. alba*. [= S, X; = *Baptisia alba* var. *macrophylla* (Larisey) Isely – I, K1, K2, SE; = *B. lactea* (Rafinesque) Thieret var. *lactea* – C, Q, Y; > *B. leucantha* var. *leucantha* – Z; > *B. pendula* Larisey var. *macrophylla* Larisey – Z]

Baptisia leucophaea Nuttall *var.* ***leucophaea***. Pinelands, woodlands. April-May. Nw. IN west to s. MN and e. NE, south to w. KY, c. MS, c. LA, se. LA (Turner 2006), and e. TX. [= *B. bracteata* var. *leucophaea* – I, K2, SE; < *B. leucophaea* var. *leucophaea* – F, G, Q; < *B. bracteata* Muhlenberg ex Elliott var. *leucophaea* (Nuttall) Kartesz & Gandhi – K1; < *B. bracteata* var. *glabrescens* (Larisey) Isely – C, Y; < *B. leucophaea* var. *glabrescens* Larisey – Z]

Baptisia leucophaea Nuttall *var.* ***laevicaulis*** A. Gray ex Canby. Pinelands, coastal prairies. April-May. [< *B. bracteata* Muhlenberg ex Elliott var. *leucophaea* (Nuttall) Kartesz & Gandhi – K1; = *B. bracteata* var. *laevicaulis* (A. Gray ex Canby) Isely – I, K2, SE; < *B. bracteata* var. *glabrescens* (Larisey) Isely – Y; < *B. leucophaea* var. *glabrescens* Larisey – Z]

Baptisia megacarpa Chapman ex Torrey & A. Gray, Apalachicola Wild Indigo, Bigpod Wild Indigo. Moist florests of floodplains and lower slopes. Late April-early June; June-July. E. Panhandle FL and sw. GA west to se. AL. [= I, K, Q, S, SE, WH, X, Y; > *B. megacarpa* – Z; > *B. riparia* Larisey var. *riparia* – Z; > *B. riparia* var. *minima* – Z]

Baptisia nuttalliana Small. Woodlands and prairies. S. AR and se. OK south to se. LA (Florida parishes) and se. TX. [= I, K1, K2, Q, S, SE, Y, Z] {synonymy incomplete}



Baptisia perfoliata (Linnaeus) R. Brown ex Aiton f., Catbells, Gopherweed. Sandhills. April-May; May-July. S. SC to e. GA; disjunct in c. peninsular FL (Orange and Osceola counties); disjunct in wc. AL (Sumter County) (Keener 2007), a Southeastern Coastal Plain endemic. [= RAB, I, K, Q, S, SE, X, Y, Z]

Baptisia simplicifolia Croom. Pine flatwoods. Endemic to Panhandle FL (Franklin, Gadsden, Leon, Liberty, and Wakulla counties) (Wunderlin & Hansen 2004). [= I, K, Q, S, SE, WH, X, Y, Z]

Baptisia sphaerocarpa Nuttall. Woodlands and prairies. S. MS west to se. MO, e. OK, and e. TX. [= I, K, SE; > *B. sphaerocarpa* – Z; > *B. viridis* Larisey – Z] {synonymy incomplete}

Baptisia tinctoria (Linnaeus) Ventenat, Honesty-weed, Rattleweed. Sandhills, pine flatwoods, xeric woodlands, ridges, woodland edges, and roadbanks. April-August; July-November. Widespread in eastern United States, from NY and MN south to GA. The most widespread and common of our species of *Baptisia*, *B. tinctoria* is readily recognizable from its small, yellow flowers, small leaflets, and small fruits. The taxa synonymized need further investigation. [= RAB, C, I, K, Q, S, SE, W, X; > *B. tinctoria* var. *projecta* Fernald – F, G, Z; > *B. tinctoria* var. *tinctoria* – F, G, Z; > *B. tinctoria* var. *crebra* Fernald – F, Z; > *B. tinctoria* – S; > *B. gibbesii* Small – S]

Calliandra Bentham 1840

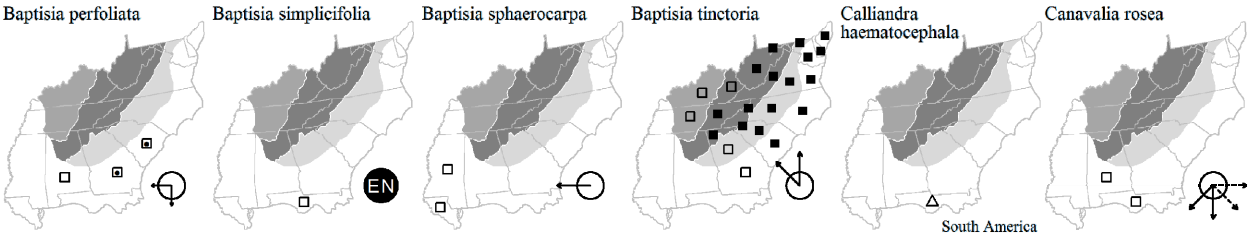
A genus of about 135 species, trees ands shrubs, of the New World tropics and subtropics. References: Isely (1998)=I.

* ***Calliandra haematocephala*** Hasskarl, Powderpuff Tree. Disturbed areas; native of South America, cultivated in the souther part of our area and allegedly persistent or spreading. [= I, WH]

Canavalia deCandolle 1825

A genus of about 50 species, perennial or annual herbs or vines, pantropical. References: Isely (1998)=I.

Canavalia rosea (Swartz) deCandolle, Baybean. Ocean beaches. Pantropical, north to Dixie County on the west coast and Volusia County on the east coast of FL. [= I, K, SE, WH; ? *Canavali lineata* (Thunberg) deCandolle – S, misapplied]



Centrosema (A.P. de Candolle) Bentham 1837 (Spurred Butterfly Pea)

A genus of about 40 species, perennial vining herbs, of tropical and warm temperate regions of the Western Hemisphere. References: Isely (1998)=I; Fantz (2002a).

Identification notes: *Centrosema* and *Clitoria* are unique among our legumes in having resupinate flowers, the pedicel twisted 180 degrees so that the large "standard" is lowermost. They are often confused; the following key includes both genera for easy differentiation.

1 Leaflets 5-7-foliolate; [rare alien] ..... ***Clitoria ternatea*** *var.* ***ternatea***
1 Leaflets 3-foliolate.
  2 Calyx tube 10-13 mm long, much longer than the lobes; bracteoles 3-7 mm long, not enclosing the calyx tube; legume 3-5 cm long, 5-7 mm broad; standard 4-6 cm long, not spurred ..... ***Clitoria mariana*** *var.* ***mariana***
  2 Calyx tube 4-5 mm long, shorter than or about as long as the lobes; bracteoles 5-12 mm long, partly enclosing the calyx tube; legume 6-12.5 cm long, 3-6 mm broad; standard 2.5-3.5 cm long, spurred near the base.
    3 Lower calyx lobe 5-8 mm long, subulate to lanceolate; upper (bifurcate) calyx lobe 3-4 mm long; bracteoles 5-7 mm long; stems to 3 m long; [of n. FL southward] ..... ***Centrosema arenicola***
    3 Lower calyx lobe 8-11 mm long, subulate; upper (bifurcate) calyx lobe 7-8 mm long; bracteoles 8-12 mm long; stems to 1.5 m long; [widespread in our area] ..... ***Centrosema virginianum***

Centrosema arenicola (Small) F.J. Hermann, Sand Butterfly-pea. Longleaf pine sandhills. N. FL (Columbia, Dixie, and Duval counties) south to s. FL. [= K, WH; > *Bradburya arenicola* Small – S; > *Bradburya floridana* Britton – S; = *C. arenicolum* – I, orthographic variant]

Centrosema virginianum (Linnaeus) Bentham, Spurred Butterfly Pea. Dry woodlands and openings. June-August; July-October. S. NJ south to s. FL, west to KY, AR, and TX. [= RAB, C, G, K, SE, W, WH; > *C. virginianum* var. *virginianum* – F; > *C. virginianum* var. *ellipticum* Fernald – F; = *Bradburya virginiana* (Linnaeus) Kuntze – S]

Cercis Linnaeus 1753 (Redbud)

A genus of about 6-10 species, trees of north temperate areas. Apparently the basalmost (evolutionarily the earliest diverging) extant genus in the Fabaceae (Lewis et al. 2005). References: Isely (1975)=Z; Robertson & Lee (1976)=Y; Isely (1998)=I.

1 Flowering pedicels 10-20 mm long; flowers (11-) 12-14 mm long ..... ***[C. chinensis]***
1 Flowering pedicels 6-8 mm long; flowers 8-13 mm long.
  2 Leaves this, dull above (sun leaves slightly coriaceous, slightly glossy above); legumes 9-14 (-18) mm wide; flowers 8-11 mm long ..... ***C. canadensis*** *var.* ***canadensis***
  2 Leaves coriaceous, glossy above; legumes (11-) 13-17 (-20 mm wide; flowers (9-) 10-13 mm long ..... ***[C. canadensis*** *var.* ***texensis]***

Cercis canadensis Linnaeus *var.* ***canadensis***, Eastern Redbud. Moist to dry forests and woodlands, especially over calcareous or mafic rocks, also commonly planted as an ornamental. March-May; June-November. MA, WI, and NE south to c. peninsular FL and e. TX. This spectacular small tree is showy in bud or flower. The smooth, medium gray bark is distinctive in winter. Other varieties occur in TX and Mexico. [= C, G, I, K, SE, Y, Z; < *C. canadensis* – RAB, F, S, W, WH]

* *Cercis canadensis* Linnaeus var. *texensis* (S. Watson) M. Hopkins, Texas Redbud. Native of OK and TX, sometimes cultivated. [= I, K2] {keyed; not mapped; rejected as a currently naturalized component of the flora}

* *Cercis chinensis* Bunge, Chinese Redbud. Native to China, sometimes cultivated. [= I] {keyed; not mapped; rejected as a current naturalized component of the flora}

Chamaecrista Moench 1794 (Partridge-pea)

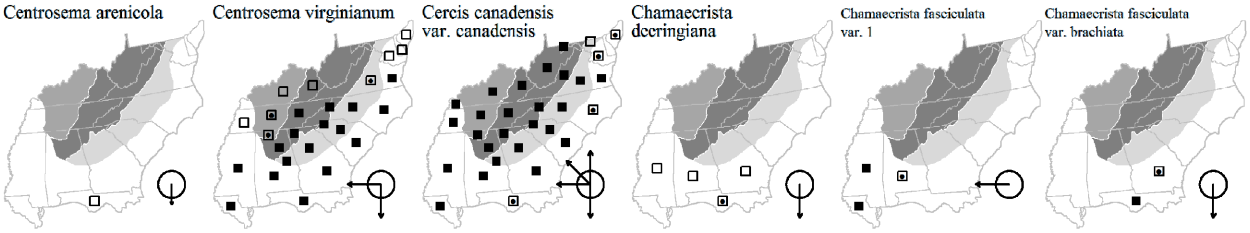
A genus of about 250-350 species, shrubs and herbs, of primarily tropical and subtropical areas, extending into temperate areas in North America, South America, and e. Asia. References: Isely (1975)=Z; Irwin & Barneby (1982)=Y; Robertson & Lee (1976)=X; Isely (1998)=I.

1 Corolla 0.8-1.0 cm in diameter, the larger petals 4-7 (-8) mm long; functional stamens 5-8.
  2 Petiole pilose with hairs 1-2 (-3) mm long; petiolar gland cylindric or clavate; functional stamens 5-8; leaflets 5-6× as long as wide ..... ***C. nictitans*** *var.* ***aspera***
  2 Petiole incurved-puberulent with hairs 0-0.8 mm long; petiolar gland stalked-cupuliform or stalked-discoid; functional stamens 5; leaflets 3-5× as long as wide ..... ***C. nictitans*** *var.* ***nictitans***
1 Corolla 2.5-3.5 cm in diameter, the larger petals 15-20 mm long; functional stamens 10.
  3 Perennial from a horizontal woody root or crown; stems clustered ..... ***C. deeringiana***
  3 Annual from a taproot; stems solitary.
    4 Pods 6.5-10 mm wide; seeds 4.7-6.3 mm across; [of tidal marshes in e. VA] ..... ***C. fasciculata*** *var.* ***macrosperma***
    4 Pods 3-5 (-6.5) mm wide; seeds (2.8-) 3.2-4.8 mm across; [widespread geographically and ecologically].
      5 Surface of leaflets pubescent; [from w. Panhandle FL and s. AL westward] ..... ***[C. fasciculata*** *var.* ***puberula]***
      5 Surface of leaflets glabrous; [collectively widespread in our area].
        6 Petiolar gland depressed, 1.5-2.5 mm wide, raised at both ends; pods 6-10 cm long; plant usually glabrous or glabrescent, to 24 dm tall ..... ***C. fasciculata*** *var.* ***brachiata***
        6 Petiolar gland not depressed, <1.5 mm wide; pods 4-6 cm long; plant usually pubescent, to 10 dm tall ..... ***C. fasciculata*** *var.* ***fasciculata***

Chamaecrista deeringiana Small & Pennell, Florida Senna. Sandhills, dry longleaf pine woodlands, disturbed sandy areas. June-July. Sw. and wc. GA (Jones & Coile 1988) south to Panhandle FL and west to s. MS (Sorrie & Leonard 1999); disjunct in s. FL. [= I, K, S, SE, Y, Z; < *C. fasciculata* (Michaux) Greene – WH]

Chamaecrista fasciculata (Michaux) Greene *var.* ***1***. Dunes, sandy disturbed areas. s. AL west to e. and s. TX. [= I; < *Chamaecrista fasciculata* var. *fasciculata* – K; > *Chamaecrista littoralis* Pollard – S; > *Chamaecrista mississipiensis* (Pollard) Pollard ex Heller – S; < *Chamaecrista fasciculata* – Y; = *Cassia fasciculata* Michaux var. *puberula* (Greene) J.F. Macbride (variants 1, 2, and 3) – SE, Z; > *Chamaecrista puberula* Greene] {synonymy incomplete}

Chamaecrista fasciculata (Michaux) Greene var. ***brachiata*** (Pollard) Isely. Fields, disturbed areas. E. GA south to s. FL, west to w. Panhandle FL. [= I, SE; < *Chamaecrista fasciculata var. fasciculata* – K; = *Cassia fasciculata* var. *brachiata* (Pollard) Pullen ex Isely – X, Z; = *Chamaecrista brachiata* Pollard – S; < *Chamaecrista fasciculata* – WH, Y]



Chamaecrista fasciculata (Michaux) Greene *var.* ***fasciculata***, Common Partridge-pea. Fields, disturbed areas, fencerows, and a wide range of other habitats. June-September; July-November. MA west to MN, south to s. FL and Mexico. See discussion of the *Chamaecrista fasciculata* complex under var. *macrosperma*. [< *Cassia fasciculata* Michaux – RAB, W; < *Chamaecrista fasciculata* – C, WH, Y; > *Cassia fasciculata* var. *fasciculata* – F, G, X; > *Cassia fasciculata* var. *robusta* (Pollard) J.F. Macbride – F, G, X; > *Chamaecrista fasciculata* – S; > *Chamaecrista robusta* Pollard – S; = *Chamaecrista fasciculata* var. *fasciculata* (variant 1, variant 2, and typical variant) – Z; < *Chamaecrista fasciculata* var. *fasciculata* – I, SE (also see var. *macrosperma*); < *Chamaecrista fasciculata* var. *fasciculata* – K (also see var. *brachiata*); > *Cassia fasciculata* var. *littoralis* (Pollard) J.F. MacBride – X]

Chamaecrista fasciculata (Michaux) Greene *var.* ***macrosperma*** (Fernald) C.F. Reed, Tidal-marsh Partridge-pea. Freshwater tidal marshes. Endemic to e. VA (Rappahannock, Mattaponi, Pamunkey, Chickahominy, James, and Appomattox Rivers and their major estuarine tributaries) and MD. Isely (1975) did not recognize this taxon formally, but treated it informally as "variant 1," commenting (incorrectly) that it is "apparently a local, saline-adapted ecotype." Irwin & Barneby (1982) treated *C. fasciculata* as a very polymorphic species in which it was impractical to recognize infraspecific taxa, concluding "a student of tropical *Chamaecrista* has the choice of accepting as a fact of life that sort of infraspecific variability that inspired the dissection of *C. fasciculata* or of retreating to the position of Britton & Urban who, driven by logic rather than sense, found a species in every particular combination of gland and hairiness that fell in their way. But in passing over the observed variation as taxonomically insignificant, it is well to bear in mind that its cause and its biological significance remain a mystery." Botanists familiar with var. *macrosperma* in the field contend that it shows a cohesion in morphologic characters, ecology, and distribution that is biologically and taxonomically significant; it warrants varietal status. [= K; < *Chamaecrista fasciculata* – C, S, Y; = *Cassia fasciculata* var. *macrosperma* Fernald – F, G; < *Chamaecrista fasciculata* var. *fasciculata* – I, SE; = *Cassia fasciculata* var. *fasciculata* "variant 1" – Z]

Chamaecrista nictitans (Linnaeus) Moench *var.* ***aspera*** (Muhlenberg ex Elliott) Irwin & Barneby, Southern Sensitive-plant. Savannas, pinelands, disturbed sandy soils. June-October; July-November. Var. *aspera* ranges from se. SC south to s. FL. [= I, WH; = *Cassia aspera* Muhlenberg ex Elliott – RAB, X, Z; = *Chamaecrista nictitans* ssp. *nictitans* var. *aspera* (Muhlenberg ex Elliott) Irwin & Barneby – K, SE, Y; = *Chamaecrista aspera* (Muhlenberg ex Elliott) Greene – S]

Chamaecrista nictitans (Linnaeus) Moench *var.* ***nictitans***, Common Sensitive-plant. Forests, woodlands, disturbed areas, pine savannas, and a wide variety of other habitats. June-October; July-November. *C. nictitans* is widely distributed in e. North America, and (depending on the scope of what is included in it) south into South America. Var. *nictitans* ranges throughout se. United States, north to MA, NY, OH, and KA. [= I, WH; < *Cassia nictitans* Linnaeus – RAB, W, X, Z; < *Chamaecrista nictitans* – C; > *Cassia nictitans* var. *nictitans* – F, G; > *Cassia nictitans* var. *hebecarpa* Fernald – F, G; = *Chamaecrista nictitans* ssp. *nictitans* var. *nictitans* – K, SE, Y; > *Chamaecrista procumbens* (Linnaeus) Greene – S; > *Chamaecrista multipinnata* Pollard – S]

Chapmannia Torrey & A. Gray 1838 (Alicia)

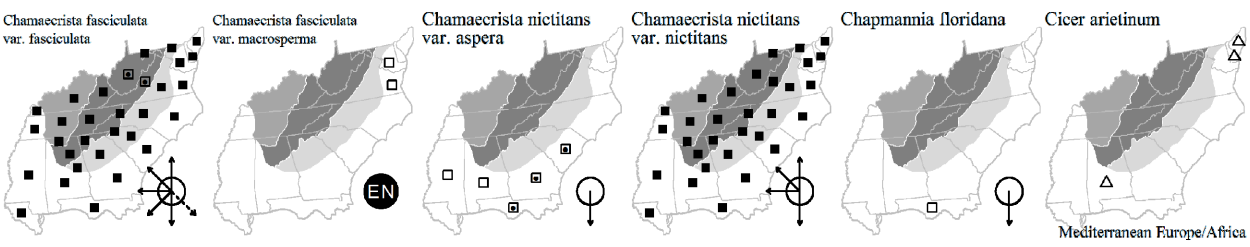
A genus of about 7 species, perennial herbs, shrubs and trees, of tropical America and Africa, most closely related in the Southeastern flora to *Stylosanthes* and the introduced *Arachis* (Lewis et al. 2005). References: Isely (1998)=I.

Chapmannia floridana Torrey & A. Gray, Alicia. Longleaf pine sandhills, scrub. N. FL (Clay County) south to s. FL. [= I, K, S, WH]

Cicer Linnaeus 1753 (Chick Pea, Garbanzo)

A monotypic genus, of Mediterranean Europe, w. Asia. References: Isely (1998)=I.

* ***Cicer arietinum*** Linnaeus, Chick Pea, Garbanzo. Disturbed areas; native of Mediterranean Europe and w. Asia. Described by Isely (1998) as "an occasional recurrent waif." [= I, K2, SE]



Cladrastis Rafinesque 1824 (Yellow-wood)

A genus of about 6 species, trees, of the se. United States and montane regions of Japan and China. *Cladrastis* is the only member of the tribe Sophoreae in our area, with the exception of the cultivated (and weakly, if at all, established) *Styphnolobium* and *Maackia*; additionally *Sophora tomentosa* Linnaeus var. *truncata* Torrey & A. Gray closely approaches our area in n. peninsular FL. References: Duley & Vincent (2003)=X; Isely (1981)=Z; Isely (1998)=I; Rudd (1972)=Y.

Cladrastis kentukea (Dumont de Courset) Rudd, Yellow-wood. Mountain forests, Piedmont bluffs, especially on calcareous or mafic rocks (introduced only in the Piedmont of NC). April-May; July-August. This small to large tree has a native range primarily in the Southern Appalachians (mostly on the west side), the Ozarks, and limestone regions in-between (such as c. TN), ranging from s. OH, s. IN, and s. MO south to sw. NC, sc. SC, n. GA, AL, c. AR, and e. OK, but is cultivated more widely. As discussed by Wyatt (1985), the SC occurrence on Fall Line bluffs of the Savannah River is an interesting disjunction, apparently relictual. Yellow-wood is a distinctive tree, distinguished by its smooth silvery-gray bark, peculiar leaves with alternate leaflets, and pendent panicles of white flowers. The genus *Cladrastis* has 4 other species, all of temperate e. Asia. [= K, W, X, Y; = *C. lutea* (Michaux f.) K. Koch – RAB, C, F, G, I, S, SE, Z]

Clitoria Linnaeus 1753 (Butterfly Pea, Pigeonwings)

A genus of about 60 species, of tropical and warm temperate regions of the New and Old World. References: Isely (1998)=I; Fantz (2000, 2002b)=Z.

Identification notes: *Centrosema* and *Clitoria* are unique among our legumes in having resupinate flowers, the pedicel twisted 180 degrees so that the large "standard" is lowermost. They are often confused; see key under *Centrosema*.

1 Leaves 3-foliolate; standard 4.5-5.5 cm long ..... ***C. mariana*** *var.* ***mariana***
1 Leaves 5-7-foliolate; standard 3.5-4 cm long ..... ***C. ternatea*** *var.* ***ternatea***

Clitoria mariana Linnaeus *var.* ***mariana***, Butterfly Pea. Dry woodlands and openings, roadsides. June-August; July-October. NY (Long Island), NJ west to s. OH, s. IL, MO, and OK, south to c. peninsular FL, TX, and South America; disjunct in s. AZ. Var. *pubescentia* Fantz is endemic in c. and s. peninsular FL. Var. *orientalis* Fantz is endemic in se. Asia. [= Z; < *C. mariana* – RAB, C, F, G, I, K, SE, W, WH; < *Martiusia mariana* (Linnaeus) Small – S]

* ***Clitoria ternatea*** Linnaeus *var.* ***ternatea***, Blue-pea. Disturbed areas; native of the Paleotropics. Weakly naturalized in s. GA (Isely 1998) and southwards. [= Z; < *C. ternatea* – I, K, S, SE]

Crotalaria Linnaeus 1753 (Rattlebox)

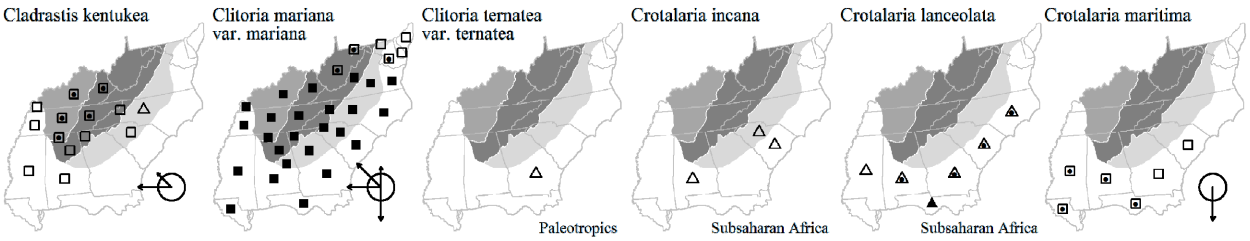
A genus of about 600 species, annual and perennial herbs, nearly cosmopolitan in tropical and temperate regions (especially diverse in Africa). References: Windler (1974)=Z; Isely (1986b)=Y; Ward (2009, 2010)=X; Isely (1998)=I. Key adapted in part from SE.

1 Leaves trifoliolate; erect annual herb, typically 1-2 m tall.
  2 Leaflets obovate to elliptic-oblong, 1.5-3.5× as long as wide; legume conspicuously curved (or straight in *C. incana*).
    3 Legume 10-15 mm in diameter, pilose; stem pubescence spreading ..... ***C. incana***
    3 Legume 5-6 mm in diameter, minutely puberulent; stem pubescence appressed ..... ***C. pallida*** *var.* ***obovata***
  2 Leaflets lanceolate, often narrowly so, 3-15× as long as wide; legume straight or nearly so (or upcurved at the tip).
    4 Corolla 8-10 mm long; legume 4-6 mm in diameter, upcurved at tip ..... ***C. lanceolata***
    4 Corolla 18-20 mm long; legume 15 mm in diameter, not upcurved ..... ***C. ochroleuca***
1 Leaves unifoliolate; plants of various habits, mostly either perennial, smaller, or both.
  5 Corolla 1.7-3.0 cm long; leaflets 4-15 cm long; stipules not decurrent on the stem and not conspicuously foliose; [exotic annual herbs, in disturbed habitats].
    6 Bracts of the inflorescence 2-3 mm long, caducous; leaflets 4-8 cm long ..... ***C. retusa***
    6 Bracts of the inflorescence 5-8 mm long, persistent; leaflets 5-15 cm long ..... ***C. spectabilis***
  5 Corolla 0.7-1.4 cm long; leaflets 1-8 cm long; stipules of at least the upper leaves conspicuously decurrent on the stem, giving the impression of a downward-pointing arrowhead (this feature sometimes inconspicuous or essentially absent in *C. rotundifolia*); [native perennial or annual herbs, in natural or disturbed habitats].
    7 Plant an erect annual; stems with spreading pubescence, the longer hairs 1-2 mm long; leaflets of the upper portion of the plant (4-) avg. 6 (-8)× as long as wide; [mostly of the Piedmont and Mountains (and Coastal Plain of VA)] ..... ***C. sagittalis***
    7 Plant a decumbent, sprawling, or erect perennial; stems with appressed or spreading pubescence, the longer hairs <1.2 mm long; leaflets of the upper portion of the plant averaging either (1-) avg. 1-2 (-4)× or (5-) avg. 8-10 (-15)× as long as wide; [mostly of the Coastal Plain].
      8 Leaflets glabrous above; leaflets of the upper portion of the plant usually (5-) 10 (-15)× as long as wide; plant erect or ascending ..... ***C. purshii***
      8 Leaflets pubescent above (the hairs sometimes sparse – check with hand lens); leaflets of the upper portion of the plant usually (1-) 2 (-4)× as long as wide; plant decumbent to low-ascending.
        9 Stem pubescence appressed ..... ***C. maritima***
        9 Stem pubescence spreading ..... ***C. rotundifolia***

* ***Crotalaria incana*** Linnaeus, Shake-shake. Disturbed areas; native of Africa. Also in peninsular FL, from Alachua County southward. [= I, K, S, SE, WH]

* ***Crotalaria lanceolata*** E. Meyer, Lanceleaf Rattlebox. Sandy fields, roadsides, other disturbed areas; native of Africa. July-October; August-November. [= RAB, I, K, SE, WH]

Crotalaria maritima Chapman, Low Rattlebox, Rabbitbells. Sandy forests and woodlands, roadsides. E. SC south to s. FL, and west to e. LA, endemic to the Southeastern Coastal Plain. [= S, X; = *Crotalaria rotundifolia* Walter ex J.F. Gmelin var. *rotundifolia* – Z; < *C. rotundifolia* – C, I, K, SE, WH, Y; < *C. angulata* – RAB, F, G, apparently misapplied]



* ***Crotalaria ochroleuca*** G. Don, Slenderleaf Rattlebox. Roadsides and sandy fields; native of Africa. July-August; August-October. All naturalized southeastern US material appears to be *C. ochroleuca*, not *C. brevidens* var. *intermedia* (M. Woods, pers. comm., 2011). [= I, K, SE, WH; ? *C. intermedia* – RAB, misapplied; ? *C. brevidens* Bentham var. *intermedia* (Kotschy) Polhill, misapplied]

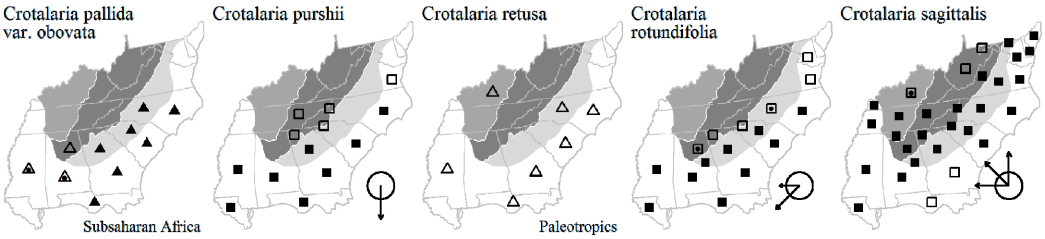
* ***Crotalaria pallida*** Aiton *var.* ***obovata*** (G. Don) Polhill, Smooth Rattlebox. Roadsides and fields; native of Africa. July-September; August-October. [= I, K, SE, WH; ? *C. mucronata* – RAB; ? *C. striata* A.P. de Candolle – S]

Crotalaria purshii A.P. de Candolle, Coastal Plain Rattlebox, Pursh's Rattlebox. Mesic to dry pinelands, sandy openings, roadsides. May-July; July-September. A Southeastern Coastal Plain endemic: se. VA south to n. FL, c. peninsular FL, and west to e. LA, with scattered locations inland. [= RAB, C, G, I, K, S, SE, W, WH; > *C. purshii* var. *purshii* – F; > *C. purshii* var. *bracteolifera* Fernald – F]

* ***Crotalaria retusa*** Linnaeus, Rattleweed. Disturbed areas; native of the Old World tropics. July-September; August-October. [= RAB, F, G, I, K, S, SE, WH]

Crotalaria rotundifolia Walter ex J.F. Gmelin, Low Rattlebox, Rabbitbells. Sandy forests and woodlands, roadsides. Se. VA south to c. peninsular FL, west to se. LA; also widespread in Mexico. [= X; = *Crotalaria rotundifolia* Walter ex J.F. Gmelin var. *vulgaris* Windler – Z; < *C. rotundifolia* – C, I, K, SE, WH, Y; < *C. angulata* – RAB, F, G, misapplied; = *C. rotundifolia* – S]

Crotalaria sagittalis Linnaeus, Common Rattlebox. Woodlands, woodland edges, openings, fields. June-August; July-September. MA and VT west to s. MI, s. WI, and c. MN, south to c. SC, s. AL, s. MS, TX, Mexico and Central America; West Indies. [= RAB, C, G, I, K, S, SE, W, WV; > *C. sagittalis* var. *sagittalis* – F; > *C. sagittalis* var. *oblonga* Michaux – F]



* ***Crotalaria spectabilis*** Roth, Showy Rattlebox. Fields, roadsides, disturbed areas; native of s. Asia. July-September; August-October. [= RAB, C, F, G, I, K, SE, WH; *? C. retzii* A. Hitchcock – S]

Cullen Medikus 1787

A genus of ca. 35 species, herbs and shrubs, of the Old World. References: Isely (1998)=I.

* ***Cullen americanum*** (Linnaeus) Rydberg, Scurf-pea. Waste areas around wool-combing mills, other disturbed areas, perhaps only a waif; native of the w. Mediterranean region (a misnomer). There are other (older) reports from other southeastern states, including FL and MS. [= I, S; = *C. americana* – K1, K2, SE, orthographic variant]

* ***Cullen corylifolia*** (Linnaeus) Medikus, Malaysian Scurf-pea. On ships ballast, probably only a waif; native of s. Asia [= K1, K2] {add to synonymy; not yet keyed}

Cytisus Desfontaines 1798 (Broom)

A genus of about 65 species, shrubs and herbs, of Eurasia. References: Isely (1998)=I.

* ***Cytisus scoparius*** (Linnaeus) Link, Broom, Scotch Broom, Besom, Ginster. Roadbanks, woodland borders, disturbed areas; native of Europe. April-June; May-July. [= RAB, C, F, G, I, S, SE, W, WV; > *C. scoparius* var. *scoparius* – K]

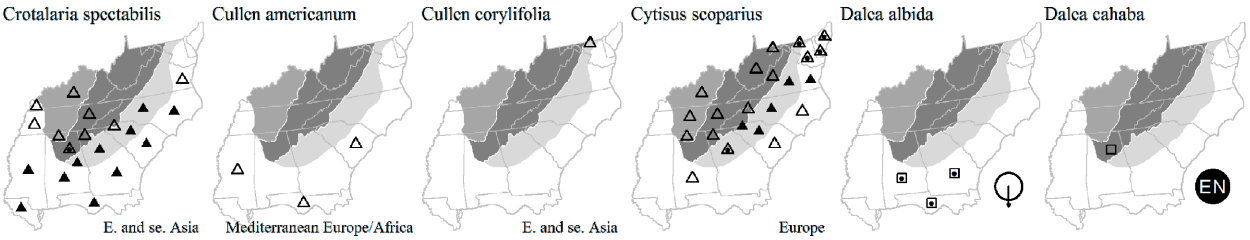
Dalea Lucanus 1758 (Prairie-clover)

A genus of about 165 species, herbs and shrubs, of temperate and tropical America, especially dry areas and most diverse in Mexico. References: Barneby (1977)=Z; Ward (2004c)=Y; Isely (1998)=I. Key adapted from SE.

1 Spikes corymbosely aggregated, capitate, surrounded by an involucre of 3-4 series of sterile bracts; [subgenus *Dalea*, section *Kuhnistera*].
2 Leaflets 5-9 (-15); petals (other than the standard) mostly 3.7-4.5 mm long ..... ***D. pinnata*** *var.* ***pinnata***
2 Leaflets usually 3; petals (other than the standard) mostly 4.8-6.8 mm long ..... ***D. pinnata*** *var.* ***trifoliata***
1 Spikes not corymbosely disposed, ovoid to cylindric, with or without a few subtending, sterile bracts.
3 Corolla subpapilionaceous, with apparent, differentiated wings and keel; stamens 9-10; annual herb; [alien, of disturbed habitats]; [subgenus *Dalea*, section *Dalea*] ..... ***D. leporina***
3 Corolla not papilionaceous, the wings and keel not differentiated; stamens 5; perennial herb; [native, primarily of calcareous glades and Coastal Plain pinelands]; [subgenus *Dalea*, section *Kuhnistera*].
4 Leaflets 15-25; leaflets 2.5-3.5× as long as wide ..... ***D. foliosa***
4 Leaflets 3-9; leaflets 3-10 (or more)× as long as wide.
5 Plants slightly to obviously pubescent (at least the spikes obviously pubescent); leaflets commonly involute or tubular, and > 10× as long as wide; corolla purple or pink.
6 Leaflets 5-7 (-9); spikes lengthening and loosening in fruit, often becoming sinuous; plants decumbent to ascending, stems normally branching only below the middle ..... ***D. gattingeri***
6 Leaflets 3-5 (-7); spikes remaining compact; plants decumbent or ascending, stems normally branching only below the middle (*D. cahaba*), or ascending to erect, the stems branching above the middle (*D. purpurea* var. *purpurea*).
7 Interfloral bracts with pubescence along the keel and margins; plants decumbent to ascending, stems normally branching only below the middle ..... ***D. cahaba***
7 Interfloral bracts with pubescence in a transverse band only; plants ascending to erect, the stems branching above the middle ..... ***D. purpurea*** *var.* ***purpurea***
5 Plants glabrous (except that the calyx lobes may be pubescent); leaflets broad and flat or narrow and involute; corolla pink-purple or white.
8 Calyx tube not incised on the ventral (upper) side; blade of the standard cordate; corolla white; [of calcareous habitats of inland provinces of GA, AL, TN, WV and westward] ..... ***D. candida***
8 Calyx tube deeply incised on the ventral (upper side; blade of the standard not cordate; corolla pink-purple or white; [of the Coastal Plain of GA southward and westward].
9 Leaflets linear, folded, or involute and terete-filiform; spikes globose ca. 6-12 mm long and in diameter; bracts much shorter than the calyx; corolla usually bright pink-purple (less commonly white or lavender) ..... ***D. feayi***
9 Leaflets elliptic to oblanceolate, flat or folded; spikes ovoid to cylindric, 7-40 mm long; bracts as long as or longer than the calyx; corolla pink or white.
10 Plants spreading or decumbent; leaves widely spaced, generally lacking axillary fascicles; bract tips recurved in bud; calyx 2.7-3.3 mm long; flowers white; [of sc. and sw. GA west to se. LA] ..... ***D. gracilis***
10 Plants erect-ascending to sprawling; leaves more densely spaced, generally with well-developed axillary fascicles; bract tips not recurved in bud; flowers pink or white; [of the GA Coastal Plain, se. AL, and south through e. FL Panhandle to the s. FL peninsula].
11 Leaflets of primary stem leaves mostly 5; corolla white ..... ***D. albida***
11 Leaflets of primary stem leaves mostly 7-9; corolla pink (rarely white) ..... ***D. carnea***

Dalea albida (Torrey & A. Gray) D.B. Ward, White-tassels. Pinelands. July-November. E. GA (near the SC border) west to se. AL, south to ne. FL, n. peninsular FL, and e. FL Panhandle. [= Y; = *Dalea carnea* (Michaux) Poiret var. *albida* (Torrey & A. Gray) Barneby – I, K, SE, WH, Z; = *Petalostemon albidus* (Torrey & A. Gray) Small – S]

Dalea cahaba J. Allison, Cahaba Prairie-clover. Dolomitic Ketona glades. May-June; June-September. Endemic to c. AL (Bibb County) (Allison & Stevens 2001). [= K2]



Dalea candida Michaux ex Willdenow, White Prairie-clover. Limestone glades and barrens. Late May-August. WV, KY, IN, WI, MN, and SK south to nw. GA, e. TN, w. AL, sc. MS, s. LA, and ne. TX. [= I, SE (excluding *D. occidentalis*); = *D. candida* var. *candida* – C, K, Z; = *Petalostemum candidum* (Michaux ex Willdenow) Michaux – F, G; = *Petalostemon candidus* (Michaux ex Willdenow) Michaux – S]

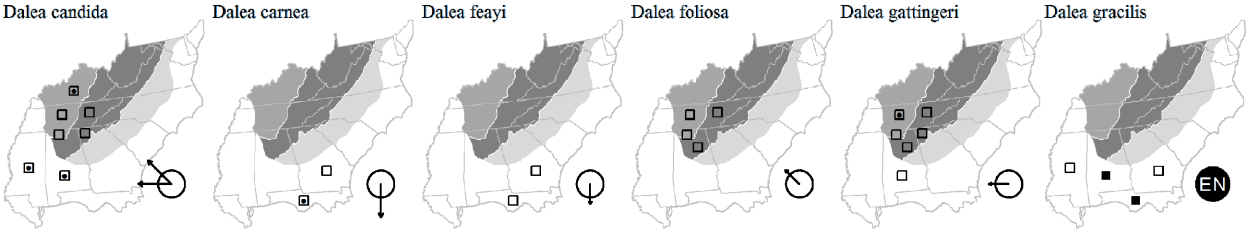
Dalea carnea (Michaux) Poiret, Pink-tassels. Dry sandy pinelands. June-November. Se. GA south to s. peninsular FL. [= Y; = *Dalea carnea* (Michaux) Poiret var. *carnea* – I, K, SE, WH, Z; = *Petalostemon carneus* Michaux – S]

Dalea feayi (Chapman) Barneby, Feay's Prairie-clover. Sandhills. June-October. E. GA (vicinity of the Altamaha River); FL peninsula; Panhandle FL (vicinity of the Apalachicola River). [= I, K, SE, WH, Z; = *Petalostemon feayi* Chapman – S]

Dalea foliosa (A. Gray) Barneby, Cedar Glade Prairie-clover. Calcareous glades. Late June-September. C. TN, n. AL, IL, and OH (?). [= C, I, K, SE, Z; = *Petalostemum foliosum* A. Gray – F, G; = *Petalostemon foliosus* A. Gray – S]

Dalea gattingeri (A. Heller) Barneby, Gattinger's Prairie-clover. Limestone glades and barrens. May-August. C. TN, nw. GA, n. AL, s. MO, and n. AR (Sundell et al. 1999). [= I, K, SE; = *Petalostemon gattingeri* (A. Heller) A. Heller – S]

Dalea gracilis (Nuttall) D.B. Ward, Sprawling White-tassels. Wet pine savannas. August -September. Sc. and sw. GA west to se. LA. [= Y; = *Dalea carnea* (Michaux) Poiret var. *gracilis* (Nuttall) Barneby – I, K, SE, WH, Z; = *Petalostemon gracilis* Nuttall – S]



* ***Dalea leporina*** (Aiton) Bullock, Hare's-foot Dalea. Habitat not known, presumably agricultural; native of w. North America. [= I, K, SE, Z; *? Parosela alopecuroides* (Willdenow) Rydberg – S]

Dalea pinnata (J.F. Gmelin) Barneby *var.* ***pinnata***, Summer Farewell, Eastern Prairie-clover. Sandhills and other dryish pinelands, especially in loamy sands. August-November. Sc. and se. NC south through SC and GA to c. peninsular FL and e. Panhandle FL. [= I, K, SE, WH, Z; < *Petalostemum pinnatum* (J.F. Gmelin) Blake – RAB; < *Kuhnistera pinnata* (J.F. Gmelin) Kuntze – S]

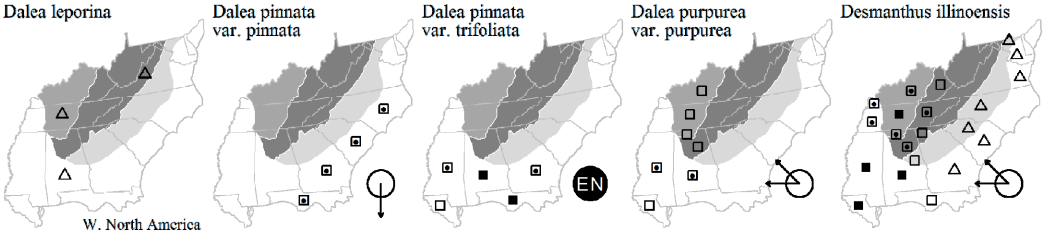
Dalea pinnata (J.F. Gmelin) Barneby *var.* ***trifoliata*** (Chapman) Barneby. Sandhills, dry to moist longleaf pine flatwoods. September-November. E. GA (near the Savannah River) south and west to w. Panhandle FL, s. AL, and s. MS. [= I, K, SE, WH, Z; < *Kuhnistera pinnata* (J.F. Gmelin) Kuntze – S; = *Petalostemon pinnatus* (J.F. Gmelin) Blake ssp. *trifoliatus* (Chapman) Wemple]

Dalea purpurea Ventenat *var.* ***purpurea***, Purple Prairie-clover. Prairies, glades, and open woodlands. NY and ON west to BC, south to KY, TN, n. AL, c. MS, TX, and NM. [= C, I, K, SE, Z; < *Petalostemum purpureum* (Ventenat) Rydberg – F, G; < *Petalostemon purpureus* (Ventenat) Rydberg – S]

Desmanthus Willdenow 1806 (Bundleflower)

A genus of about 25 species, herbs and shrubs, of warm temperate and subtropical America. References: Isely (1973)=Z; Isely (1998)=I.

Desmanthus illinoensis (Michaux) MacMillan ex B.L. Robinson & Fernald, Bundleflower, Prairie Mimosa. Prairies, marsh edges, disturbed areas. June-July; August-November. OH, MN, and ND south to Panhandle FL, TX, and NM; with scattered adventive occurrences east and west of the native distribution. [= RAB, C, F, G, I, K, SE, W, WH, Z; = *Acuan illinoense* (Michaux) Kuntze – S; = *Mimosa illinoensis* Michaux]



Desmodium Desvaux 1813 (Tick-trefoil, Tick-clover, Beggar's-ticks, Stick-tights)

A genus of about 300 species, annual herbs, perennial herbs, and shrubs, nearly cosmopolitan (but lacking from Europe). In our area, *Desmodium* is a complex genus. Some of the species in our area are confusing and can be identified only with difficulty. References: Isely (1998)=I; Krings (2004). Key based on SE, C, RAB, F, and Krings (2004). Some parts adapted with little change from SE. Some parts, especially Key D, will likely be substantially revised, based on additional herbarium and field testing. [also see *Hylodesmum*]

1 Longest calyx lobes shorter than the calyx tube; stipe of the loment 4-20 mm long, about 3× or more as long as the calyx; mature leaves without stipels at the base of the petiolules of the leaflets; leaves subverticillate at the top of the stem (alternate in *D. pauciflorum*); stamens monadelphous; lower margin of the loment incised to the upper suture..... [see ***Hylodesmum***]

1 Longest calyx lobes longer than the calyx tube; stipe of the loment absent or nearly so, included within the calyx; mature leaves retaining stipels at the base of the petiolules of the leaflets; leaves alternate; stamens diadelphous; lower margin of the loment not incised to the upper suture.

2 Leaflets narrow, the terminal leaflet < 10 mm wide, and also 4-12× as long as wide, typically thick and strongly reticulate; petioles of midstem leaves 1-10 (-15) mm long; [primarily of the Coastal Plain and lower Piedmont (rarely Mountains) in our area]..... **Key A**

2 Leaflets broader, the terminal leaflet > 15 mm wide, or < 4× as long as wide, typically thin and not reticulate; petioles of midstem leaves various, but > 15 mm long if leaflet proportions are narrow; [collectively widespread in our area].
3 Stems trailing vinelike along the ground, and/or the plants stolonoferous-rhizomatous ..... **Key B**
3 Stems erect or ascending, not vinelike.
4 Stipules persistent (most or all of the stipules persisting through the year), 4-20 mm long, ovate to amplexicaul-clasping (to lance-attenuate, and if so, generally longer than 8 mm long, except in *D. floridanum*); leaflets 1.5-3× as long as wide ..... **Key C**
4 Stipules caducous (most or all of the stipules falling soon after expansion of the leaves), 2-6 (-8) mm long, mostly linear-subulate or lance-attenuate (in some species narrowly ovate to triangular); leaflets 1-8 (-10)× as long as wide..... **Key D**

Key A: *Desmodium* with very narrow leaflets

1 Petioles (0-) 1-3 (-4) mm long, the leaves thus subsessile; leaflets 5-10 mm wide, strongly pubescent on the lower surface..... ***D. sessilifolium***
1 Petioles 3-15 mm long, the leaves thus obviously petiolate; leaflets 2-5 (-8) mm wide, glabrate or inconspicuously puberulent on the lower surface.
2 Loment segments flat to distinctly concave along the upper (suture) margin; [of dry to mesic habitats] ..... ***D. strictum***
2 Loment segments slightly convex along the upper (suture) margin; [of boggy, wet, or mesic habitats]..... ***D. tenuifolium***

Key B: *Desmodium* with trailing stems or stoloniferous-rhizomatous habit

1 Flowers in axillary clusters; leaflets broadly obovate, 0.5-1 cm long ..... ***D. triflorum***
1 Flowers in axillary or terminal racemes; leaflets rotund, broadly ovate, broadly elliptic, or narrowly eliptic, the larger > 1 cm long.
2 Flowers in simple terminal racemes; leaflets mostly > 2.5× as long as wide ..... ***D. incanum***
2 Flowers either in axillary racemes or in terminal panicles; leaflets mostly 0.9-2.0× as long as wide.
3 Stipules ovate, persistent, slightly to strongly clasping at the base, 6-12 mm long.
4 Leaflets ovate, 1.2-1.9× as long as wide; flowers white to yellowish; loment uncinate-puberulent only along the sutures ..... ***D. ochroleucum***
4 Leaflets ovate, 0.8-1.1× as long as wide; flowers blue-purple; loment uncinate-puberulent over the surface ..... ***D. rotundifolium***
3 Stipules lanceolate to linear (or deltate in *D. humifusum*), usually quickly deciduous, not clasping at the base, 2-8 mm long.
5 Terminal leaflet 1.4-2.0× as long as wide, 3.0-7.0 cm long; loment segments 6-8 mm long; stipules 4-8 mm long, ovate to lance-acuminate ..... ***D. humifusum***
5 Terminal leaflet 0.9-1.2× as long as wide, 1.5-2.3 cm long; loment segments 4-5 mm long; stipules lanceolate, 1-5 mm long..... ***D. lineatum***

Key C

1 Loment segments nearly symmetrical along the axis of the loment (the isthmi more or less equal above and below, thus each segment diamond-shaped, rounded-diamond-shaped, or essentialy elliptical), each segment 3-3.5 mm long; annual from a taproot; [of NC and southward] ..... ***D. tortuosum***
1 Loment segments asymmetrical along the axis of the loment (the isthmi deeper below than above, thus each segment triangular, rounded-triangular, or semi-circular), each segment 5-11 mm long; perennial; [collectively widespread in our area].
2 Corolla 6-7 mm long; loment with 2-4 segments, each 5-7 mm long; lower leaves often 1-foliolate; [of se. SC and southward]..... ***D. floridanum***
2 Corolla 8-13 mm long; loment with 4-6 segments, each 6.5-11 mm long; lower leaves usually 3-foliolate; [collectively widespread in our area].
3 Stem densely spreading pilose (at least the upper stem) and also uncinate-puberulent; loment segments 6.5-10 mm long .... ***D. canescens***
3 Stem glabrous or uncinate-puberulent; loment segments 9-11 mm long
4 Leaves glabrous or nearly so ..... ***D. cuspidatum*** *var.* ***cuspidatum***
4 Leaves evidently pubescent ..... ***D. cuspidatum*** *var.* ***longifolium***

Key D

1 Corolla 8-11 mm long; petioles mostly 1-8 mm long; [plants of the Mountains of VA and possibly NC] ..... ***D. canadense***
1 Corolla 3-8 (-9) mm long (or 8-10 mm long in *D. laevigatum*); petioles mostly longer, mostly 10-60 mm long (except *D. ciliare* and *D. obtusum*); [plants collectively widespread in our area].
2 Loment with 1-3 segments, rounded below.
3 Leaflets cinereous on the lower surface; corolla 6-7 mm long; loment with 3 (-4) segments ..... ***D. nuttallii***
3 Leaflets not cinereous on the lower surface; corolla 3.5-6 mm long; loment with 1-2 (-3) segments; ["*Desmodium ciliare* group"].
4 Leaflets 3-5.5× as long as wide ..... ***D. ciliare***
4 Leaflets 1.2-3-5× as long as wide.
5 Terminal leaflet usually distinctly longer and narrower than the lateral leaflets; stem (near the middle) sparsely to densely uncinate-pubescent ..... ***D. obtusum***
5 Terminal leaflet similar to the lateral leaflets; stem (near the middle) glabrous to pilose, or also with some uncinate-pubescence.
6 Petioles 1-3 (-5) mm long; pedicels 3-8 mm long; stem usually pilose; leaflets sub-appressed pubescent (to glabrate)..... ***D. ciliare***
6 Petioles 10-25 mm long; pedicels 8-15 mm long; stem glabrous (to sparsely uncinate-puberulent); stem glabrous (to sparsely uncinate-puberulent); leaflets glabrous or with only a few scattered hairs ..... ***D. marilandicum***
2 Loment with 3-5 segments, mostly obtusely angled below.

7 Leaves densely villous on the lower surface; stem densely pubescent with uncinate or non-uncinate hairs.
8 Leaflets 1.5-2.0 (-2.2)× as long as wide; loment usually curved (the upper margin convex); loment with 2-4 segments; loment segments 4-5 mm long ..... ***D. nuttallii***
8 Leaflets 1.0-1.5 (-1.9)× as long as wide; loment straight; loment with (3-) 4-5 (-6) segments; loment segments (4-) 5-8 (-9) mm long. ..... ***D. viridiflorum***
7 Leaves glabrous to moderately appressed-villous on the lower surface; stem glabrate, pilose or uncinate pubescent.
9 Bracts (subtending clusters of 2-3 flowers) usually villous; plants moderately to densely villous; loment usually incurved (the upper margin convex); loment with 2-4 segments, each segment 4-5 mm long ..... ***D. nuttallii***
9 Bracts (subtending clusters of 2-3 flowers) not villous; plants glabrous or slightly to moderately villous or pilose; loment usually nearly straight; loment with 3-5 segments, each segment 4-8.5 mm long.
10 Corolla 8-10 mm long; pedicels usually 10-15 (-20) mm long; stems and leaves glabrous; leaflets distinctly pale on the lower surface ..... ***D. laevigatum***
10 Corolla 6-8 (-9) mm long; pedicels 3-12 mm long; stems and leaves pubescent or glabrate (but pubescent at least on the leaves); leaflets green or slightly pale on the lower surface; ["*Desmodium paniculatum* group"].
11 Leaflet lower surface glabrous, except for the conspicuous uncinate puberulence on the veins; stems and petioles glabrous or uncinate-puberulent; [plant of the Coastal Plain and possibly lower Piedmont] ..... ***D. fernaldii***
11 Leaflet lower surface strigose to conspicuously sub-appressed-villous, and sometimes also uncinate-puberulent; stems and petioles glabrate to conspicuously pilose or uncinate-puberulent; [plants collectively widespread in our area].
12 Leaflets (2.5-) 3-8 (-10)× as long as wide; leaflet pubescence usually sparse, of straight, appressed hairs < 0.5 mm long (or sometimes of longer spreading hairs); leaflets usually lacking uncinate pubescence on either surface; mid-stems glabrous or glabrate, the pubescence usually uncinate puberulence.
13 Loment segments rounded on the lower margin (thus semicircular to gibbous); leaves subsessile to short-petiolate; [plant restricted to Coastal Plain] ..... ***D. paniculatum*** *var.* ***epetiolatum***
13 Loment segments angled on the lower margin (thus triangular to sub-rhombic); leaves long-petiolate; [plant widespread in our area] ..... ***D. paniculatum*** *var.* ***paniculatum***
12 Leaflets 1.5-3 (-4)× as long as wide; leaflet pubescence usually evident, of spreading hairs > 0.5 mm long; leaflets usually with uncinate pubescence on the veins of the upper surface; mid-stems pubescent, either pilose or with uncinate pubescence (if not, evidently pubescent on the petioles).
14 Stem and petiole pubescence sparsely to densely uncinate-puberulent; upper surface of leaflets commonly uncinate-puberulet on the veins ..... ***D. glabellum***
14 Stem and petiole pubescence pilose; upper surface of leaflets occasionally uncinate-puberulent on the veins ..... ***D. perplexum***

Desmodium canadense (Linnaeus) A.P. de Candolle, Showy Tick-trefoil, Canadian Tick-trefoil. Marl marshes, *Thuja* swamps, springs, seeps, hay meadows, streambanks. July-September; August-October. QC and NS west to AB, south to n. VA, sw. VA, NC (?), c. WV, MO, and OK. Small (1933) reports this species for NC; the documentation is not known. [= C, F, G, I, K, SE, W, WV; = *Meibomia canadensis* (Linnaeus) Kuntze – S]

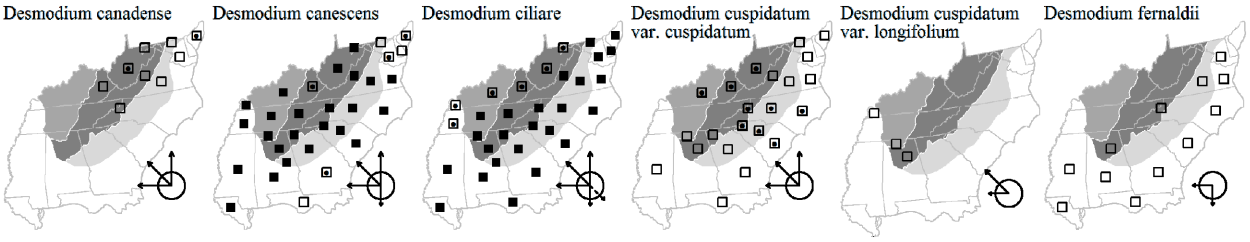
Desmodium canescens (Linnaeus) A.P. de Candolle, Hoary Tick-trefoil. Fields, woodland borders, disturbed areas. June-August; August-October. MA west to WI and NE, south to n. peninsular FL and TX. [= RAB, C, F, G, I, K, SE, W, WH, WV; = *Meibomia canescens* (Linnaeus) Kuntze – S]

Desmodium ciliare (Muhlenberg ex Willdenow) A.P. de Candolle. Fields, woodland borders, disturbed areas. June-September; August-October. MA west to IN, MO, and se. KS, south to s. FL and TX; also in Cuba. [= RAB, C, G, I, SE, W, WH, WV; > *D. ciliare* var. *ciliare* – F, K; > *D. ciliare* var. *lancifolium* Fernald – F, K; = *Meibomia ciliaris* (Muhlenberg ex Willdenow) Blake – S]

Desmodium cuspidatum (Muhlenberg ex Willdenow) A.P. de Candolle ex Loudon *var.* ***cuspidatum***, Toothed Tick-trefoil. Fields, woodland borders, disturbed areas. June-August; August-October. VT and MA west to MI and WI, south to FL Panhandle and OK. [= C, F, G, K, SE; < *D. cuspidatum* – RAB, I, W, WH, WV; = *Meibomia grandiflora* (A.P. de Candolle) Kuntze – S]

Desmodium cuspidatum (Muhlenberg ex Willdenow) A.P. de Candolle ex Loudon *var.* ***longifolium*** (Torrey & A. Gray) Schubert. Forests and woodlands. OH west to MN and NE, south to GA and ne. TX. [= C, F, G, K, SE; < *D. cuspidatum* – RAB, I]

Desmodium fernaldii Schubert, Fernald's Tick-trefoil. Sandhills, dry flatwoods, woodland borders. June-September; August-October. Se. VA south to s. SC (and maybe e. GA and n. FL); Isely (1998) states that reports from the Gulf Coast are based on "glabrate forms of *D. glabellum*," and also suggests that *D. fernaldii* is only weakly differentiated from *D. glabellum*. [= RAB, C, F, G, I, K, SE, W, WH; < *Meibomia rhombifolia* Vail – S (also see *D. floridanum*)]



Desmodium floridanum Chapman, Florida Tick-trefoil. Sandhills, other dry sandy habitats. June-September; August-October. Se. SC south to s. FL. [= RAB, I, K, SE, WH; < *Meibomia rhombifolia* Vail – S (also see *D. fernaldii*)]

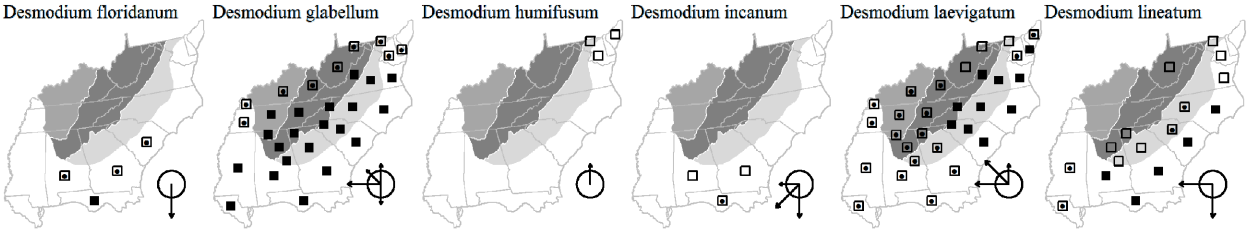
Desmodium glabellum (Michaux) A.P. de Candolle. Fields, woodland borders, disturbed areas. June-September; August-October. ME west to WI and NE, south to n. peninsular FL and TX. [= RAB, F, I, K, SE, WH, WV; < *D. glabellum* – C (also see *D. perplexum*); *? Meibomia paniculata* (Linnaeus) Kuntze – S, in part; *? Meibomia pubens* (Torrey & A. Gray) Rydberg – S (also see *D. paniculatum* var. *paniculatum*); < *D. paniculatum* var. *dillenii* (Darlington) Isely – W]

Desmodium humifusum (Muhlenberg ex Bigelow) Beck. Dry, sandy soils. MA (NS?) south to MD and DC (and possibly VA). Perhaps only a hybrid. [= C, F, I, K, SE; = *D. glabellum* – G, misapplied; = *Meibomia glabella* – S, misapplied]

Desmodium incanum A.P. de Candolle. Lawns, disturbed areas; presumably introduced or adventive from tropical America. A pantropical weedy species. [= I, SE, WH; > *D. incanum* var. *incanum* – K; = *Meibomia cana* (J.F. Gmelin) Blake – S, illegitimate basionym; = *D. canum* (J.F. Gmelin) Schinz & Thellung, illegitimate basionym] {not yet keyed}

Desmodium laevigatum (Nuttall) A.P. de Candolle. Dry oak and pine forests, fields, woodland borders, disturbed areas. June-September; August-October. S. NY west to IN and MO, south to n. FL, Panhandle FL, and TX. [= RAB, C, F, G, I, K, SE, W, WH, WV; = *Meibomia laevigata* (Nuttall) Kuntze – S]

Desmodium lineatum A.P. de Candolle, Matted Tick-trefoil. Sandhills and other dry forests and woodlands. June-September; August-October. Se. MD south to n. peninsular FL, west to TX, rarely inland. [= RAB, C, F, G, I, K, SE, W, WH, WV; > *Meibomia arenicola* Vail – S; > *Meibomia polymorpha* (A. Gray) Small – S]



Desmodium marilandicum (Linnaeus) A.P. de Candolle. Fields, woodland borders, disturbed areas. June-September; August-October. MA west to MI and MO, south to n. peninsular FL and TX. [= RAB, C, F, G, I, K, SE, W, WH, WV; = *Meibomia marilandica* (Linnaeus) Kuntze – S]

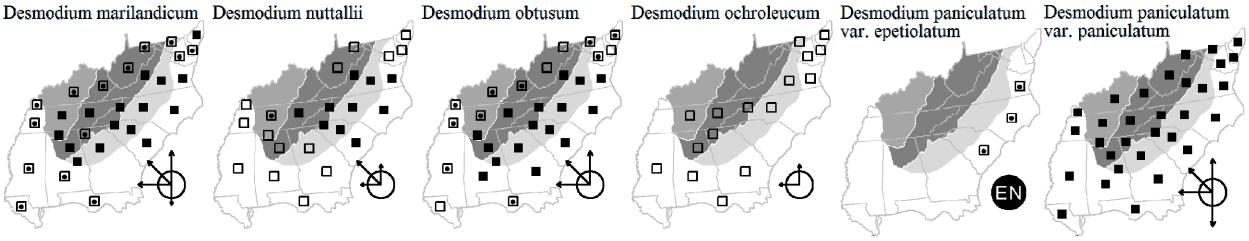
Desmodium nuttallii (Schindler) Schubert. Fields, woodland borders, disturbed areas. July-September; August-October. NY west to IN, south to n. peninsular FL, FL Panhandle, AL, and AR. [= RAB, F, I, K, SE, W, WH, WV; < *D. viridiflorum* – C, G; < *Meibomia viridiflora* (Linnaeus) Kuntze – S (also see *D. viridiflorum*)]

Desmodium obtusum (Muhlenberg ex Willdenow) A.P. de Candolle. Dry pine woodlands, fields, woodland borders, disturbed areas. June-September; August-October. MA west to s. MI, south to Panhandle FL and TX. [= RAB, I, K, SE, W, WH; = *D. rigidum* (Elliott) A.P. de Candolle – C, F, G, WV; = *Meibomia rigida* (Elliott) Kuntze – S]

Desmodium ochroleucum M.A. Curtis ex Canby, White Tick-trefoil, Creamflower Tick-trefoil. Dry woodlands, especially over calcareous soils. June-August; August-October. NJ (?), DE, and MD south to sc. and sw. NC, GA, TN, AL, Panhandle FL, MS, and MO. [= RAB, C, F, G, I, K, SE, W; = *Meibomia ochroleuca* (M.A. Curtis ex Canby) Kuntze – S]

Desmodium paniculatum (Linnaeus) A.P. de Candolle *var.* ***epetiolatum*** Schubert. Pine savannas and flatwoods, bogs. June-September; August-October. Var. *epetiolatum* ranges from se. VA south to se. NC or e. SC. It may reflect hybridization between *D. paniculatum* var. *paniculatum* and another species. Further study is needed. [= F, I, K, SE; < *D. paniculatum* – RAB, C; < *D. paniculatum* var. *paniculatum* – W]

Desmodium paniculatum (Linnaeus) A.P. de Candolle *var.* ***paniculatum***. Fields, woodland borders, disturbed areas. June-September; August-October. S. ME west to s. ON, MI, and NE, south to s. FL and TX. [= F, I, K, SE; < *D. paniculatum* – RAB, C, WH, WV; > *Meibomia chapmanii* (Britton) Small – S; = *D. paniculatum* var. *pubens* Torrey & A. Gray – G; > *Meibomia paniculata* (Linnaeus) Kuntze – S; >< *Meibomia pubens* (Torrey & A. Gray) Rydberg – S (also see *D. glabellum*); < *D. paniculatum* var. *paniculatum* – W]



Desmodium perplexum Schubert. Fields, woodland borders, disturbed areas. July-September; August-October. [= RAB, F, I, K, SE, WH, WV; < *D. glabellum* – C; *? Meibomia dillenii* (Darlington) Kuntze – S; < *D. paniculatum* var. *dillenii* (Darlington) Isely – W]

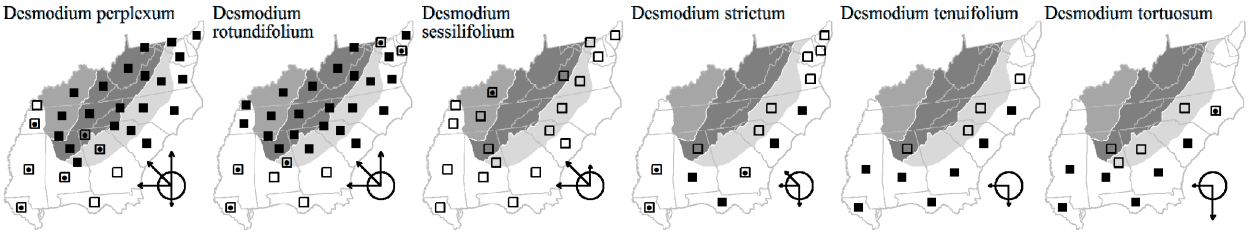
Desmodium rotundifolium A.P. de Candolle, Roundleaf Tick-trefoil. Dry forests and woodlands. June-August; August-October. VT and MA west to s. MI, south to ne. FL, Panhandle FL, LA, and MO. [= RAB, C, F, G, I, K, SE, W, WH, WV; *? Meibomia michauxii* Vail – S]

Desmodium sessilifolium (Torrey) Torrey & A. Gray, Sessile-leaf Tick-trefoil. Dry woodlands. July-August; August-October. RI west to s. MI and KS, south to NC, Panhandle FL, MS, and TX. [= RAB, C, F, G, I, K, SE, W, WH; = *Meibomia sessilifolia* (Torrey) Kuntze – S]

Desmodium strictum (Pursh) A.P. de Candolle, Pineland Tick-trefoil, Pinebarren Tick-trefoil. Sandhills, other dry woodlands. July-August; August-October. S. NJ south to s. FL, west to w. LA. [= RAB, C, F, G, I, K, SE, W, WH; = *Meibomia stricta* (Pursh) Kuntze – S]

Desmodium tenuifolium Torrey & A. Gray, Slimleaf Tick-trefoil. Savannas, wet pine flatwoods. July-August; August-October. Se. VA south to c. peninsular FL, west to w. LA. [= RAB, C, F, G, I, K, SE, WH; = *Meibomia tenuifolia* (Torrey & A. Gray) Kuntze – S]

*? ***Desmodium tortuosum*** (Swartz) A.P. de Candolle. Fields, woodland borders, disturbed areas. July-August; August-October. E. NC south to s. FL, west to TX; perhaps only introduced in the southeastern United States. [= RAB, I, K, SE, WH; = *Meibomia purpurea* (P. Miller) Vail – S]



* ***Desmodium triflorum*** (Linnaeus) deCandolle. Lawns, roadsides; native of the Old World tropics. Reported for Escambia County, FL Panhandle (Kunzer et al. 2009). [= I, K, SE, WH; = *Sagotia triflora* (Linnaeus) Duchassaing & Walpers – S] {add to synonymy}

Desmodium viridiflorum (Linnaeus) A.P. de Candolle. Fields, woodland borders, disturbed areas. June-September; August-October. DE south to c. peninsular FL, west to TX, and inland to w. VA, w. NC, n. TN, and AR. [= RAB, F, I, K, SE, W, WH; < *D. viridiflorum* – C, G (also see *D. nuttallii*); < *Meibomia viridiflora* (Linnaeus) Kuntze – S (also see *D. nuttallii*)]

Dichrostachys (de Candolle) Wight & Arnott (Sickle Bush)

A genus of about 6 species, shrubs and trees, of Africa and tropical Asia. References: Isely (1998)=I.

* ***Dichrostachys cinerea*** (Linnaeus) Wight & Arnott *ssp.* ***africana*** Brenan, African Sickle Bush, Kalahari Christmas Tree. Disturbed areas; native of Africa. [= K2; < *D. cinerea* – I, SE]

Erythrina Linnaeus 1753 (Coral Bean)

A genus of about 120 species, trees, shrubs, and perennial herbs, of tropical and subtropical regions of the Old and New World. References: Isely (1998)=I.

1 Leaflets not lobed; [cultivated tree, persistent] ..... ***E. crista-galli***
1 Leaflets hastately lobed; [native herb or shrub] ..... ***E. herbacea***

* ***Erythrina crista-galli*** Linnaeus, Coraltree. Cultivated, disturbed areas, roadside ditches; native of South America. [= I, K, SE; = *Micropteryx crista-galli* (Linnaeus) Walpers – S]

Erythrina herbacea Linnaeus, Coral Bean, Cardinal-spear. Maritime forests, dry sandy woodlands, sandhills in the outer Coastal Plain. May-July; July-September. Se. NC south to FL, west to se. TX, and south to e. Mexico (Tamaulipas and e. San Luis Potosi). [= RAB, I, K, SE, WH; > *E. herbacea* – S; > *E. arborea* (Chapman) Small – S]

Galactia P. Browne 1756 (Milkpea)

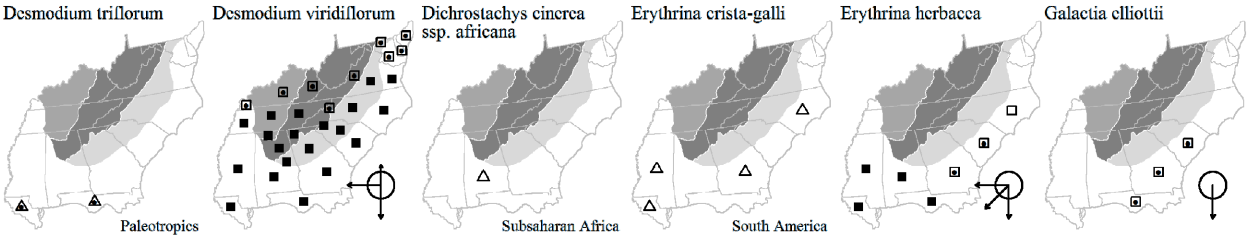
A genus of about 50-60 species, perennial herbs, of tropical and warm temperate regions, primarily American. References: Duncan (1979)=Z; Isely (1998)=I; Ward & Hall (2004)=Y.

Identification notes: Definite identification of the taxa from key lead 4 on is problematic. Note also that the traditional application of *G. regularis* and *G. volubilis* is reversed.

1 Leaves with (5-) 7 (-9) leaflets; flowers white ..... ***G. elliottii***
1 Leaves with 3 leaflets; flowers white, pink, red, or purple.
  2 Plant erect, with 4-6 (-8) leaves ..... ***G. erecta***
  2 Plant prostrate, trailing, or twining, generally with numerous leaves.
    3 Legumes villous with hairs 1-1.5 mm long; corolla when fresh bright reddish purple and white (drying dark on herbarium specimens); stems villous with hairs > 0.5 mm long ..... ***G. mollis***
    3 Legumes glabrous, or pubescent with hairs < 1 mm long; corolla pink to pink-purple (drying pale or the petals dropping on herbarium specimens); stems glabrate to villosulous with hairs < 0.5 mm long.
      4 Inflorescences generally exserted, (2-) 4-15 (-20) cm long, the flowers well distributed along half or more of the length of the inflorescence axis; flower buds generally 5-8 mm long; corolla 8-12 (-14) mm long; plants twining (rarely trailing) ..... ***G. regularis***
      4 Inflorescences short or exserted, if exserted then the flowers generally from nodes crowded into the upper half of the axis; flower buds 5-10 mm long; corolla (11-) 12-16 (-18) mm long; plants trailing or twining.
        5 Internodes short, 1-2 cm long, the stem thus appearing leafy; inflorescences with 1-3 flowers (or also with solitary axillary flowers); [plants of Coastal Plain of SC southward] ..... ***G. minor***
        5 Internodes generally longer; inflorescences with 1-3 or more flowers; [plants collectively widespread in our area].

6 Stems glabrescent to conspicuously pubescent with spreading hairs < 0.5 mm long; leaflets 1.5-3.5 (-4) cm long, the undersurface with hairs 0.4-0.7 mm long; [plants of e. GA southward] ..... ***G. floridana***
6 Stems antrorse- or retrorse-strigose; leaflets 1.5-5 (-7) cm long, the undersurface strigose with hairs < 0.3 mm long; [plants widespread in our area] ..... ***G. volubilis*** *var.* ***volubilis***

Galactia elliottii Nuttall, Elliott's Milkpea. Moist forests. July-September; August-October. S. SC south to s. FL. [= RAB, I, K, S, SE, WH, Y, Z]



Galactia erecta (Walter) Vail, Erect Milkpea. Sandhills. May-July; July-September. Se. NC south to Panhandle FL, west to e. TX. [= RAB, I, K, S, SE, WH, Y, Z]

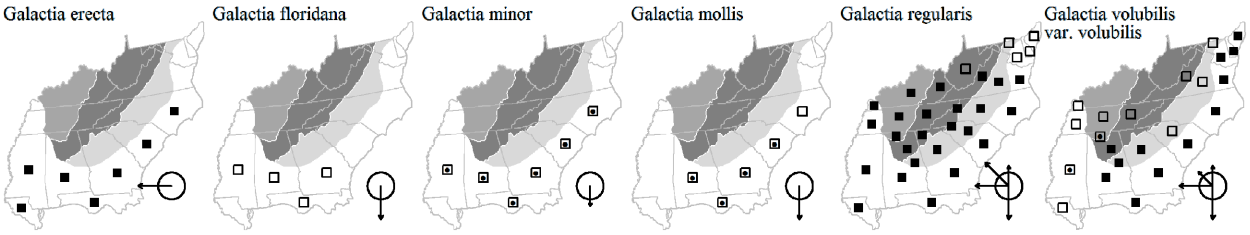
Galactia floridana Torrey & A. Gray, Florida Milkpea. Sandhills and other xeric sands. S. GA south to s. FL, west to s. MS. [= Y; < *G. floridana* – I, K, SE, Z (also see *G. volubilis* var. *fasciculata*); = *G. floridana* var. *floridana* – S; < *G. volubilis* – WH]

Galactia minor W.H. Duncan, Little Milkpea. Sandhills. June-August; July-October. Sc. NC south to Panhandle FL, west to s. MS. [= Y, Z; < *G. regularis* (Linnaeus) Britton, Sterns, & Poggenburg – RAB (misapplied); = *G. microphylla* (Chapman) H.J. Rogers ex Isely – I, K, SE; = *G. floridana* Torrey & A. Gray var. *microphylla* Chapman – S; < *G. volubilis* – WH]

Galactia mollis Michaux. Sandhills. May-July; July- September. Se. NC south to c. peninsular FL, west to Panhandle FL and se. AL. [= RAB, I, K, S, SE, WH, Y, Z]

Galactia regularis (Linnaeus) Britton, Sterns, & Poggenburg. Dry forests and woodlands. July-September; August-October. Se. PA west to MO and OK, south to s. FL and se. TX. [= Y, Z; > *G. volubilis* (Linnaeus) Britton – RAB, C, F, G, WV (misapplied); > *G. macreei* M.A. Curtis – RAB, C, F, G; = *G. volubilis* – I, K, S, SE, misapplied; < *G. volubilis* – WH]

Galactia volubilis (Linnaeus) Britton *var.* ***volubilis***. Sandhills, other dry forests and openings. June-August; July-October. NJ and s. PA west to c. AR, south to s. FL and LA. Var. *baltzelliana* D.B. Ward & D.W. Hall and var. *fasciculata* (Vail) D.B. Ward & D.W. Hall are localized endemics of the FL Peninsula. Duncan (1979) describes additional forms of this taxon (which he treated under the name *G. glabella*) that he considered to potentially warrant description as varieties or species; they need further study. [= Y; < *G. regularis* (Linnaeus) Britton, Sterns, & Poggenburg – RAB, C, F, G, I, K, SE, WH (misapplied); > *G. regularis* – S, misapplied; > *G. brevipes* Small – S; > *G. brachypoda* Torrey & A. Gray – S; < *G. glabella* Michaux – Z]



Genista Linnaeus 1753 (Dyer's Greenweed)

A genus of about 80-90 species, shrubs, herbs, and small trees, native to Eurasia. References: Isely (1998)=I.

* ***Genista tinctoria*** Linnaeus, Dyer's Greenweed, Dyer's Broom. Disturbed areas; native of Europe. June-September. Not cited in Harvill et al. (1992), but described as naturalized in sterile soils south to VA in C, F, and G. [= C, F, G, I, K]

Gleditsia Linnaeus 1753 (Honey Locust, Water Locust)

A genus of 13-16 species, trees (and a shrub), scattered relictually in the Old and New Worlds, related to *Gymnocladus*. References: Isely (1975)=Z; Robertson & Lee (1976)=Y; Isely (1998)=I; Schnabel & Wendel (1998).

Identification notes: The hybrid *Gleditsia ×texana* Sargent (pro sp.) [*G. aquatica* × *triacanthos*] occurs occasionally in the area of range overlap of its parents. It is intermediate between its parents.

1 Legume ovate, 3-5 (-8) cm long and 1-3-seeded; foliage glabrous (or slightly puberulent when young); [trees of frequently flooded swamps, often with *Taxodium*, rarely planted and escaped] ..... ***G. aquatica***
1 Legume elongate, 20-40 cm long and multi-seeded; foliage puberulent (even in age); [trees of moist to dry forests, frequently planted and escaped in disturbed areas] ..... ***G. triacanthos***

Gleditsia aquatica Marshall, Water Locust. Swamp forests. April-May; July-November. E. SC south to c. peninsular FL, west to TX, and north in the interior to IN, IL, and MO; occasionally cultivated north of its native range. [= RAB, C, F, G, GW, I, K, S, SE, WH, Y, Z]

Gleditsia triacanthos Linnaeus, Honey Locust. Woodlands, forests (generally bottomland), fencerows, often planted as a street tree. April-May; July-November. Native distribution is believed to be from w. NY west to se. SD, south to Panhandle FL and TX (west of the Blue Ridge); its occurrence over much of our region appears to be as an adventive. The trunks are normally beset with lengthy, branched thorns, but thornless trees are encountered (and are usually favored for horticultural planting). [= RAB, C, G, GW, I, K, S, SE, W, WV, Y, Z]

Glycine Willdenow 1802 (Soybean, Soya)

A genus of about 10-20 species, annual and perennial herbs, of Asia and Australia. References: Isely (1998)=I.

* ***Glycine max*** (Linnaeus) Merrill, Soybean. Abundantly cultivated, rarely persisting as a waif; native of e. Asia. July-October. One of the most important legume crops in the world. [= RAB, F, I, K, SE]

Glycyrrhiza Linnaeus 1753 (Licorice)

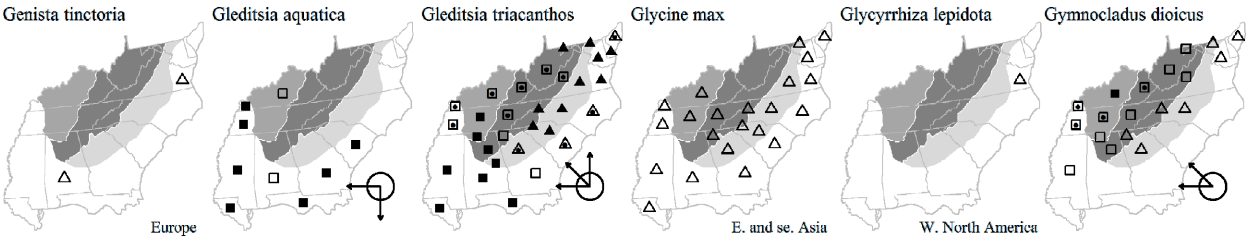
A genus of about 20 species, herbs, mainly of Eurasia (isolated taxa in North Americam South America, and Australia). References: Isely (1998)=I.

* ***Glycyrrhiza lepidota*** Pursh, Wild Licorice, American Licorice. Disturbed areas; native of w. North America. Described as naturalized in old fields in e. VA in C, F, and G. [= K; > *G. lepidota* Pursh var. *glutinosa* (Nuttall) S. Watson – C, F, G, I]

Gymnocladus Lamarck 1785 (Kentucky Coffee-tree)

A genus of 6 species, all trees, ours in e. North America and 5 species in e. Asia, related to *Gleditsia*. References: Isely (1975)=Z; Robertson & Lee (1976)=Y; Lee (1976)=X; Isely (1998)=I.

Gymnocladus dioicus (Linnaeus) K. Koch, Kentucky Coffee-tree, Kentucky Mahogany. Native in rich bottomland and slope forests, also in disturbed areas, persistent and weakly spreading from horticultural plantings. April-June; August-November (and persistent). The original native range has been obscured, perhaps PA west to se. SD, south to w. VA, TN, n. AL, and OK. [= RAB, C, F, G, I, K, S, SE, WV, X, Y, Z]



Hylodesmum H. Ohashi & R.R. Mill 2000

A genus of ca. 15 species, perennial herbs, mainly of e. Asia and e. North America. This group has often been included in *Desmodium* as a section or subgenus, but is now shown to be amply distinct in morphology and also to form a monophyletic group based on molecular analysis. References: Raveill (2006); Ohashi & Mill (2000)=Z.

1 Stems dimorphic, the flowering stem normally lacking leaves (rarely with leaves), the sterile stem with a subverticillate cluster of 3-7 leaves near the top; pedicels 10-20 mm long ..... ***H. nudiflorum***
1 Stems monomorphic, bearing both leaves and flowers, the leaves either subverticillate or not; pedicels 2-10 mm long.
  2 Leaves subverticillate, clustered; leaflets conspicuously and strongly acuminate, 5-10 cm long; flowers usually distinctly pink or pink-purple; inflorescence 3-8 dm long, elongate, large, and conspicuous, much exceeding the leaves ..... ***H. glutinosum***
  2 Leaves alternate, scattered; leaflets acute to slightly acuminate, 3-7 cm long; flowers white; inflorescence 1-2 dm long, small and inconspicuous, often partly obscured by the leaves ..... ***H. pauciflorum***

Hylodesmum glutinosum (Muhlenberg ex Willdenow) H. Ohashi & R.R. Mill, Heartleaf Tick-trefoil, Clusterleaf Tick-trefoil. Moist forests, especially nutrient-rich. June-August; August-October. NS west to SK, south to Panhandle FL and Mexico. [= Z; = *Desmodium glutinosum* (Muhlenberg ex Willdenow) A. Wood – RAB, C, F, G, I, K, SE, W, WH, WV; = *Meibomia acuminata* (Michaux) Blake – S]

Hylodesmum nudiflorum (Linnaeus) H. Ohashi & R.R. Mill, Naked Tick-trefoil. Moist to dry forests. July-August; August-October. ME west to MN, south to Panhandle FL, n. peninsular FL, and TX. [= Z; = *Desmodium nudiflorum* (Linnaeus) A.P. de Candolle – RAB, C, F, G, I, K, SE, W, WH, WV; = *Meibomia nudiflora* (Linnaeus) Kuntze – S]

Hylodesmum pauciflorum (Nuttall) H. Ohashi & R.R. Mill, Few-flowered Tick-trefoil. Moist forests. June-August; August-October. NY west to OH and IA, south to Panhandle FL and TX. [= Z; = *Desmodium pauciflorum* (Nuttall) A.P. de Candolle – RAB, C, F, G, I, K, SE, W, WH, WV; = *Meibomia pauciflora* (Nuttall) Kuntze – S]

Indigofera Linnaeus 1753 (Indigo)

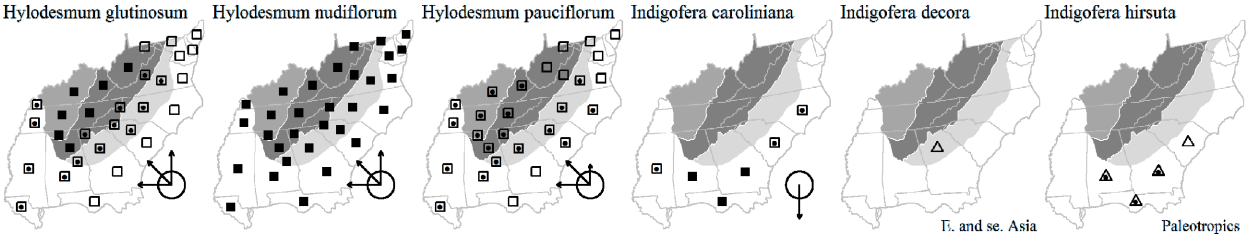
A genus of about 700 species, annual herbs, perennial herbs, and shrubs, nearly cosmopolitan in tropical and warm temperate regions. References: Isely (1998)=I.

1 Leaflets borne alternately or irregularly on the rachis.
  2 Stipules subulate, < 1.5 mm wide; legumes divergent to deflexed, spaced on the rachis; flowers 6-10 per inflorescence ..... ***I. miniata var. leptosepala***
  2 Stipules deltate to lanceolate, 2-3 mm wide; legumes deflexed, crowded on the rachis; flowers many per inflorescence ..... ***I. spicata***
1 Leaflets borne opposite on the rachis.
  3 Stem pubescence hirsute or pilose with long brownish hairs ..... ***I. hirsuta***
  3 Stem pubescence strigose-appressed.
    4 Legume 7-9 mm long, ovoid, not falcate, indehiscent, with 2-3 seeds; corolla 6-9 mm long; [native species] ..... ***I. caroliniana***
    4 Legume 15-36 mm long, linear-cylindric, slightly to strongly falcate, dehiscent, with 3-12 or more seeds; corolla **either** 5-6 mm long **or** 15-18 mm long; [introduced species].
      5 Corolla 15-18 mm long; legume 30-40 mm long, straight; leaflets 2.5-4 cm long ..... ***I. decora***
      5 Corolla 5-6 mm long; legume 15-36 mm long, slightly to strongly falcate; leaflets (0.5-) 1-3 cm long.
        6 Legume 15-20 mm long, strongly falcate ..... ***I. suffruticosa***
        6 Legume 28-36 mm long, slightly falcate ..... ***I. tinctoria***

Indigofera caroliniana P. Miller, Wild Indigo, Carolina Indigo. Sandy forests and woodlands, including sandhills and sandy maritime forests. June-August; July-October. E. NC south to s. FL, west to se. LA, a Southeastern Coastal Plain endemic. [= RAB, I, K1, K2, S, SE, WH]

* ***Indigofera decora*** Lindley, Chinese Indigo. Planted horticulturally and spreading to nearby roadbanks, potentially invasive; native of China. June-July (-September). In GA (Oglethorpe County). [= K2]

* ***Indigofera hirsuta*** Linnaeus, Hairy Indigo. Sandy disturbed areas, such as wildlife "food fields"; native of the Old World tropics. First reported for SC by Nelson & Kelly (1997). Also known from other scattered locations in the Southeast, such as s. MS (Leonard, 2006, pers.comm.) and AL (Diamond & Woods 2009). [= I, K1, K2, SE, WH]



Indigofera miniata Ortega *var.* ***leptosepala*** (Nuttall ex Torrey & A. Gray) B.L. Turner. Dunes, dry disturbed areas. S. KS south to s. TX, disjunct eastwards in FL and (?) GA (where reported by Chapman 1883). [= I, SE, WH; < *I. miniata* – K1, K2; = *I. leptosepala* Nuttall ex Torrey & A. Gray – S]

* ***Indigofera spicata*** Forsskål, Trailing Indigo. Dry, disturbed areas, hammocks, dunes; native of Africa. Reported for Camden County, GA (Carter, Baker, & Morris 2009). [= I, K1, SE, WH; ? *I. hendecaphylla* Jacquin – K2]

* ***Indigofera suffruticosa*** P. Miller, West Indian Indigo. Disturbed areas, dry sandy woodlands, formerly commonly cultivated, locally established as a weed at that time, perhaps no longer present in our area; native of the New World tropics, including s. FL. [= I, K1, K2, S, SE, WH; ? *I. anil* Linnaeus]

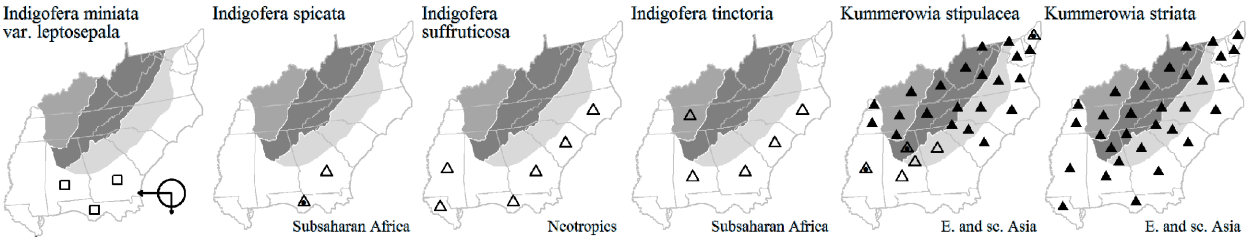
* ***Indigofera tinctoria*** Linnaeus, African Indigo. Formerly commonly cultivated, locally established as a weed at that time, perhaps no longer present in our area; native of Africa. Both this species and *I. suffruticosa* were cultivated as an important export crop in the Coastal Plain of GA, SC, and (less so) NC in the seventeenth and eighteenth centuries. [= I, K1, K2, S, SE, WH]

Kummerowia Schindler 1912 (Korean-clover, Japanese-clover)

A genus of 2 species, annual herbs, native to temperate e. Asia. *Kummerowia* differs from *Lespedeza* in its annual habit (vs. perennial), conspicuous stipules (vs. not conspicuous), inflorescence branching pattern (see Akiyama & Ohba 1985), and leaflets with striate, parallel, lateral veins (vs. with reticulate lateral veins). It is now generally regarded as distinct from *Lespedeza* at the generic level, though they are closely related. References: Akiyama & Ohba (1985)=Z; Isely (1998)=I. Key based closely on SE.

1 Mid-stem leaves with petioles 4-10 mm long; leaflets emarginate at the apex; leaflets conspicuously spreading-ciliate; stems antrorsely appressed-strigose; calyx covering 1/3-1/2 of the legume.....***K. stipulacea***
1 Mid-stem leaves with petioles 1-2 (-4) mm long; leaflets not emarginate at the apex; leaflets inconspicuously appressed-ciliate; stems retrorsely appressed-strigose; calyx covering 1/2-4/5 of the legume.....***K. striata***

* ***Kummerowia stipulacea*** (Maximowicz) Makino, Korean Lespedeza, Korean-clover. Fields, roadsides, disturbed areas; native of e. Asia. July-September; August-November. [= I, K, SE, Z; = *Lespedeza stipulacea* Maximowicz – RAB, C, F, G, W, WV]
* ***Kummerowia striata*** (Thunberg) Schindler, Japanese-clover, Common Lespedeza. Fields, roadsides, disturbed areas; native of e. Asia. July-September; August-November. [= I, K, SE, WH, Z; = *Lespedeza striata* (Thunberg) Hooker & Arnott – RAB, C, F, S, G, W, WV]



Lablab Adanson 1763 (Hyacinth-bean)

A genus of a single species, an annual to perennial herb, native of the Old World tropics. References: Isely (1998)=I.

* ***Lablab purpureus*** (Linnaeus) Sweet, Hyacinth-bean. Disturbed areas; native of Africa. Cultivated and rarely may escape or persist as a waif in disturbed areas; it is reported from se. PA (Rhoads & Klein 1993). [= I, K, SE; = *Dolichos lablab* Linnaeus]

Lackeya Fortunato, L.P. Queiroz, & G.P. Lewis 1996

A monotypic genus, a perennial woody or semi-woody vine, of the Southeastern United States. References: Fortunato, de Queiroz, & Lewis (1996)=Z; Isely (1998)=I.

Lackeya multiflora (Torrey & A. Gray) Fortunato, L.P. Queiroz, & G.P. Lewis. Alluvial forests, prairies. S. GA and FL Panhandle west to e. TX, north in the interior to w. TN and w. KY. [= Z; = *Dioclea multiflora* (Torrey & A. Gray) C. Mohr – C, G, I, K, S, SE; = *Galactia mohlenbrockii* R.H. Maxwell – WH]

Lathyrus Linnaeus 1753 (Wild-pea, Vetchling)

A genus of about 150-160 species, annual and perennial herbs, of nearly cosmopolitan distribution. References: Isely (1998)=I.

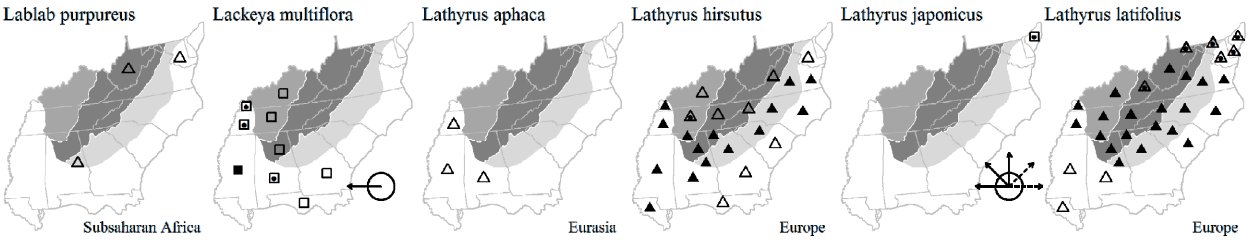
1 Leaflets > 2, generally 4-12; [native species of various habitats].
  2 Foliaceous stipules laterally symmetrical, with 2 approximately equal basal lobes; leaves somewhat fleshy; [plants of ocean beaches and dunes].....***L. japonicus***
  2 Foliaceous stipules asymmetrical, oblique at the base, the basal lobe well-developed only on one side.
    3 Racemes with 2-6 (-9) flowers; leaflets 4-8 (-10) per leaf; [plants of marshes, bottomlands, and other wet habitats].....***L. palustris***
    3 Racemes with (5-) 10-20 flowers; leaflets (8-) 10-14 per leaf; [plants of dry to mesic forests].....***L. venosus***
1 Leaflets 0-2; [alien species, except *L. pusillus*].
  4 Leaflets absent (but with foliaceous stipules).....***L. aphaca***
  4 Leaflets 2.
    5 Stems not winged or flanged; corollas 10-15 mm long; flowers 3-10 per inflorescence.
      6 Corollas yellow.....***V. pratensis***
      6 Corollas red-purple.....***V. tuberosus***
    5 Stems winged; corollas 6-30 mm long; flowers 1-15 per inflorescence.
      7 Stems with wings 0-1 (-2) mm wide; corolla 6-14 mm long; flowers 1-3 (-4) per raceme.
        8 Legume (in fruit) and ovary (in flower) hirsute with swollen-based hairs; corolla 9-14 mm long.....***L. hirsutus***
        8 Legume (in fruit) and ovary (in flower) glabrous; corolla 6-9 mm long.....***L. pusillus***
      7 Stems with wings 1-3 mm wide; corolla 13-30 mm long; flowers 2-12 per raceme.
        9 Stems hirsute with swollen-based hairs; plant an annual; flowers 2-4 per raceme.....***L. odoratus***
        9 Stems glabrate; plant a perennial; flowers (3-) 4-12 per raceme.
          10 Stipules 4-10 mm wide; leaflets 2-5× as long as wide.....***L. latifolius***
          10 Stipules 2-3 mm wide; leaflets 6-15× as long as wide.....***L. sylvestris***

* ***Lathyrus aphaca*** Linnaeus, Yellow Vetchling. Disturbed areas; native of Eurasia. Scattered in occurrence in the Southeast, including AL, TN, and KY (Kartesz 1999). [= G, I, K, SE]

* ***Lathyrus hirsutus*** Linnaeus, Caley Pea, Singletary Pea. Roadsides, fields, disturbed areas; native of Europe. April-July. [= RAB, C, F, G, I, K, S, SE, W, WH]

Lathyrus japonicus Willdenow, Beach Pea. Beaches. Circumboreal, south in eastern North America to NJ (or NC?) and the shores of the Great Lakes. Reported from ocean beaches in Dare County (NC), but without adequate documentation. [= I; > *L. maritimus* (Linnaeus) Bigelow var. *pellitus* (Fernald) Gleason C, G; > *Lathyrus japonicus* Willdenow var. *pellitus* Fernald – F, K1; < *L. japonicus* – I; > *L. japonicus* var. *maritimus* (Linnaeus) Kartesz & Gandhi – K2]

* ***Lathyrus latifolius*** Linnaeus, Everlasting Pea, Perennial Sweet Pea. Roadsides, fencerows, disturbed areas; native of Europe. May-September. [= RAB, C, F, G, I, K, SE, W, WV]



* ***Lathyrus odoratus*** Linnaeus, Sweet Pea. Cultivated, and occasionally persisting; native of s. Europe. [= C, F, G, I, K, SE, WV]

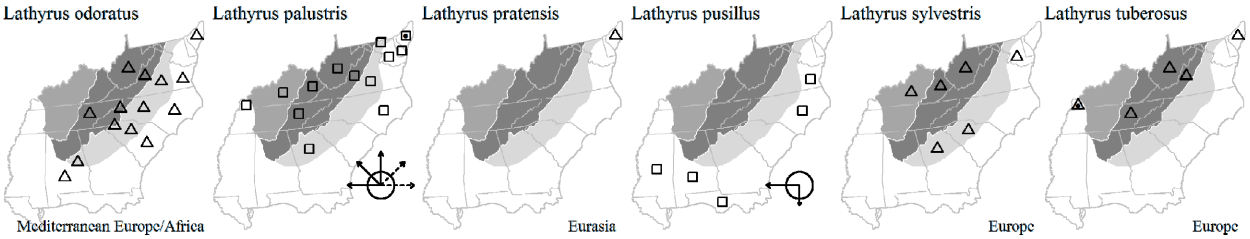
Lathyrus palustris Linnaeus, Marsh Pea, Marsh Vetchling. Bottomland forests, marshes, streambanks. May-June; July-September. Circumboreal, ranging in North America south to DE, VA, ne. NC, ec. GA, OH, IN, MO, CO, and CA. [= RAB, I, K, SE; > *L. palustris* var. *palustris* – C, F, G, WV; > *L. palustris* var. *myrtifolius* (Muhlenberg ex Willdenow) A. Gray – F, G, WV; > *L. palustris* var. *linearifolius* Seringe – G; > *L. myrtifolius* Muhlenberg ex Willdenow – S]

* ***Lathyrus pratensis*** Linnaeus, Meadow Pea. Disturbed areas; native of Eurasia. Reported for VA on the basis of "personal communication" (Kartesz 1999). {investigate} [= C, F, I, K]

Lathyrus pusillus Elliott, Tiny Pea. Open areas in bottomlands, disturbed areas. April-July. E. VA, MO and KS, south to FL Panhandle and TX. [= RAB, F, G, I, K, S, SE, WH]

* ***Lathyrus sylvestris*** Linnaeus, Perennial Pea. Cultivated, and occasionally persisting; native of Europe. [= C, F, G, I, K, SE, WV]

* ***Lathyrus tuberosus*** Linnaeus, Tuberous Vetchling. Disturbed areas; native of Europe. Introduced in e. TN (Chester, Wofford, & Kral 1997), WV (Strausbaugh & Core 1978), and KY. [= C, F, G, I, K, SE, WV]



Lathyrus venosus Muhlenberg ex Willdenow, Forest Pea, Bush Vetch. Dry to mesic slope and bottomlands forests and woodlands, especially in base-rich soils. July-September. S. ON west to MN and SK, south to c. NC, wc. GA, and MO. [= RAB, I, K, S, SE, W; > *L. venosus* var. *venosus* – C, F, G, WV; > *L. venosus* var. *intonsus* Butters & St. John – C, F, G, WV; > *L. venosus* var. *meridionalis* Butters & St. John – F; "*L. palustris* var. *meridionalis*" – WV]

Lens P. Miller (Lentil)

A genus of about 5 species, herbs, of sw. Asia, s. Europe, and n. Africa. References: Isely (1998)=I.

* ***Lens culinaris*** Medikus, Lentil. Disturbed areas; native of Mediterranean Europe and w. Asia. {MD, NJ}. [= I, K1, K2]

Lespedeza Michaux 1803 (Lespedeza)

A genus of about 40 species, perennial herbs and shrubs, of temperate regions of e. Asia and e. North America. References: Clewell (1966a)=Z; Clewell (1966b)=Y; Isely (1986b)=X; Akiyama (1988)=Q; Clewell & Stickel (1990); Isely (1998)=I. Key based primarily on Z and SE. [also see *Kummerowia*]

Identification notes: Many species of *Lespedeza* hybridize, and most combinations may occur in our area. Some of the hybrids have been named in the past as varieties or species. Hybrids generally occur in mixed populations with both parents and can usually be identified by their intermediate morphology (identification much easier in the field where context is apparent than in the herbarium). See Isely (1990) and Clewell (1966a) for additional hints about identification of hybrids.

1 Plants annual; stipules ovate to ovate-lanceolate, conspicuous; leaflets with striate, parallel, lateral veins ..... ***[Kummerowia]***

1 Plants perennial, stipules subulate, setaceous, or lanceolate, not conspicuous; leaflets with reticulate lateral veins, joining before reaching the margin.
2 Leaflets distinctly widest toward the tip, 3-5× as long as wide, the base and apex very differently shaped (the base narrowly cuneate, the tip rounded, truncate or even retuse); racemes reduced, with 2-3 flowers, shorter than the subtending leaves; [plants alien].....***L. cuneata***
2 Leaflets generally widest near the middle, 1-8 (-10)× as long as wide, the base and apex shaped similarly (i.e. both rounded, or both cuneate); racemes with 3-many flowers, shorter or longer than the subtending leaves; [plants native, except *L. virgata*].
3 Midrib of leaflets distinctly excurrent as a spinose bristle 0.5-1.5 mm long; [plant a rare introduction].....***L. virgata***
3 Midrib of leaflets not excurrent, or only as an obscure mucro, not at all spinose; [plants native].
4 Plants trailing at maturity (young stems erect to arching-ascending up to 2 dm tall, then lopping over); stems slender, wiry; corolla pink to purple.
5 Pubescence of the stem spreading (pilose) .....***L. procumbens***
5 Pubescence of the stem appressed (strigose).
6 Calyx of legumes produced from cleistogamous flowers 1/4-1/3 as long as the pod; stems usually lacking axillary leaves; keel subequal to the wings, or shorter; stipules 2-4 (-5) mm long .....***L. repens***
6 Calyx of legumes produced from cleistogamous flowers ca. 1/5 as long as the pod; stems often with axillary leaves distinctly smaller than the primary leaves; keel usually longer than the wings; stipules 3-5 (-6) mm long .....***L. frutescens***
4 Plants erect at maturity; stems generally stout, stiff; corolla pink, purple, white, cream, or mixed.
7 Plants in flower.
8 Corolla primarily white or cream (often with a purplish throat).
9 Raceme peduncles short (shorter than the subtending leaf), the inflorescence itself barely if at all exceeding the subtending leaf; calyx lobes 6-10 mm long; leaflets (2-) 2.5-5 (-8)× as long as wide .....***L. capitata***
9 Raceme peduncles elongate (often longer than the subtending leaf), the inflorescence itself well-exserted beyond the subtending leaf; calyx lobes 3-7 mm long; leaflets either narrower or wider (see below).
10 Leaflets 4-8 (-10)× as long as wide .....***L. angustifolia***
10 Leaflets 1.3-1.8× as long as wide.
11 Leaves closely strigose on both surfaces with hairs 0.2-0.5 mm long, silvery when fresh; leaflets 1-2 cm long; petiole of midstem leaves not generally > 1 cm long, about the same length as the rachis; [plants of the Coastal Plain and, in NC and SC, the lower Piedmont].....***L. hirta** var. **curtissii***
11 Leaves glabrate, or strigose above only, at least some of the hairs (especially those on the veins below) > 0.5 mm long, green or grey (to somewhat silvery) when fresh; leaflets 1.5-4 (-5) cm long; petiole of midstem leaves 1-1.5 (-2) cm long, much exceeding the rachis; [plants widespread in our area].....***L. hirta** var. **hirta***
8 Corolla primarily pink or purple.
12 Peduncles of the racemes of chasmogamous (petaliferous) flowers longer than the subtending leaves; keel > 1 mm longer than the wings.
13 Stems to 7 dm long, not bushy-branched; petioles of medial leaves 0.5-2 cm long; chasmogamous panicles with 4-7 flowers; corolla 6-8 mm long; chasmogamous legumes glabrate or inconspicuously strigulose, 5-7 mm long; [native].....***L. frutescens***
13 Stems 10-30 dm long, bushy-branched; petioles of medial leaves 2-4 cm long; chasmogamous panicles with 5-15 flowers; corolla 8-15 mm long; chasmogamous legumes strigose, 7-8 mm long; [plants alien, planted in "wildlife food plots" and persisting or spreading]; [section *Macrolespedeza*].
14 Calyx lobes equal to or shorter than the calyx tube; corolla 8-11 mm long; leaflets 1.5-2 × as long as wide; racemes erect or strongly ascending; stems 1-several per crown, brown when young.....***L. bicolor***
14 Calyx lobes longer than the calyx tube (at least the lowest lobe); corolla (10-) 12-15 mm long; leaflets 2-3 × as long as wide; racemes lax and drooping; stems many per crown, purplish when young.....***L. thunbergii***
12 Peduncles of the racemes of chasmogamous (petaliferous) flowers shorter than the subtending leaves; keel about as long as or shorter than the wings; [native].
15 Upper surface of the leaflets glabrous (sometimes strigose along the midrib only); pubescence of the stem appressed; leaflets 1.5-3× as long as wide .....***L. violacea***
15 Upper surface of the leaflets pubescent; pubescence of the stem appressed or spreading; leaflets 1.3-7× as long as wide.
16 Leaflets 1.3-3 (-3.5)× as long as wide .....***L. stuevei***
16 Leaflets (4-) 5-7× as long as wide .....***L. virginica***
7 Plants not in flower.
17 Leaflets of average, mid-stem leaves > 4× as long as wide (*L. capitata* keyed here and below).
18 Petioles of mid-stem leaves ca. 10 mm long .....***L. virginica***
18 Petioles of mid-stem leaves 1-3 mm long.
19 Leaflets 4-8(-10)× as long as wide; pubescence of the stems and leaves usually not silvery-cinereous .....***L. angustifolia***
19 Leaflets (2-) 2.5-5 (-8)× as long as wide; pubescence of stems and leaves usually silvery-cinereous .....***L. capitata***
17 Leaflets of average, mid-stem leaves < 3.5× as long as wide (*L. capitata* keyed here and above).
20 Leaflets (2-) 2.5-5 (-8)× as long as wide; leaf rachis (the apparent petiolule of the terminal leaflet) longer than the petiole.....***L. capitata***
20 Leaflets 1.3-3 (-3.5)× as long as wide; leaf rachis shorter than the petiole (or about equal in *L. hirta* var. *curtissii*).
21 Central axis not strongly dominant, branches divaricate, irregular; stems slender, wiry .....***L. frutescens***
21 Central axis strongly dominant, branches ascending, mostly on the upper stem; stems stout, stiff.
22 Stems 10-30 dm tall, 1-many from the base; medial leaf petiole 2-4 cm long; [plants alien, planted in "wildlife food plots" and persisting or spreading]; [section *Macrolespedeza*].
23 Calyx lobes equal to or shorter than the calyx tube; leaflets 1.5-2 × as long as wide; racemes erect or strongly ascending; stems 1-several per crown, brown when young.....***L. bicolor***
23 Calyx lobes longer than the calyx tube (at least the lowest lobe); leaflets 2-3 × as long as wide; racemes lax and drooping; stems many per crown, purplish when young .....***L. thunbergii***
22 Stems 3-15 (-20) dm tall, 1-few from the base; medial leaf petiole 0.7-2.5 cm long; [native].
24 Leaflets (1.3-) 1.8-3 (-3.5)× as long as wide.

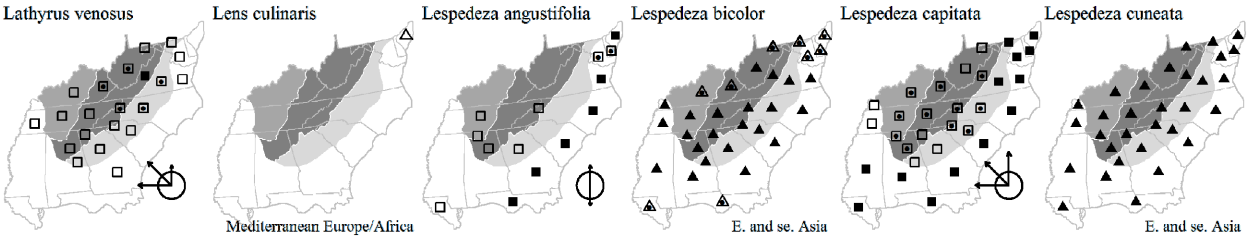
25 Upper surface of the leaflets pubescent; pubescence of the stem appressed or spreading ..... ***L. stuevei***
25 Upper surface of the leaflets glabrous (sometimes strigose along the midrib only); pubescence of the stem appressed ..... ***L. violacea***
24 Leaflets 1.3-1.8× as long as wide.
26 Leaves closely strigose, the hairs 0.2-0.5 mm long, silvery when fresh; leaflets 1-2 cm long; [plants of the Coastal Plain and, in NC and SC, the lower Piedmont] ..... ***L. hirta* var. *curtissii***
26 Leaves glabrate, or strigose above only, at least some of the hairs > 0.5 mm long, green or grey when fresh; leaflets 1.5-4 (-5) cm long; [plants widespread in our area] ..... ***L. hirta* var. *hirta***

Lespedeza angustifolia (Pursh) Elliott, Narrow-leaved Lespedeza. Sandhill-pocosin ecotones and dry to moist savannas, mountain bogs. August-October; September-November. MA south to c. peninsular FL, west to s. MS, essentially a Southeastern Coastal Plain endemic, rarely disjunct inland to w. NC, c. GA, and ec. TN (Chester, Wofford, & Kral 1997). [= RAB, C, G, I, K, S, SE, W, WH, Y, Z; > *L. angustifolia* – F; > *L. hirta* var. *intercursa* Fernald – F]

* ***Lespedeza bicolor*** Turczaninow, Bicolor Lespedeza. "Wildlife food plots," roadsides, forests; native of e. Asia. June-September; August-November. [= RAB, C, I, K, Q, S, SE, W, WH, WV]

Lespedeza capitata Michaux, Bush-clover. Woodlands and woodland borders. August-October; September-November. ME and s. ON west to MN, SD, and NE, south to FL Panhandle and TX. [= RAB, C, I, K, S, SE, W, Y, Z; > *L. capitata* var. *capitata* – F, G, WV; > *L. capitata* var. *stenophylla* Bissell & Fernald – F, G, WV; > *L. capitata* var. *velutina* (Bicknell) Fernald – F, G; > *L. capitata* var. *vulgaris* Torrey & A. Gray – F, WV]

* ***Lespedeza cuneata*** (Dumont-Cours.) G. Don, Sericea Lespedeza, Chinese Lespedeza. Roadbanks, "wildlife food plots", disturbed areas, floodplains, creekbanks; native of e. Asia. July-September; October-November. [= RAB, C, F, G, I, K, SE, W, WV]



Lespedeza frutescens (Linnaeus) Elliott, Violet Lespedeza. Woodlands and woodland borders. July-September; October-November. MA and NY west to MI, WI, IA, and KS, south to ne. FL, FL Panhandle, AL, MS, AR, and TX. [= K, S; = *L. violacea* (Linnaeus) Persoon – RAB, C, F, G, I, SE, W, WV, Y, Z, misapplied]

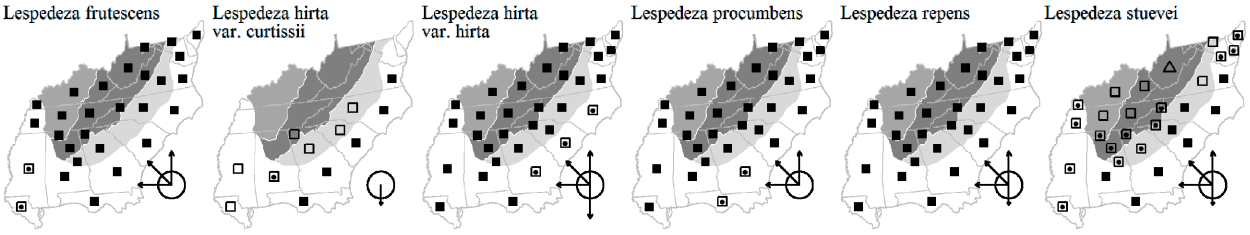
Lespedeza hirta (Linnaeus) Hornemann *var.* ***curtissii*** (Clewell) Isely, Silvery Lespedeza. Sandhills and dry to moist savannas. August-October; September-November. Se. VA south to s. FL, west to Panhandle FL and se. AL, barely extending onto the Piedmont in NC, SC, and GA. Clewell (1966a) discusses apparent intergrades between the two varieties in s. NJ. [= C, I, SE, X; < *L. hirta* – RAB, G, S, WH; = *L. hirta* var. *appressipilis* Blake – F (as to intent, but not the type); = *L. hirta* ssp. *curtissii* Clewell – K, Y, Z]

Lespedeza hirta (Linnaeus) Hornemann *var.* ***hirta***, Hairy Lespedeza. Woodlands and woodland borders. August-October; September-November. S. ME and s. ON west to MI, n. IL, c. MO, and OK, south to c. peninsular FL and TX. [= C, I, SE, X; < *L. hirta* – RAB, G, S, W, WH, WV; > *L. hirta* var. *hirta* – F; > *L. capitata* var. *calycina* (Schindler) Fernald – F; = *L. hirta* ssp. *hirta* – K, Y, Z]

Lespedeza procumbens Michaux, Downy Trailing Lespedeza. Woodlands and woodland borders, hammocks. July-September; August-November. MA, NH, and NY west to IL, MO, and KS, south to Panhandle FL and TX. [= RAB, C, G, I, K, S, SE, W, WH, WV, Y, Z; > *L. procumbens* var. *procumbens* – F; > *L. procumbens* var. *elliptica* Blake – F]

Lespedeza repens (Linnaeus) W. Barton, Smooth Trailing Lespedeza. Woodlands and woodland borders. July-September; August-November. CT and NY west to n. OH, s. WI, MO, and KS, south to n. peninsular FL, Panhandle FL, and c. TX. [= RAB, C, F, G, I, K, S, SE, W, WH, WV, Y, Z]

Lespedeza stuevei Nuttall, Velvety Lespedeza. Woodlands and woodland borders. July-September; August-November. MA south to n. peninsular FL, west to c. and n. TX, north in the interior to. NC, TN, s. IN, s. IL, c. MO, and nc. KS. [= RAB, C, F, G, I, K, SE, W, WH, WV, Y, Z; = *L. stuvei* – S, orthographic variant]



* ***Lespedeza thunbergii*** (A.P. de Candolle) Nakai. "Wildlife food plots," roadbanks; native of e. Asia. Reported for Macon County, NC by Pittillo & Brown (1988). [= C, F, G, I, K, Q, SE, WH]

Lespedeza violacea (Linnaeus) Persoon, Wand Lespedeza. Woodlands and woodland borders. July-September; August-November. S. ME and s. ON west to MI and se. MN, south to ne. FL, Panhandle FL, and e. TX. [= K, S, WH; = *L. intermedia* (S. Watson) Britton – RAB, C, F, G, I, SE, W, WV, Y, Z]

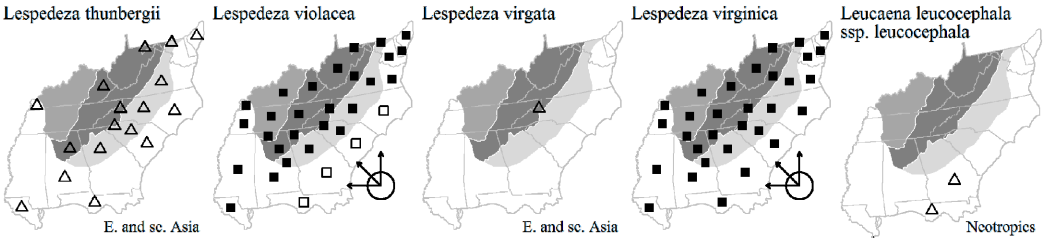
* ***Lespedeza virgata*** (Thunberg) A.P. de Candolle. Roadbanks; native of e. Asia. Clewell & Stickel (1990) report the occurrence of this species in NC. [= I, K]

Lespedeza virginica (Linnaeus) Britton, Virginia Lespedeza. Sandhills, woodlands, and woodland borders. July-September; August-November. MA and NH west to MI, WI, IA, and KS, south to Panhandle FL and c. TX. [= RAB, C, F, G, I, K, S, SE, W, WH, WV, Y, Z]

Leucaena Bentham 1842 (Leadtree, Leucaena)

A genus of about 22 species, of tropical and warm temperate America. References: Hughes (1998)=Z; Isely (1998)=I.

* ***Leucaena leucocephala*** (Lamarck) de Wit *ssp.* ***leucocephala***, Leadtree, Leucaena, Jumbie-bean. Disturbed areas; native of the New World tropics. E. GA (Kartesz 1999, voucher at UGA), south into FL and the New World tropics. [= Z; < *L. leucocephala* – I, K, SE, WH; < *L. glauca* (Linnaeus) Bentham – S, misapplied]



Lotus Linnaeus 1753 (Birdsfoot-trefoil)

A genus of about 120-130 species, annual and perennial herbs and shrubs, of temperate Eurasia. New World taxa often referred to Lotus are not closely related to *Lotus*, and should be segregated (Degtjareva et al 2006; Allan & Porter 2000). References: Isely (1981)=Z; Isely (1998)=I; Degtjareva et al. (2006); Allan & Porter (2000); Grant & Small (1996). [also see *Acmispon*]

1 Leaves 3-foliolate, the upper commonly 1-foliolate; flowers solitary in leaf axils; [native annual herbs] ..... [see ***Acmispon helleri***]
1 Leaves 5-foliolate; flowers in umbels; [alien perennial herbs].
  2 Calyx tube 2.8-3.5 mm long; corolla usually 10-14 mm long; leaflets of the medial leaves mostly 1.5-2.5 (-5)× as long as wide ..... ***L. corniculatus***
  2 Calyx tube 1.8-2.8 mm long; corolla usually 8-10 mm long; leaflets of the medial leaves 3-4 (-6)× as long as wide..... ***L. tenuis***

* ***Lotus corniculatus*** Linnaeus, Birdsfoot-trefoil, Eggs-and-Bacon. Fields, roadsides, and waste places; native of Eurasia. June-September. First reported for GA (Rabun County) by Stiles & Howel (1998). [= RAB, C, F, G, K, S, SE, W, WV, Z; < *L. corniculatus* Linnaeus – I (also see *L. tenuis*)]

* ***Lotus tenuis*** Waldstein & Kitaibel ex Willdenow, Slender Birdsfoot-trefoil. Fields, roadsides, and waste places; native of Eurasia. June-September. [= C, K, SE, Z; < *L. corniculatus* Linnaeus – I]

Lupinus Linnaeus 1753 (Lupine)

A genus of about 200-250 species, annual herbs, perennial herbs, and shrubs, of temperate and tropical regions in North America, Mediterranean Europe, South America, and Africa (especially diverse in w. North America and South America). References: Isely (1998)=I.

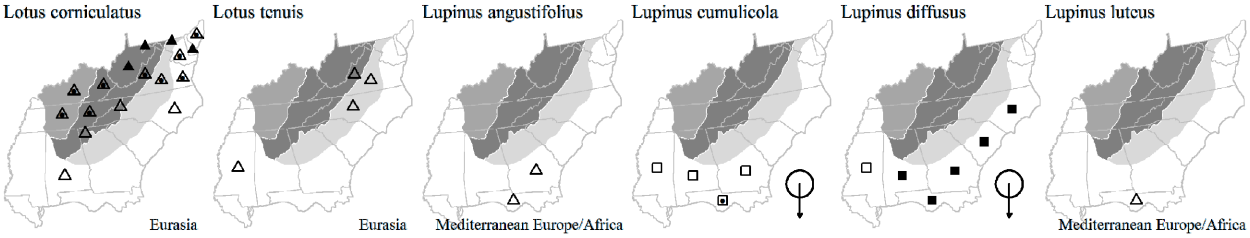
1 Leaves unifoliolate; leaves and stems evergreen, overwintering (absent in midsummer); plant conspicuously pubescent.
  2 Standard with a white to creamy eyespot; hairs of the legume 1.5-3 mm long, villous or sericeous.
    3 Legumes 35-47 mm long, 6.3-7.6 mm wide; plants to 7 dm tall; living plants grey-green; [of se. NC south to s. FL, west to s. MS] ..... ***L. diffusus***
    3 Legumes 27-42 mm long, 8.1-8.5 mm wide; plants to 19 dm tall; living plants silvery; [of FL] ..... ***L. cumulicola***
  2 Standard with a red or deep purple eyespot; hairs of the legume 3-5 mm long, villous.
    4 Hairs of the petioles 1.5-2.5 mm long; corolla pinkish to lavender; plants 2-6 dm long; [of se. NC southward to n. FL, west to se. LA] ... ***L. villosus***
    4 Hairs of the petioles 0.5-1 (-1.5) mm long; corolla blue; plants 8-15 dm tall; [of FL Panhandle] ..... ***L. westianus***
1 Leaves palmately compound; leaves and stems deciduous, dying back in winter; plant inconspicuously pubescent.
  5 Corolla yellow; plant annual; [alien] ..... ***L. luteus***
  5 Corolla blue; plant perennial or annual; [native or alien].
    6 Leaflets 5-9, linear, 5-9× as long as wide; plant annual; [alien] ..... ***L. angustifolius***
    6 Leaflets 7-11, oblanceolate, 3-5× as long as wide; plant perennial; [native]
      7 Stem short; leaves clustered, nearly whorled; leaflets narrow; racemes long exserted; flowers small; [plants of e. GA southward and westward] ..... ***L. perennis*** *ssp.* ***gracilis***
      7 Stem elongate; leaves alternate; leaflets broad; racemes only moderately exserted; flowers large; [plants of n. SC northward]..... ***L. perennis*** *ssp.* ***perennis***

* ***Lupinus angustifolius*** Linnaeus, Narrowleaf Lupine. Fields, disturbed areas; native of Mediterranean Europe. [= I, K, WH]

Lupinus cumulicola Small. Sandhills and scrub. Peninsular FL. [= K, S; < *L. diffusus* – I, SE, WH]

Lupinus diffusus Nuttall, Blue Sandhill Lupine. Sandhills, sandy roadsides. March-May; June-July. Se. NC south to s. FL, west to s. MS. I concur with Duncan & McCartney (1992) in recognizing *L. cumulicola* Small of peninsular FL as distinct from *L. diffusus*. [= RAB, K, S; < *L. diffusus* – I, SE, WH]

Lupinus luteus Linnaeus, Yellow Lupine. Disturbed areas; native of Mediterranean Europe. [= I, K, SE, WH]



Lupinus perennis Linnaeus *ssp.* ***gracilis*** (Nuttall) Dunn, Southern Sundial Lupine. Sandhills and sandy or dry rocky roadsides. E. GA (immediately across the Savannah River from SC), south to n. FL and west to s. AL. The validity of this taxon is uncertain; the differences may be only clinal. [= K, SE; < *L. perennis* – RAB, C, G, WH; = *L. perennis* var. *gracilis* (Nuttall) Chapman – I; = *L. nuttallii* S. Watson – S]

Lupinus perennis Linnaeus *ssp.* ***perennis***, Northern Sundial Lupine. Sandhills, sandy roadsides, other dry habitats. April-May; June-July. ME west to MN, south to n. SC, w. VA, e. WV, IN, and IL. [= SE; < *L. perennis* – RAB, C, G, W; > *L. perennis* var. *perennis* – F, I, WV; > *L. perennis* var. *occidentalis* S. Watson – F, WV; > *L. perennis* ssp. *perennis* var. *perennis* – K; > *L. perennis* ssp. *perennis* var. *occidentalis* – K; = *L. perennis* – S]

Lupinus villosus Willdenow, Pink Sandhill Lupine. Sandhills, sandy roadsides. April-May; June-August. Se. NC south to n. FL, west to se. LA. [= RAB, I, K, S, SE, WH]

Lupinus westianus Small, Gulf Coast Lupine. Coastal dunes, sandhills. Endemic to Panhandle FL. The related *L. aridorum* McFarlane ex Beckner is endemic to sand pine scrub in the central FL peninsula. [= *L. westianus* var. *westianus* – I, K, WH; < *L. westianus* – S]

Maackia Ruprecht & Maximowicz 1856 (Maackia)

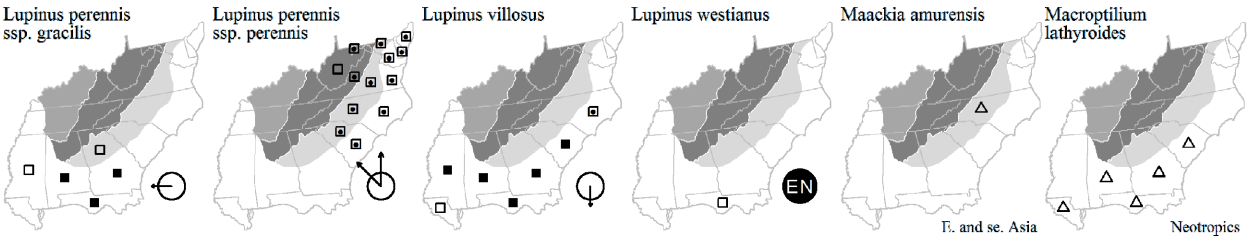
A genus of about 8 species, trees and shrubs, of e. Asia.

* ***Maackia amurensis*** Ruprecht, Amur Maackia, Chinese Yellow-wood. Sparingly naturalizing in suburban woodlands; native of China and Siberia. Reported as sparingly naturalizing on Duke University campus, Durham County, NC (W. Cook, pers. comm., 2007).

Macroptilium (Bentham) Urban 1928

A genus of about 20 species, annual and perennial herbs, of tropical and subtropical America. References: Isely (1998)=I.

* ***Macroptilium lathyroides*** (Linnaeus) Urban. Disturbed areas; native of tropical America. [= I, K, SE, WH; = *Phaseolus lathyroides* Linnaeus]



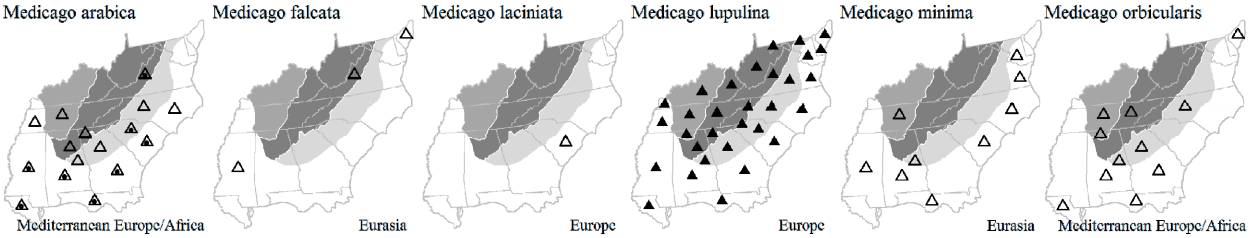
Medicago Linnaeus 1753 (Medick, Bur-clover)

A genus of about 80 species, annual and perennial herbs, of Eurasia and Africa. References: Isely (1998)=I. Key based largely on SE.

1 Legume 1-seeded, reniform, black at maturity; corolla 2-3 mm long ..... ***M. lupulina***
1 Legume several-seeded, spirally coiled or falcate, tan to dark brown; corolla 3-11 mm long.
  2 Plants perennial, mostly erect or ascending, 2-8 (-10) dm tall; corolla 6-11 mm long, violet, yellow, or varicolored; legumes spineless.
    3 Legume falcate; corolla yellow ..... ***M. falcata***

3 Legume spiral; corolla violet or varicolored (rarely yellow).....***M. sativa***
2 Plant annual, mostly prostrate or ascending, 1-6 dm tall; corolla 3-6 mm long, yellow; legumes spiny (except lacking spines in *M. orbicularis*).
4 Stipules entire or slightly dentate (*M. minima*) or the base only of the stipule lacerate (*M. laciniata*); plants pilose (*M. minima*) or glabrous (*M. laciniata*).
5 Stipules lacerate at the base; plant glabrous.....***M. laciniata***
5 Stipules entire or slightly dentate; plant pilose .....***M. minima***
4 Stipules lacerate; plants glabrous or sparsely pubescent.
6 Legume lacking spines; stipules deeply lacerate, the sinuses extending nearly to the base..... ***M. orbicularis***
6 Legume spiny; stipules **either** deeply lacerate (*M. polymorpha*) or shallowly lacerate (*M. arabica*).
7 Leaflets 0.7-1.1× as long as wide, usually marked with a central dark spot; leaflet tip usually strongly notched; stipules shallowly lacerate, the sinuses extending < ½ way to the base.....***M. arabica***
7 Leaflets 1-2× as long as wide, not marked with a central dark spot; leaflet tip not strongly notched; stipules deeply lacerate, the sinuses extending > ½ way to the base .....***M. polymorpha***

* ***Medicago arabica*** (Linnaeus) Hudson, Spotted Medick, Spotted Bur-clover. Fields, roadsides, disturbed areas; native of Mediterranean Europe. April-August. [= RAB, F, G, I, K, S, SE]
* ***Medicago falcata*** Linnaeus, Yellow Alfalfa, Sickle Medick. Disturbed areas, perhaps only a waif; native of n. Eurasia. April-July. [= F, G, I, S, SE; = *M. sativa* Linnaeus ssp. *falcata* (Linnaeus) Arcangeli – C, K]
* ***Medicago laciniata*** (Linnaeus) P. Miller. Waste areas around wool-combing mills; rare, native of Europe, perhaps merely a waif. [= F, I, K]
* ***Medicago lupulina*** Linnaeus, Black Medick, Yellow Trefoil. Fields, roadsides, disturbed areas; native of Europe. march-December. [= RAB, C, G, I, K, S, SE, W, WH, WV; > *M. lupulina* var. *lupulina* – F; > *M. lupulina* var. *glandulosa* Neilreich – F]
* ***Medicago minima*** (Linnaeus) Linnaeus, Downy Bur-clover, Bur Medick. Fields, roadsides, disturbed areas; native of Eurasia. April-August. [= RAB, C, G, I, K, S, SE, WH; > *M. minima* var. *minima* – F; > *M. minima* var. *compacta* Neyraut – F; > *M. minima* var. *longiseta* A.P. de Candolle – F]
* ***Medicago orbicularis*** (Linnaeus) Bartalini. Lawns, disturbed areas; native of Mediterranean Europe and n. Africa. April-July. [= RAB, G, I, K, SE, WH]



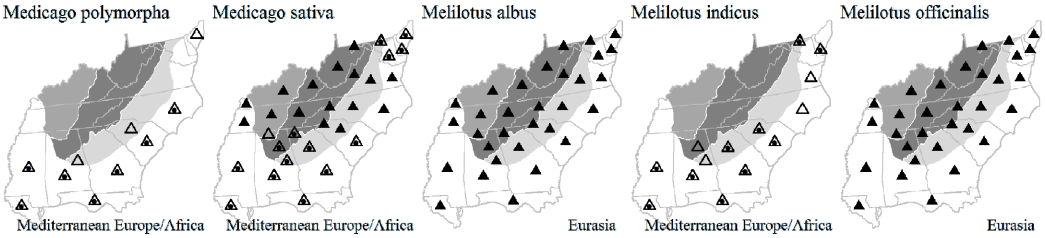
* ***Medicago polymorpha*** Linnaeus, Smooth Bur-clover, Toothed Medick. Fields, roadsides, lawns, disturbed areas; native of Mediterranean Europe. March-April. [= RAB, C, I, K, SE, WH; = *M. hispida* Gaertner – F, G, S]
* ***Medicago sativa*** Linnaeus, Alfalfa, Lucerne, Blue Alfalfa. Roadsides, fields, disturbed areas; native of se. Europe. April-July. [= RAB, F, G, I, S, SE, W, WH, WV; = *M. sativa* Linnaeus ssp. *sativa* – C, K]

Melilotus P. Miller 1754 (Melilot, Sweetclover, Sourclover)

A genus of about 20 species, annual and perennial herbs, of temperate Eurasia and Africa. References: Stace (2010)=Z; Isely (1998)=I. Key based in part on Stace (2010).

1 Corolla white .....***M. albus***
1 Corolla yellow.
2 Corolla 2-3.5 mm long; fruits < 3 mm long .....***M. indicus***
2 Corolla > 4 mm long; fruits > 3 mm long .....***M. officinalis***

* ***Melilotus albus*** Medikus, White Melilot, White Sweetclover. Fields, roadsides, disturbed areas; native of Eurasia. April-October. *M. albus* and *M. officinalis*, nearly identical except in flower color, are apparently incompatible (Isely 1998); they should not be synonymized, as was done by Kartesz (1999). Other differences useful in the determination of faded herbarium specimens are given by Isely (1998): corolla 3.5-5 mm long, the wing petals about as long as the keel (*M. albus*) vs. corolla 5-7 mm long, the wing petals generally longer than the keel (*M. officinalis*). [= I, WH, Z; = *M. alba* – RAB, C, F, G, S, SE, W, WV, orthographic variant; < *M. officinalis* – K]
* ***Melilotus indicus*** (Linnaeus) Allioni, Small Melilot, Sourclover. Roadsides, disturbed areas; native of Mediterranean Europe. April-October. [= I, K, WH, Z; = *M. indica* – RAB, C, F, G, S, SE, orthographic variant]
* ***Melilotus officinalis*** (Linnaeus) Pallas, Yellow Melilot, Yellow Sweetclover, Ribbed Melilot. Fields, roadsides, disturbed areas; native of Eurasia. April-October. [= RAB, C, F, G, I, S, SE, W, WH, WV, Z; < *M. officinalis* – K]
* *Melilotus sulcatus* Desfontaines, Mediterranean Sweetclover. Reported for AL by Kartesz (2010) based on misidentified specimens. {not keyed; not mapped; rejected as a component of our flora}



Mimosa Linnaeus 1753 (Mimosa)

A genus of about 500 species, herbs, shrubs, trees, and vines, of tropical, subtropical, and warm temperate areas, especially America. Barneby (1991) and Beard (1963) argue that there are no characters which serve to separate *Schrankia* from *Mimosa*. References: Barneby (1991)=Y; Isely (1973)=Z; Isely (1998)=I.

Identification notes: Unmistakable in our flora for its bipinnate leaves, with tiny (2-4 mm long) leaflets, responding to touch by closing.

1 Plant unarmed ..... ***M. strigillosa***
1 Plant armed.
  2 Pinnae (1-) 2 pairs per leaf ..... ***M. pudica***
  2 Pinnae 6-16 (-22) pairs per leaf.
    3 Woody shrubs, to 4 m tall ..... ***M. pellita***
    3 Sprawling vines.
      4 Leaflets without apparent secondary veins; pinnae 4-8 (-11) pairs per leaf ..... ***M. microphylla***
      4 Leaflets with evident (sometimes weakly so) secondary veins; pinnae 3-5 (-6) pairs per leaf ..... ***M. quadrivalvis*** *var.* ***floridana***

Mimosa microphylla Dryander, Eastern Sensitive-briar. Dry woodlands and forests, especially sandhills, disturbed areas. June-September; August-November. DE, WV, and MO south to FL and e. TX. A form with smaller fruits (3-5 cm long vs. 5-12 cm long) has been variously treated as a species [*Leptoglottis chapmanii* – S, *Schrankia chapmanii*] or a "recurrent fruit-form genotype" [phase *brachycarpa* of Isely (1973)]. [= K; = *Mimosa quadrivalvis* Linnaeus var. *angustata* (Torrey & A. Gray) Barneby – C, I, WH, Y; = *Schrankia microphylla* (Dryander) J.F. Macbride – RAB, F, G, W; = *Schrankia microphylla* (Dryander) J.F. Macbride var. *microphylla* – SE; > *Leptoglottis microplsoeteshylla* (Dryander) Britton & Rose – S; > *Leptoglottis chapmanii* Small ex Britton & Rose – S; > *Schrankia microphylla* "phase *brachycarpa*" – Z; > *Schrankia chapmanii* (Small ex Britton & Rose) F.J. Hermann]

Mimosa pellita Humboldt & Bonpland. Disturbed areas; native of New World tropics (s. FL, West Indies, Central America, South America). [= I, K2; ? *M. pigra* Linnaeus var. *pigra* – SE, misapplied]

* ***Mimosa pudica*** Linnaeus, Sensitive Plant, Shameplant. Disturbed areas; perhaps only a waif in our area. [= I, K, S, SE, WH]

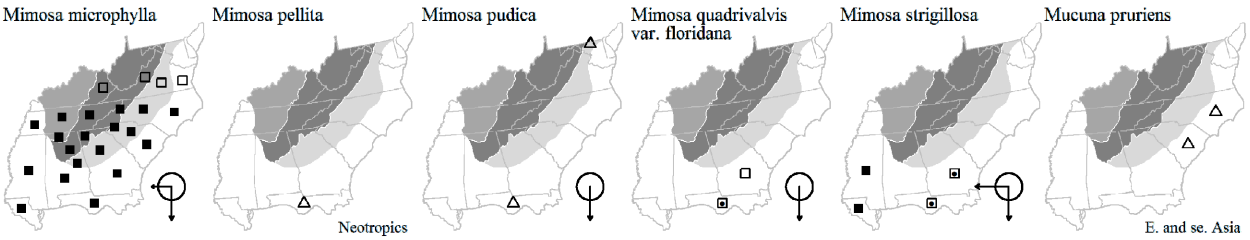
Mimosa quadrivalvis Linnaeus *var.* ***floridana*** (Chapman) Barneby, Florida Sensitive-briar. Xeric sandhills and other dry, sandy habitats. A Southeastern Coastal Plain endemic: GA south into FL. This taxon is distinct at the specific level from *M. quadrivalvis* and nomenclatural adjustments are forthcoming (Flores-Cruz et al. 2004). [= I, K, WH, Y; = *Leptoglottis floridana* (Chapman) Small ex Britton & Rose – S; = *Schrankia microphylla* (Dryander) J.F. MacBride var. *floridana* (Chapman) Isely – SE]

Mimosa strigillosa Torrey & A. Gray, Powderpuff Mimosa. Floodplain forests, open wet areas. A Southeastern Coastal Plain endemic: e. GA south to FL, west to TX. It might be expected in se. SC (see SE, Y, Z). [= I, K, S, SE, WH, Y, Z]

Mucuna Adanson 1763 (Velvetbean)

A genus of about 100 species, perennial herbs, annual herbs, and woody vines, of tropical regions of Old World and New World. References: Isely (1998)=I.

* ***Mucuna pruriens*** (Linnaeus) A.P. de Candolle. Velvetbean, Bengal Bean, Florida Bean. Disturbed areas, fields, cultivated and sporadically established in disturbed areas; native of se. Asia. [= I, SE; > *M. pruriens* var. *pruriens* – K; > *Stizolobium deeringianum* Bort – S; > *M. deeringiana* (Bort) Merrill]



Neptunia Loureiro 1790 (Neptunia)

A genus of about 12 species, herbs, of the tropics and subtropics of America and Eurasia. References: Isely (1998)=I; Windler (1966)=Z.

1 Leaflets 9-15 pairs per pinna; stipules 2-4 mm long; all flowers perfect, with functional stamens; stipe of fruit 4-14 mm long ..... ***N. lutea***
1 Leaflets (12-) 15-25 pairs per pinna; stipules 4-10 mm long; flowers in the lower part of the inflorescence with flattened staminodes; stipe of fruit 2-5 mm long ..... ***N. pubescens* var. *pubescens***

Neptunia lutea (Leavenworth) Bentham, Yellow Neptunia. Savannas, prairies, roadsides. AL west to OK and TX. [= I, K, S, SE, Z]

Neptunia pubescens Bentham *var.* ***pubescens***, Tropical Neptunia. Savannas, sandhills, scrub, prairies, roadsides. AL and FL west to TX and south to Argentina. [= I, K, SE, Z; > *N. floridana* Small – S; < *N. pubescens* – WH; > *Neptunia pubescens* var. *floridana* (Small) B.L.Turner]

Orbexilum Rafinesque 1832 (Scurfpea, Sampson's-snakeroot)

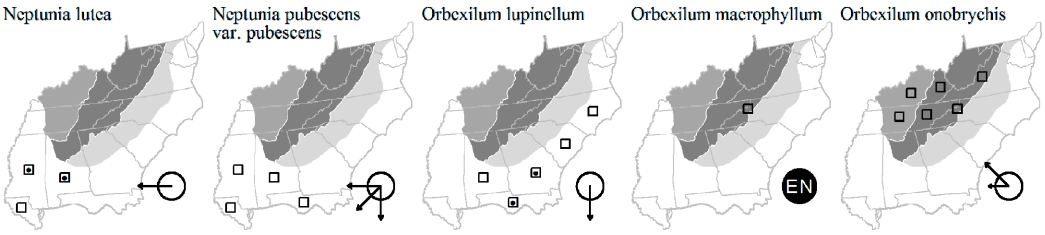
A genus of about 9 species, perennial herbs, of s. North America and Mexico (south to Chiapas). References: Grimes (1988, 1990)=Z; Isely (1998)=I.

1 Leaves unifoliolate; [subgenus *Poikadenia*] ..... ***O. virgatum***
1 Leaves with 3-7 leaflets.
  2 Leaves palmately (3-) 5-7 foliolate, the leaflets linear to very narrowly oblanceolate, 2-7 cm long, 0.5-2.0 (-3.5) mm wide, > 10× as long as wide; [subgenus *Orbexilum*] ..... ***O. lupinellum***
  2 Leaves pinnately 3-foliolate, the leaflets orbicular, ovate, elliptic or lanceolate, > 8 mm wide, 1-8× as long as wide.
    3 Leaflets 1.5-7 cm wide, 1-2.5× as long as wide; [subgenus *Orbexilum*].
      4 Upper leaf surfaces lacking glands; leaflets 3.7-5.5 cm long; [endemic to Rock Island, Jefferson Co. KY and now considered extinct] ..... ***O. stipulatum***
      4 Upper leaf surfaces glandular; leaflets 4-12 cm long.
        5 Leaflets subcordate, 4-7 cm wide, 1-1.5× as long as wide, glandular-punctate above and below, the apex obtuse; calyx stipitate-glandular; petals 8-10 mm long; [endemic to Polk Co. NC] ..... ***O. macrophyllum***
        5 Leaflets rounded at base, 2-4 cm wide, 1.5-2.5× as long as wide, eglandular or sparsely glandular above, the apex acute; calyx lacking stipitate glands; petals 5-7 mm long; [widely scattered from w. VA and w. NC westward] ..... ***O. onobrychis***
    3 Leaflets 0.8-2 cm wide, 2.5-7.5× as long as wide; [subgenus *Poikadenia*].
      6 Flowers 8-10 mm long; [of s. AL westward] ..... ***[O. simplex]***
      6 Flowers 5-7 mm long; [collectively widespread in our area].
        7 Calyx tube, fruits, and bracts of the inflorescence eglandular (rarely slightly glandular-punctate); leaflets eglandular below (rarely slightly punctate); hairs on calyx 0.7-1.0 mm long; upper 2 calyx teeth 1.0-1.5 mm long, lateral teeth 1.5-2.0 mm long, lower calyx tooth 2.0-3.0 mm long ..... ***O. pedunculatum* *var.* *pedunculatum***
        7 Calyx tube, fruits, and bracts of the inflorescence conspicuously glandular-punctate; leaflets conspicuously glandular-punctate below; hairs on calyx 0.3-0.5 mm long; upper 2 calyx teeth 0.7-1.0 mm long, lateral teeth 1.2-1.5 mm long, lower calyx tooth 1.7-2.0 mm long ..... ***O. pedunculatum* *var.* *psoralioides***

Orbexilum lupinellum (Michaux) Isely, Lupine Scurfpea. Sandhills. May-July; July-October. This peculiar species is a Southeastern Coastal Plain endemic, ranging from sc. and se. NC, south to c. peninsular FL, s. AL, and e. GA. The very peculiar leaves, palmately 5-7-foliolate with "oblinear" leaflets, make the species unmistakable. First reported for SC by McMillan et al. 2002). [= K; = *Psoralea lupinellus* Michaux - RAB; = *Orbexilum lupinellus* – I, SE, WH, Z, orthographic variant; = *Rhytidomene lupinellus* (Michaux) Rydberg – S]

Orbexilum macrophyllum (Rowlee in Small) Rydberg, Bigleaf Scurfpea. Wooded slopes of mountain on Blue Ridge escarpment, precise habitat not known (probably nutrient-rich dry woodlands). June; July-August? This species was discovered on 18 June 1897 and subsequently collected on 8 June 1899 by E.C. Townsend, somewhere on the double peak of Tryon Mountain and White Oak Mountain, Polk County, NC, a phytogeographically interesting area with disjunct, endemic, and relictual species largely of midwestern affinities. It is currently presumed to be extinct, following a number of unsuccessful attempts to relocate it. Isely (1990) states that the assignment of "this distinctive species" to *Orbexilum* is "reasonably assumptive," since fruits have never been seen. [= I, K, S, SE, Z; = *Psoralea macrophylla* Rowlee in Small – RAB, W]

Orbexilum onobrychis (Nuttall) Rydberg, Lanceleaf Scurfpea. In nutrient-rich, open or semi-open areas. June-July; August-October. Primarily a species of prairies and prairie-like areas of OH and KY west to se. IA and e. MO, *O. onobrychis* also occurs (at least formerly) as a rare disjunct in the mountains of w. NC, nw. SC, w. VA, and e. TN. The only report for NC was in the 1800's. [= C, I, K, S, SE, Z; = *Psoralea onobrychis* Nuttall – RAB, F, G, W]



Orbexilum pedunculatum (P. Miller) Rydberg *var.* ***pedunculatum***, Western Sampson's-snakeroot. Open woodlands. May-July; July-September. Var. *pedunculatum*, the western and more widespread variety, occurs primarily west of the Blue Ridge, with scattered occurrences in and east of the Blue Ridge. Its range is s. OH, s. IN, s. IL, c. MO, and se. KS, south to sw. NC, sc. SC, sw. GA, s. AL, s. LA, and e. TX. [= C, I, K, SE, Z; = *Psoralea psoralioides* (Walter) Cory var. *eglandulosa* (Elliott) F.L. Freeman – RAB, F, G, GW, W; = *Orbexilum pedunculatum* – S]

Orbexilum pedunculatum (P. Miller) Rydberg *var.* ***psoralioides*** (Walter) Isely, Eastern Sampson's-snakeroot. Savannas, open woodlands. May-July; July-September. Var. *psoralioides*, the eastern variety, occurs primarily on the Atlantic Coastal Plain, ranging from e. VA to ne. FL and Panhandle FL, inland to the Piedmont of NC and SC. [= K; = *Psoralea psoralioides* (Walter) Cory var. *psoralioides* – RAB, F, G, GW; = *Orbexilum pedunculatum* var. *gracile* (Torrey & A. Gray) Grimes – C, I, SE, Z; = *Orbexilum gracile* (Torrey & A. Gray) Rydberg – S; < *Orbexilum pedunculatum* – WH]

Orbexilum simplex (Nuttall ex Torrey & Gray) Rydberg. Prairies, open woodlands. AR and OK south to s. AL, MS, e. and w. LA, and e. TX; perhaps disjunct in IL. [= I, K, S, SE, Z]

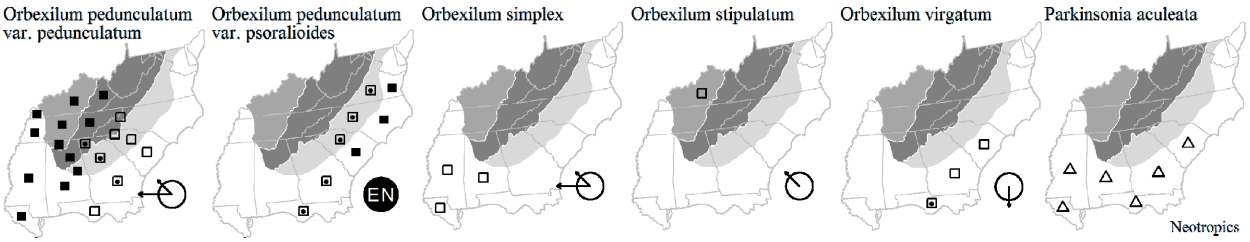
Orbexilum stipulatum (Torrey & Gray) Rydberg. Rocky limestone glade. So far as is known, once endemic to Rock Island in the Ohio River, Jefferson Co., KY, and now presumed extinct because of near obliteration of the only known site by dam-building and industrial construction (Baskin, Isely, & Baskin 1986). [= C, I, K, SE, Z; = *Psoralea stipulata* Torrey & Gray – F, G]

Orbexilum virgatum (Nuttall) Rydberg, Slender Leather-root. Sandhills. Se. GA (or SC?) south to ne. FL. A collection by Curtiss is labeled as from South Carolina. [= I, K, S, SE, WH, Z; = *Psoralea virgata* Nuttall]

Parkinsonia Linnaeus 1753 (Jerusalem Thorn)

A genus of about 10-30 species (if circumscribed to include *Cercidium*), shrubs and trees of sw. North America, Central America, and Africa. References: Isely (1975)=Z; Robertson & Lee (1976)=Y; Isely (1998)=I.

* ***Parkinsonia aculeata*** Linnaeus, Jerusalem Thorn, Retama, Horse-bean, Mexican Palo Verde. Disturbed areas; native of sw. North America. May. Rarely established or spread from cultivation in our area, more commonly so in much of FL. [= I, K, S, SE, Y, WH, Z]



Pediomelum Rydberg 1919 (Buckroot, Prairie-turnip)

A genus of about 22 species, perennial herbs, of North America. References: Allison, Morris, & Egan (2006)=Y; Grimes (1988, 1990)=Z; Isely (1998)=I.

1 Flowering calyx 1.5-2.5 mm long, the legume exserted out of it at maturity; leaves 3-5-foliolate; [of MS and KY and westward]; [former genus *Psoralidium*]..... ***P. species 1***
1 Flowering calyx 7-10 mm long, the legume mostly included within it even at maturity; leaves (1-) 3-7 foliolate; [of TN and AL and eastward].
  2 Plants acaulescent, 1-2 dm tall; leaves (4-) 5-7-foliolate; [plants of calcareous glades of the Interior (nw. GA, TN, n. AL)]; [subgenus *Disarticulatum*]..... ***P. subacaule***
  2 Plants caulescent, 3-10 dm tall; leaves (1-) 3 (-5)-foliolate; [plants of sandhills of the Coastal Plain and rocky woodlands of the lower Piedmont]; [subgenus *Pediomelum*].
    3 Inflorescence loose (much of the axis exposed); leaflets (1-) 3; leaflets < 2× as long as wide, petiolules 5-9 mm long; [of longleaf pine sandhills of the Coastal Plain]..... ***P. canescens***
    3 Inflorescence congested (the axis usually concealed); leaflets 3 (-5); leaflets > 2× as long as wide, petiolules 1.8–3 mm; [of rocky woodlands of the lower Piedmont] ..... ***P. piedmontanum***

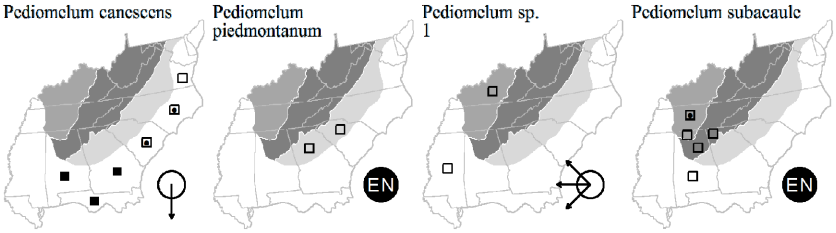
Pediomelum canescens (Michaux) Rydberg, Buckroot, Eastern Prairie-turnip, Hoary Scurfpea. Sandhills. May-July; July-October. A Southeastern Coastal Plain endemic: se. VA south to c. peninsular FL, Panhandle FL, and s. AL. This uncommon species tends to occur as very widely scattered individuals in sandhill habitats, rarely with more than a few seen at a time. It is related to *P. esculentum* (Pursh) Rydberg, the "prairie potato," prized by early travelers across the prairies for its edible tubers. An interesting collection label (by R.E. Wicker, collected in 1942, the specimen at NCU) mentions both the edible tubers and the characteristically sparse population structure of the species. "Not uncommon near Pinehurst in ... open places in sandy pine woods..., but usually only one plant at a time. Tuber hard, dark brown, about size of a medium-sized Irish potato, somewhat ventral-elongated with roots coming from pointed base. Internal pure white, apparently almost entirely starch... Mr. Wicker says that he rather likes to take a bit of it and chew when fresh, has a rather condiment taste, but does not think it well to eat..." Because of its rarity, *P. canescens* should not (of course) be eaten. Because of its habit, that of a very bushy, tumbleweed-like

plant, it superficially most closely resembles various *Baptisia* species, but it is easily separated by its rather dense and soft pubescence (our *Baptisia* are all glabrous or rather inconspicuously puberulent, except the very unifoliolate *B. arachnifera*). [= C, I, K, S, SE, WH, Z; = *Psoralea canescens* Michaux – RAB, F, G]

Pediomelum piedmontanum J.R. Allison, M.W. Morris, & A.N. Egan, Piedmont Buckroot. Open, rocky woodlands in the lower Piedmont. Late May-late June (-late July); July-August (-September). Apparently endemic to the lower Piedmont of c. SC and e. GA. See Allison, Morris & Egan (2006) for additional details. [= Y]

Pediomelum species 1, Gray Scurf-pea. Prairies. KY to MT, south to TX and n. Mexico; disjunct in MS. A recent study (Egan & Crandall 2008) shows that this species belongs in *Pediomelum*, not *Psoralidium*; the new combination has not yet been made. [= *Psoralidium tenuiflorum* (Pursh) Rydberg – C, I, K, SE, Z; = *Psoralea tenuiflora* Pursh – F, G]

Pediomelum subacaule (Torrey & A. Gray) Rydberg, Nashville Breadroot. Limestone glades. E. TN and nw. GA west to c. TN and nw. AL. [= I, K, SE, Z; = *P. subacaulis* – S, orthographic variant]



Phaseolus Linnaeus 1753 (Bean)

A genus of about 50-65 species, annual and perennial herbs, of tropical and warm temperate America (now widely distributed worldwide in cultivation). References: Isely (1998)=I; Maréchal, Mascherpa, & Stainier (1978)=Z; Freytag & Debouck (2002)=Y. Key based on SE.

1 Raceme axes slender, flexuous; [plants native perennials]; [section *Paniculati*; subsection *Volubili*].
  2 Stems climbing and twining on other vegetation; leaflets 3-10 cm long, usually not lobed and only slightly reticulate; [plants of various habitats] ..... ***P. polystachios***
  2 Stems trailing across ground; leaflets 1-4 cm long, usually strongly 3-lobed and strongly reticulate; [plants of sandhill habitats of the Coastal Plain] ..... ***P. sinuatus***
1 Raceme axes stout, stiff; [plants alien annuals, only weakly naturalized].
  3 Corolla 1.5-2 cm long, scarlet red or bright lavender; racemes exserted; plants twining; [section *Coccinei*] ..... ***P. coccineus*** *ssp.* ***coccineus***
  3 Corolla ca. 1 cm long, pink-purple, greenish white, or bicolored pink and white; racemes short or exserted; plants bushy-erect (rarely twining).
    4 Legumes distinctly flattened at maturity, 15-20 mm wide; corolla usually greenish white; [section *Paniculati*; subsection *Volubili*] ..... ***P. lunatus***
    4 Legumes nearly terete at maturity, about 8 mm in diameter; corolla usually pink-purple, at least in part; [section *Phaseoli*] ..... ***P. vulgaris***

* ***Phaseolus coccineus*** Linnaeus *ssp*. ***coccineus***, Scarlet Runner Bean. Infrequently cultivated, mostly as an ornamental in home gardens, rarely found as a waif; native of tropical America. [= Z; < *P. coccineus* – C, F, G, I, K, SE; > *P. coccineus* ssp. *coccineus* var. *coccineus* – Y]

* ***Phaseolus lunatus*** Linnaeus, Lima Bean. Frequently cultivated (both commercially and in home gardens), rarely found as a waif; native of tropical America. [= I, K, S, SE, WH, Y, Z; = *P. limensis* Macfadyen – F]

Phaseolus polystachios (Linnaeus) Britton, Sterns, & Poggenburg, Wild Bean, Wild Kidney Bean. Thickets, woodlands. July-September; August-October. S. ME west to OH, IL, and MO, south to s. FL and TX. [= RAB, C, G, I, SE, W, WV; > *P. polystachios* var. *polystachios* – F; > *P. polystachios* var. *aquilonius* Fernald – F; = *P. polystachios* var. *polystachios* – K, WH; = *P. polystachyus* – S, orthographic variant; = *P. polystachyus* ssp. *polystachyus* – Y; = *P. polystachyus* var. *polystachyus* – Z]

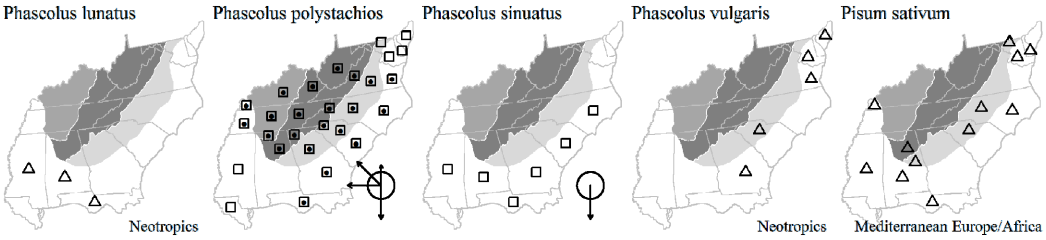
Phaseolus sinuatus (Nuttall) Torrey & A. Gray, Sandhills Bean. Sandhills. July-September; August-October. Sc. NC south to s. FL, west to s. MS, a Southeastern Coastal Plain endemic. Freytag & DeBouck (2002) describe *P. sinuatus* and *P. polystachios* as being "very distinct and there seems to be no intergradation," yet treat them as only subspecifically distinct; I choose to recognize them as species. Not easy to distinguish in sterile condition from *Strophostyles*. [= RAB, I, S, SE, W; = *P. polystachios* (Linnaeus) Britton, Sterns, & Poggenburg var. *sinuatus* (Nuttall) R. Marechal, J.M. Mascherpa, & F. Stainier – K, WH; = *P. polystachyus* ssp. *sinuatus* (Nuttall) Freytag – Y; = *P. polystachyus* var. *sinuatus* (Nuttall) R. Marechal, J.M. Mascherpa, & F. Stainier – Z]

* ***Phaseolus vulgaris*** Linnaeus, Garden Bean, Green Bean, Snap Bean, String Bean, Kidney Bean, Pole Bean, Bush Bean. Frequently cultivated (both commercially and in home gardens), rarely found as a waif; native of tropical America. [= C, F, G, I, K, S, SE; > *P. vulgaris* var. *vulgaris* – F; > *P. vulgaris* var. *humilis* Alefeld – F; < *P. vulgaris* var. *vulgaris* – Z]

Pisum Linnaeus 1753 (Pea)

A genus of 2-3 species, annual herbs, native to w. Asia and the Mediterranean region. References: Isely (1998)=I.

* ***Pisum sativum*** Linnaeus, Pea, Garden Pea, English Pea. Commonly cultivated in home gardens, rarely found as a waif; native of w. Asia and Mediterranean Europe. March-May. [= I, K, SE, WH; > *P. sativum* var. *sativum* – F; > *P. sativum* var. *arvense* (Linnaeus) Poiret – RAB, F]



Pueraria A.P. de Candolle 1825 (Kudzu)

A genus of about 15 species, perennial vining herbs and shrubs, of tropical and subtropical Asia. References: Isely (1998)=I; Ward (1998)=Z.

* ***Pueraria montana*** (Loureiro) Merrill *var.* ***lobata*** (Willdenow) van der Maesen & S. Almeida, Kudzu. Roadsides, waste areas; native of e. Asia. July-October. Kudzu was strongly promoted in the 1920's and 1930's in the Southeastern United States as a stabilizer of eroded areas. Hundreds of Kudzu Clubs formed, and Kudzu Songbooks were published. It is now notorious as a weed and symbol of the South. Despite its notoriety in the popular press, kudzu is an ecologically relatively trivial (though conspicuous) weed, since it rarely produces viable seeds in our area, and generally does not invade high quality natural areas. The thickened rhizome can weigh as much as 100 kg, and is the source of a high quality cooking starch prized in the Orient. The purple flowers smell like artificial grape flavoring. The leaves are very frost-sensitive. [= I, K, WH, Z; = *P. lobata* (Willdenow) Ohwi – RAB, C, F, G, SE, W, WV; = *P. thunbergiana* (Siebold & Zuccarini) Bentham – S]

Rhynchosia Loureiro 1790 (Snoutbean)

A genus of about 200-230 species, perennial herbs, of tropical and warm temperate regions, nearly cosmopolitan. References: Woods & Key (2009)=Y; Grear (1978)=Z; Isely (1998)=I.

1 Leaves unifoliolate (rarely with a few upper leaves trifoliolate).
  2 Plant prostrate, trailing, usually with many leaves; stipels absent; [plant very rare in our area, probably introduced]..... ***R. michauxii***
  2 Plants erect or ascending, usually with fewer than 6 leaves; stipels present; [plant common in the Coastal Plain in our area] ..... ***R. reniformis***
1 Leaves trifoliolate (rarely with a few lowermost leaves unifoliolate, these generally withering before flowering and fruiting).
  3 Plant trailing or twining; pubescence of the lower leaf surface mostly restricted to the veins.
    4 Calyx 2.5-3 (-4) mm long, clearly shorter than the corolla; [plants of e. GA southward]..... ***R. minima***
    4 Calyx 8-14 mm long, about as long as the corolla; [plants collectively widespread in our area].
      5 Calyx 10-14 mm long; inflorescence (including peduncle) 5-25 cm at anthesis, elongating further in fruit, with flowers scattered; [MS and w, TN westward] ..... ***R. latifolia***
      5 Calyx 8-10 (-12) mm long; inflorescence (including peduncle) 1-2 cm long at anthesis, elongating to 4 (-8) cm, the flowers tightly packed; [collectively widespread in our area].
        6 Pubescence of petiole of mostly incurved hairs 0.2-0.4 mm long; terminal leaflet 1-3 (-3.5) cm long; plants generally trailing; [of ne. FL southward] ..... ***R. cinerea***
        6 Pubescence of petiole of mostly spreading hairs 0.5-0.6 mm long; terminal leaflet (2-) 2.5-5 cm long; plants generally twining; [widespread in our area]..... ***R. difformis***
  3 Plant erect; pubescence of the lower leaf surface not restricted to the veins (except in the rare upright forms of *R. difformis* keyed below).
    7 Terminal leaflet suborbicular, 1.0-1.3× as long as wide; plants ascending to erect..... ***R. difformis***
    7 Terminal leaflet elliptic1.6-2.5× as long as wide; plants erect.
      8 Plant lavishly branched, bushy (with something of the aspect of a *Baptisia*); terminal leaflets 0.5-2.0 cm long; pubescence of the lower leaf surface sparse, not velvety to the touch; flowers solitary (-3) in leaf axils ..... ***R. cytisoides***
      8 Plant unbranches or with few well-developed branches in its upper portion; terminal leaflets (2.0-) 2.5-5 cm long; pubescence of the lower leaf surface grayish tomentose and velvety to the touch; flowers many, in racemes.
        9 Inflorescence a single exserted terminal raceme, 5-20 cm long; stipules caducous; [plants of s. SC southward]..... ***R. mollissima***
        9 Inflorescences several and axillary, each 1-3 cm long (or with a short terminal inflorescence also); stipules persistent; [plants widespread in our area] ..... ***R. tomentosa***

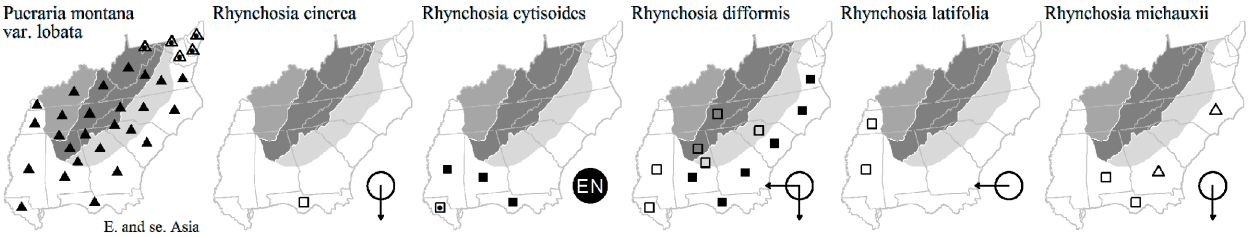
Rhynchosia cinerea Nash, Sandhill Snoutbean. Sandhills, scrub. Ne. FL (Columbia County) south to s. FL. [= I, K, S, SE, WH, Y]

Rhynchosia cytisoides (Bertoloni) Wilbur, Broom Snoutbean. Sandhills. May-June. Panhandle FL and s. AL west to MS. [= I, K, SE, WH, Y; = *Pitcheria galactioides* Nuttall – S]

Rhynchosia difformis (Elliott) A.P. de Candolle. Sandhills. June-August; July-October. Se. VA south to c. peninsular FL, west to e. TX. [= RAB, C, F, G, I, K, SE, WH, Y; = *R. tomentosa* – S, misapplied]

Rhynchosia latifolia Nuttall. Pinelands and woodlands, roadsides. May-July. W. TN s. MO, and OK south to c. MS, s. LA, and se. TX. [= I, K2, SE]

Rhynchosia michauxii Vail. Sandhills, dry hammocks, disturbed areas. June-August; August-October. Se. NC (one recor d) and e. GA (one record) south to s. peninsular FL, west to Panhandle FL. The disjunct sites are of uncertain origin. [= I, K, S, SE, Y; = *R. americana* (Houston ex P. Miller) M.C. Metz – RAB (the identification as *R. americana* based on misidentification of the specimen)]



Rhynchosia minima (Linnaeus) A.P. de Candolle. Hammocks, dry pine flatwoods, coastal sands. E. GA, south to s. FL, west to s. TX. The species also occurs in the Old World, and the New World distribution is sometimes considered a result of introduction. [= I, K, SE, WH, Y; = *Dolicholus minimus* (Linnaeus) Medikus – S]

Rhynchosia mollissima (Elliott) S. Watson. Sandhills, scrub. June-August; August-October. Se. SC (Beaufort County, documented by an old specimen [GH] by Mellichamp from the vicinity of Bluffton, where it was probably native) and e. GA south to c. peninsular FL. [= S; = *Rhynchosia tomentosa* (Linnaeus) Hooker & Arnott var. *mollissima* (Elliott) Torrey & A. Gray – I, K, SE, WH, Y; = *R. mollissima* (Elliott) S. Watson – S]

Rhynchosia reniformis A.P. de Candolle, Dollarweed. Sandhills. June-September; August-October. Se. NC south to s. FL, west to e. TX; disjunct (introduced?) in e. TN (Chester, Wofford, & Kral 1997). [= RAB, K, SE, WH, Y; = *R. simplicifolia* (Walter) Wood – S]

Rhynchosia tomentosa (Linnaeus) Hooker & Arnott. Xeric woodlands and forests, sandhills, edges, open areas. June-August; August-October. DE south to n. peninsular FL, west to LA, and north in the interior to e. and c. TN. [= *Rhynchosia tomentosa* (Linnaeus) Hooker & Arnott var. *tomentosa* – C, I, K, SE, WH, Y; < *R. tomentosa* – RAB, F, G, W; > *R. erecta* (Walter) A.P. de Candolle – S; > *R. intermedia* (Torrey & Gray) Small – S]

Robinia Linnaeus 1753 (Locust)

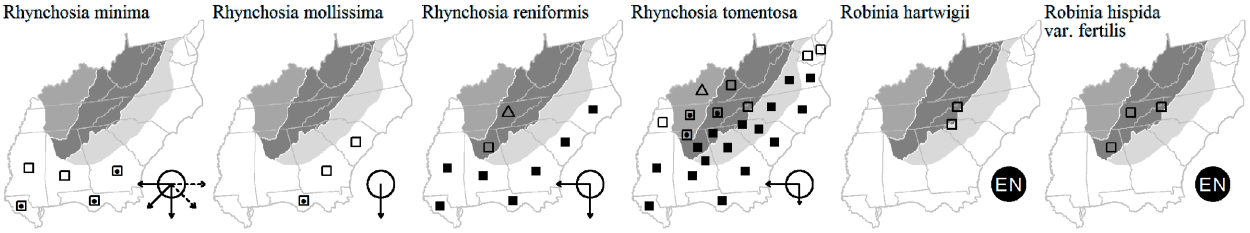
A genus of 5-8 species, shrubs and trees, of e. and sw. North America. The Southern Appalachians are a center of diversity of *Robinia*, with active hybridization, introgression, and formation of local (sterile) races involved; a fully satisfying taxonomic treatment of such a situation is not possible. Isely & Peabody's (1984) treatment seems a reasonable approach, and I have largely followed it here, differing in the rank of some of the taxa. References: Isely & Peabody (1984)=Z; Ashe (1922)=Y; Isely (1998)=I.

Identification notes: The key is differently structured than that in RAB or SE; it is presented as an alternative. This treatment may be altered substantially prior to publication. A variety of hybrids (including some cultivars) are known, including the following: *Robinia* ×*longiloba* Ashe (pro sp.) [*R. hispida* × *viscosa*], known from NC and SC; *Robinia* ×*margarettae* Ashe (pro sp.) [*R. hispida* × *pseudoacacia*], known from NC, SC, and GA; *Robinia* ×*ambigua* Poiret (pro sp.) [*R. pseudoacacia* × *viscosa*], known from NC; *Robinia hartwigii* × *hispida*, known from Whiteside Mountain, Jackson County, NC; *Robinia hartwigii* × *viscosa*, known from Whiteside Mountain, Jackson County, NC.

1 Corolla white, 1.5-2.0 cm long; peduncles, pedicels, and calyces velvety-puberulent, the hairs neither glandular nor hispid; plant a small to large tree ..... ***R. pseudoacacia***
1 Corolla pink to pink-purple (rarely white or nearly so), (1.5-) 2.0-2.5 cm long; peduncles, pedicels, and calyces glandular-pubescent, hispid, or with short-stalked to sessile glands; plant a shrub to small tree.
  2 Twigs and leafstalks conspicuously hispid with hairs 1-5 mm long, these stiff, thick-based, and typically persistent several years.
    3 Plants fruiting abundantly; shrubs 0.6-2 (-3) m tall; leaflets relatively broad, mostly 1.2-1.8× as long as wide ..... ***R. hispida*** *var.* ***fertilis***
    3 Plants sterile (rarely fruiting scantily); shrubs 0.5-1.5 m tall; leaflets relatively narrow, mostly 1.8-2.5× as long as wide ..... ***R. hispida*** *var.* ***hispida***
  2 Twigs and leafstalks either viscid with sessile or short-stalked glands, or densely glandular-pubescent (the hairs 0.5-2 mm long), or tomentulose, or sparsely hispid with weak, non-persistent hairs.
    4 Leaflets usually 13-21, permanently but inconspicuously appressed-pubescent beneath; bracts (evident only before anthesis) aristate; plants never with long, hispid pubescence.
      5 Twigs and peduncles finely glandular-pubescent with hairs 1 (-2) mm long; plants abundantly pod-forming..... ***R. hartwigii***
      5 Twigs and peduncles viscid with sessile or short-stalked glands (the racemes sometimes with some glandular pubescence); plants sterile or forming pods..... ***R. viscosa***
    4 Leaflets usually 9-13, initially appressed-silky but later glabrate beneath; bracts (evident only before anthesis) not aristate; plants with or without sparse long, hispid pubescence.
      6 Plants fruiting abundantly; shrubs 1-3 m tall ..... ***R. hispida*** *var.* ***kelseyi***
      6 Plants sterile (rarely fruiting scantily); shrubs or small trees, 0.4-3 (-8) m tall.
        7 Shrubs or small trees, 1-3 (-8) m tall, much branched, the stems and branches relatively straight, the nodes usually lacking spines; leaflets 1.5-3 cm long..... ***R. hispida*** *var.* ***rosea***
        7 Shrubs, 0.4-1 m tall, little branched, the stems and branches typically zigzag (bent at each node), the nodes usually with spines; leaflets 1-2 (-3) cm long..... ***R. nana***

Robinia hartwigii Koehne, Granite Dome Locust, Highlands Locust, Hartwig's Locust. Forests and outcrop edges on high elevation granitic domes, also clearings. June-July; August-September. Apparently endemic to several mountains within a 5 km radius of Highlands, NC. While certainly related to and apparently hybridizing with *R. viscosa*, *R. hartwigii* seems worthy of recognition as a species. The original spelling (in Koehne 1913) is "*hartwigii*;" it is not clear why the variants (see synonymy) arose. [= RAB, S; = *R. viscosa* var. *hartwegii* (Koehne) Ashe – K, orthographic variant; = *R. viscosa* var. *hartwigii* – SE, Z; < *R. viscosa* – W; = *R. viscosa* var. *hardwegii* – Y, orthographic variant]

Robinia hispida Linnaeus *var.* ***fertilis*** (Ashe) Clausen, Arnot Bristly Locust. Woodlands and forests. May-June; July-August. Apparently endemic to the Southern Appalachians of w. NC and e. TN. A horticultural selection of var. *fertilis*, the Arnot Bristly Locust, is used as a soil binder. [= C, F, K, SE, Z; < *R. hispida* – RAB; > *R. fertilis* Ashe – S; > *R. grandiflora* Ashe – S, Y; > *R. pedunculata* Ashe – S; < *R. hispida* – W]



Robinia hispida Linnaeus *var.* ***hispida***, Common Bristly Locust. Woodlands and forests, and as an escape in disturbed areas and roadsides. May-June. Probably originally endemic to the Southern Appalachians (and perhaps adjacent provinces) of NC, SC, GA, and VA, now widely distributed in e. North America as an escape from cultivation. [= C, F, K, SE, Z; < *R. hispida* – RAB, W, WH, WV; = *R. hispida* – G, S, WH, Y; > *R. hispida* – S; > *R. pallida* Ashe – S; > *R. speciosa* Ashe – S]

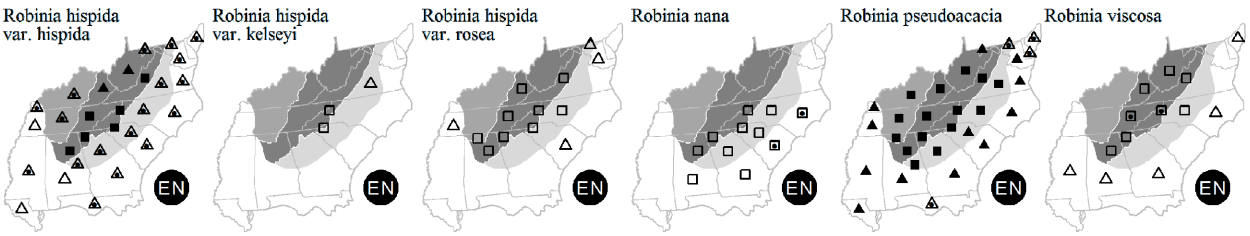
Robinia hispida Linnaeus *var.* ***kelseyi*** (Cowell ex Hutchinson) Isely, Kelsey's Locust. Mountain woodlands, introduced elsewhere. April-July; July-October. Traditionally considered an endemic originally restricted to w. NC, but SE and Z suggest that var. *kelseyi* may have been only of horticultural origin. [= K, SE, Z; = *R. kelseyi* Cowell ex Hutchinson – RAB, G, S, Y; < *R. hispida* – W]

Robinia hispida Linnaeus *var.* ***rosea*** Pursh, Boynton's Locust. Mountain woodlands. April-July. Originally distributed from w. NC and e. TN south to nw. SC, n. GA, and ne. AL, now occasionally found outside that range as an escape from cultivation. [= C, K, SE, Z; = *R. boyntonii* Ashe – RAB, G, S, Y; < *R. hispida* – W]

Robinia nana Elliott, Dwarf Bristly Locust. Sandhills, dry rocky forests (especially associated with chestnut oak). April-June; July-October. Se. and nc. NC south through SC to GA and AL. This species fruits infrequently. [= RAB, S, Y; = *R. hispida* Linnaeus var. *nana* (Elliott) A.P. de Candolle – K, SE, Z; = *R. elliottii* (Chapman) Ashe ex Small – RAB, F, G, S; < *R. hispida* – W; > *R. nana* – Y; > *R. elliottii* – Y]

Robinia pseudoacacia Linnaeus, Black Locust. Forests, woodlands, disturbed areas, roadcuts; common (uncommon in DE, rare in FL). April-June; July-November. Native in the s. and c. Appalachians, from PA south to GA and AL, now much more widespread, throughout e. and c. North America, also widely cultivated and escaped in Europe. Generally considered a weed tree. [= C, K, SE, WH, Z; = *R. pseudo-acacia* – RAB, F, S, WV, orthographic variant; > *R. pseudo-acacia* var. *pseudo-acacia* – G, orthographic variant; > *R. pseudo-acacia* var. *rectissima* (Linnaeus) Raber – G]

Robinia viscosa Ventenat, Clammy Locust. Mountain forests and woodlands, roadsides, disturbed areas, rare in wild, uncommon as an escape. May-July; July-August. Originally a Southern and Central Appalachian endemic, ranging from PA south through w. MD, w. VA, e. WV, w. NC, and e. TN, to n. GA and n. AL, now much more widespread as an escape from cultivation. Reported for GA Coastal Plain (Marion County) (Carter, Baker, & Morris 2009). [= RAB, F, G, S, WV; = *R. viscosa* var. *viscosa* – C, K, SE, Y, Z; < *R. viscosa* – W (also see *R. hartwigii*)]



Scorpiurus Linnaeus 1753 (Scorpion's-tail)

A genus of 2-4 species, herbs, of Mediterranean Europe west into w. Asia.

* ***Scorpiurus muricatus*** Linnaeus. Disturbed areas; native of Mediterranean Europe. [= K] {add synonymy}

Securigera A.P. de Candolle 1805 (Crown-vetch)

A genus of about 12-13 species, annual and perennial herbs, of Eurasia. This genus is sometimes included in *Coronilla*, but is apparently better separated (Isely 1998). References: Isely (1998)=I.

1 Corolla yellow; annual; [rare waif] ..... ***S. securidaca***
1 Corolla white and pink; perennial; [common alien, planted and established] ..... ***S. varia***

* ***Securigera securidaca*** (Linnaeus) Degen & Dörfler. Disturbed areas; native of Europe. Reported by Small (1933); rejected by Isely (1990) on the basis of no material seen to document the occurrence. This taxon's status as part of our flora is uncertain. [= I, SE; = *Bonaveria securidaca* (Linnaeus) Reichenbach – S; = *Coronilla securidaca* Linnaeus – K]

* ***Securigera varia*** (Linnaeus) Lassen, Crown-vetch. Roadbanks, woodland borders; native of Europe. This species, generally known as *Coronilla varia*, is now widely used to stabilize road-cuts. [= I; = *Coronilla varia* Linnaeus – RAB, C, F, G, K, SE, W, WH, WV]

Senna P. Miller 1754 (Senna, Sicklepod, Wild Coffee)

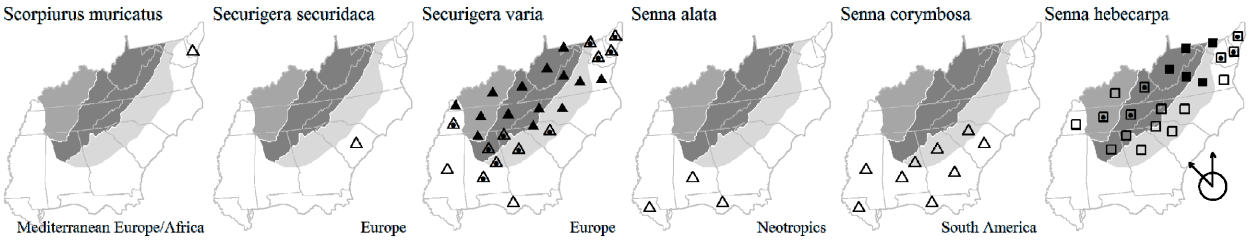
A genus of about 295-350 species, trees, shrubs, and herbs, of tropical and warm temperate areas. References: Isely (1975)=Z; Irwin & Barneby (1982)=Y; Robertson & Lee (1976)=X; Isely (1998)=I; Marazzi et al. (2006).

1 Racemes spike-like, 3-6 (-10) dm long; legume winged; [section *Senna*, series *Pictae*] ..... ***S. alata***
1 Racemes not spike-like, <3 dm long; legume not winged; [section *Chamaefistula*].
  2 Plant a shrub, 1-3 m tall; gland between the lowest pair of the acute or acuminate leaflets; [plants aliens, barely established in the vicinity of cultivation]; [section *Chamaefistula*, series *Coluteoideae*].
    3 Gland between the lowest pair of leaflets only; leaflets 3-5× as long as wide ..... ***S. corymbosa***
    3 Glands between each pair of leaflets; leaflets 2-3× as long as wide, acuminate ..... ***S. septemtrionalis***
  2 Plant an herb, 0.1-1.5 m tall; gland near the base of the petiole (except in *S. occidentalis* which has leaflets rounded to emarginate at the apex); [plants natives, or aliens generally well-established and weedy].
    4 Leaflets obovate, the apex rounded to emarginate, 1.3-2× as long as wide; gland between the lowest pair of leaflets; [section *Chamaefistula*, series *Trigonelloideae*] ..... ***S. obtusifolia***
    4 Leaflets ovate or narrowly elliptic, the apex acute or acuminate, 2-3.5× as long as wide; gland near the base of the petiole.
      5 Leaflets 1.5-3.0 cm wide, in 3-6 pairs; racemes with 1-5 flowers; [section *Chamaefistula*, series *Basiglandulosae*] ..... ***S. occidentalis***
      5 Leaflets 0.7-2.0 cm wide, in 6-10 pairs; racemes with 5-10 (-25) flowers; [series *Temperatae*].
        6 Legume 5.5-8 mm wide, with broad, nearly square segments, usually pilose initially, the hairs up to 0.8-2 mm long (sometimes glabrate); ovary lanate with hairs to 1 mm long; ovules 10-15 (-18); petiolar gland broadest above the middle ..... ***S. hebecarpa***
        6 Legume 8-11 mm wide, with narrow segments (much shorter than broad), glabrous (or with a few hairs, these < 0.6 mm long); ovary strigulose with hairs to 0.5 mm long; ovules 20-25 (-30); petiolar gland usually broadest at or below the middle ..... ***S. marilandica***

* ***Senna alata*** (Linnaeus) Roxburgh, Emperor's Candlesticks, Candlestick Plant. Disturbed areas; native of tropical America. September-November. Planted and slightly naturalized from s. AL and FL west to OK and TX. [= I, K, SE, WH, Y; = *Cassia alata* Linnaeus – Z]

* ***Senna corymbosa*** (Lamarck) Irwin & Barneby. Cultivated as an ornamental, rarely persistent or spreading to disturbed areas; native of South America. August-September. reported for AL (Diamond & Woods 2009). [= I, K, SE, WH, Y; = *Adipera corymbosa* (Lamarck) Britton & Rose – S; = *Cassia corymbosa* – X, Z]

Senna hebecarpa (Fernald) Irwin & Barneby, Northern Wild Senna. Open wet habitats, moist forests. July-August; August-November. MA and s. NH west to s. WI, south to sc. NC, e. TN, s. IN, and c. IL. [= C, I, K, SE, Y; = *Cassia hebecarpa* Fernald – RAB, G, W, X, Z; > *C. hebecarpa* var. *hebecarpa* – F, WV; > *C. hebecarpa* var. *longipila* E.L. Braun – F, WV; = *Ditremexa marilandica* (Linnaeus) Britton & Rose – S, misapplied]



Senna ligustrina (Linnaeus) Irwin & Barneby, Privet Wild Senna. Hardwood hammocks, wet disturbed habitats. N. peninsular FL south to s. FL; Central America; West Indies. [= I, K2, SE, WH; = *Cassia ligustrina* Linnaeus; ? *Peiranisia bahamensis* (P. Miller) Britton & Rose - S] {not yet keyed; add X, Y, Z synonymy}

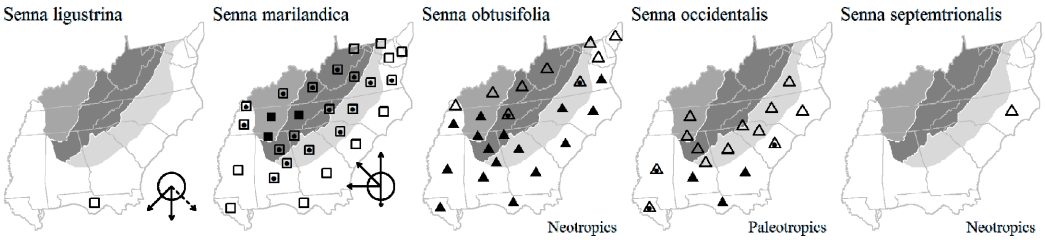
Senna marilandica (Linnaeus) Link, Maryland Wild Senna. Dry to moist forests, especially on greenstone and diabase barrens and rocky woodlands, thickets, woodland borders, sometimes somewhat weedy. July-August; August-November. S. MA and s. NY west to e. NE, south to c. peninsular FL and c. TX. [= C, I, K, SE, WH, Y; = *Cassia marilandica* Linnaeus – RAB, F, G, W, WV, X, Z; = *Ditremexa medsgeri* (Shafer) Britton & Rose – S]

* ***Senna obtusifolia*** (Linnaeus) Irwin & Barneby, Sicklepod, Coffeeweed. Fields (especially soybean fields), disturbed areas; probably native of the New World Tropics. July-September; August-November. The species is now pantropical. [= C, I, K, SE,

WH, X, Y; = *Cassia obtusifolia* Linnaeus – RAB, W, Z; < *Cassia tora* Linnaeus – F, G, misapplied; < *Emelista tora* (Linnaeus) Britton & Rose – S, misapplied]

* ***Senna occidentalis*** (Linnaeus) Link, Coffee Senna. Disturbed places; native of the Old World Tropics. July-August; August-November. The species is now pantropical. [= C, I, K, SE, WH, Y; = *Cassia occidentalis* Linnaeus – RAB, F, G, X, Z; = *Ditremexa occidentalis* (Linnaeus) Britton & Rose ex Britton & Wilson – S]

* ***Senna septemtrionalis*** (Viviani) Irwin & Barneby. Disturbed areas; native of the tropics, probably originally from tropical America, perhaps not truly established, though Isely (1990) states that "the weedy nature of this species suggests that it is almost certainly somewhat established." [= I, K, SE, Y; = *Cassia laevigata* Willdenow – Z]



Sesbania Adanson 1760 (Rattlebox, Sesban)

A genus of about 50-60 species, annual herbs, perennial herbs, shrubs, and trees, of tropical, subtropical, and less commonly warm temperate regions of the Old and New World, here circumscribed to include *Glottidium*, following Lewis et al. (2005). References: Isely (1998)=I.

1 Corolla 8-9 mm long; legume flat; leaves with 8-13 pairs of leaflets ..... ***S. vesicaria***
1 Corolla 9-25 mm long; legume quadrangular or 4-winged; leaves with 10-35 pairs of leaflets.
  2 Legume quadrangular in cross-section, the corners not winged, 15-20 cm long, 0.3-0.5 cm wide; corolla 10-15 (-20) mm long, yellow, often marked with purple; leaves with 15-35 pairs of leaflets; [plant a robust herb, to 4 m tall]..... ***S. herbacea***
  2 Legume quadrangular or conspicuously 4-winged longitudinally, 3-8 cm long, 0.5-1.5 cm wide; corolla 9-25 mm long, yellow, orange, or scarlet; leaves with 10-20 pairs of leaflets; [plant a shrub, to 4 m tall].
    3 Legume quadrangular or slightly flanged, 0.5-0.7 cm wide; corolla 9-12 mm long..... ***S. virgata***
    3 Legume conspicuously 4-winged longitudinally, 1-1.5 cm wide; corolla 13-25 mm long.
      4 Corolla yellow; pedicels 0.5-1.0 cm long; legume blunt or abruptly acuminate to a beak ..... ***S. drummondii***
      4 Corolla orange or red; pedicels 0.5-1.2 (-1.5) cm long; legume acuminate or tapering to a beak ..... ***S. punicea***

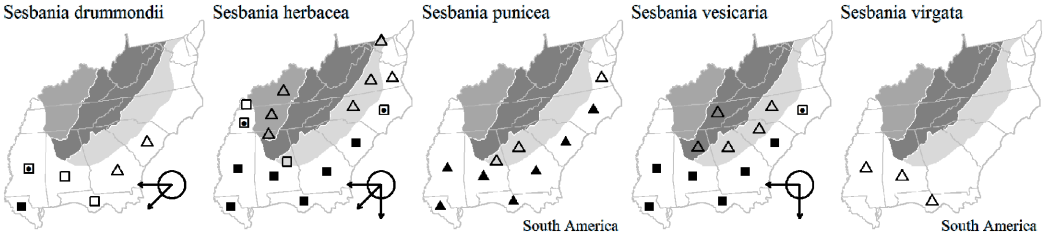
Sesbania drummondii (Rydberg) Cory, Rattlebox, Poison-bean. Disturbed areas, spoil, marsh edges, ditches. Native on the Gulf Coast west to s. TX and Mexico, the exact eastern edge of the native range uncertain, perhaps w. FL Panhandle. First reported for GA and SC by Townsend et al. (2000), where clearly introduced. [= GW, I, K1, K2, SE, WH; = *Daubentonia drummondii* Rydberg – S]

Sesbania herbacea (P. Miller) McVaugh, Sesban, Coffee-weed, Indigo-weed, Peatree. Ditches, wet fields, perhaps native only in the deeper South. July-September; August-November. Native distribution undertain, perhaps e. NC south to s. FL, west on the Coastal Plain and Mississippi Embayment to TX, south into Mexico. [= K1, WH; = *S. exaltata* (Rafinesque) Cory – RAB, C, F, G, I, K2, SE; = *Sesbania macrocarpa* Muhlenberg ex Rafinesque – GW; = *Sesban exaltatus* (Rafinesque) Rydberg – S]

* ***Sesbania punicea*** (Cavanilles) Bentham, Rattlebox, Scarlet Wisteria-tree, Purple Sesban. Ditches, wet fields, marshes, ponded wetlands, wet pinelands; presumably native of South America. June-October; August-November. [= GW, I, K1, K2, SE, WH; = *Daubentonia punicea* (Cavanilles) A.P. de Candolle – RAB, S]

Sesbania vesicaria (Jacquin) Elliott, Bladderpod, Bagpod. Ditches, marshes, disturbed wet areas. July-September; August-November. The original native distribution of *S. vesicaria* is uncertain; its distribution is from ne. NC south to s. FL, west to e. OK and se. TX, and Isely (1998) states that it is unknown from outside the United States; occurrences in provinces inland of the Coastal Plain seem to represent introductions into artificial wetlands (such as ditches). [= GW, K2, WH; = *Glottidium vesicarium* (Jacquin) R.M. Harper – RAB, I, K1, S, SE]

* ***Sesbania virgata*** (Cavanilles) Poiret. Disturbed areas; native of South America. June-October; August-November. [= I, K1, K2, SE, WH]



Strophostyles Elliott 1823 (Sand Bean, Woolly Bean, Wild Bean)

A genus of 3 species, annual and perennial herbs, of North America. References: Pelotto & Martínez (1998)=Z; Isely (1998)=I. Key adapted from SE.

1 Legumes 2-4 cm long, permanently pubescent; corolla 5-8 mm long; leaves permanently pubescent on the upper surface; seeds glabrous ..... ***S. leiosperma***
1 Legumes 3-8 cm long, glabrate at maturity; corolla 8-15 mm long; leaves usually glabrate on the upper surface; seeds pubescent.
2 Bracteoles (immediately subtending the calyx) 2-3 mm long, equaling or exceeding the calyx tube; leaflets usually prominently 3-lobed; terminal leaflet 2.5-3.5 cm wide; plant an annual ..... ***S. helvola***
2 Bracteoles (immediately subtending the calyx) 0.5-1.0 (-1.5) mm long, shorter than the calyx tube; leaflets not lobed; terminal leaflet 0.3-2.0 cm wide; plant a perennial ..... ***S. umbellata***

Strophostyles helvola (Linnaeus) Elliott, Annual Sand Bean. Coastal dunes, beaches, dry sandy woodlands, disturbed areas. June-September; August-October. QC west to MN and SD, south to n. peninsular FL and e. TX. See Isely (1986b) for a discussion of the orthography of the epithet. [= RAB, C, G, S, WH, WV; = *S. helvula* (Linnaeus) Elliott – K, SE, W, Z, orthographic variant; > *S. helvola* var. *helvola* – F; > *S. helvola* var. *missouriensis* (S. Watson) Britton – F]

Strophostyles leiosperma (Torrey & A. Gray) Piper, Small-flowered Sand Bean. Prairies, glades, barrens, sand bars, disturbed areas. June-September; August-October. IN, WI, MN, and ND, south to FL Panhandle, AL, MS, LA, TX, NM, and AZ; also scattered eastward presumably as introductions. This species is native east to KY and TN; it should be sought inland in prairies, glades, and barrens with midwestern affinities. [= C, F, G, K, SE, WH, Z; = *S. pauciflora* (Bentham) S. Watson – S]

Strophostyles umbellata (Muhlenberg ex Willdenow) Britton, Perennial Sand Bean. Dry sandy or rocky woodlands, disturbed areas. June-September; August-October. S. NY west to s. IN, s. MO, and KS, south to c. peninsular FL and s. TX. [= RAB, C, F, G, K, S, SE, W, WH, Z; > *S. umbellata* var. *umbellata* – F; > *S. umbellata* var. *paludigena* Fernald – F]

Stylosanthes Swartz 1788 (Pencil-flower)

A genus of about 25-50 species, annual and perennial herbs, pantropical and less commonly temperate. References: Isely (1998)=I.

Stylosanthes biflora (Linnaeus) Britton, Sterns, & Poggenburg, Pencil-flower. Sandhills, dry to moist (but not wet) pine savannas and flatwoods, dry forests, woodlands, woodland borders, glades, barrens, rock outcrops. June-August; July-October. S. NY west to OH, s. IL, and KS, south to c. peninsular FL and e. TX. The large, adnate stipules are distinctive. Variation in this species (see synonymy) needs additional study. [= RAB, C, I, K, SE, W, WH, WV; > *S. biflora* var. *biflora* – F, G; > *S. biflora* var. *hispidissima* (Michaux) Pollard & Ball – F, G; > *S. riparia* Kearney – G, S; > *S. riparia* var. *riparia* – F; > *S. riparia* var. *setifera* Fernald – F; > *S. biflora* – S]

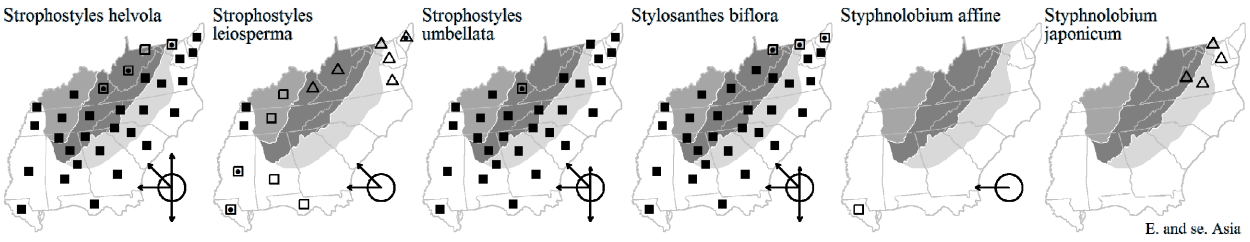
Styphnolobium Schott 1830 (Pagoda Tree)

A genus of about 9 species, trees, shrubs, of central and South America and e. Asia. References: Isely (1998)=I; Isely (1981)=Z; Sousa S. & Rudd (1993)=Y; Palomino et al. (1993).

1 Flowers in terminal panicles; leaflets 13-17 per leaf ..... ***S. affine***
1 Flowers in axillary racemes; leaflets 9-15 per leaf ..... ***S. japonicum***

Styphnolobium affine (Torrey & A. Gray) Walpers, Eve's Necklace. Woodlands, disturbed areas. April-June. Sw, AR and OK south to sw. LA and c. TX; disjunct eastwards in se. LA. [= K2; = *Sophora affinis* Torrey & A. Gray]

* ***Styphnolobium japonicum*** (Linnaeus) Schott, Pagoda Tree. Cultivated ornamental, rarely persistent; native of China. Reported as "slightly escaped" in the United States by Isely (1981), but all specimens seen are from cultivated plants. Also reported for VA, MD, PA, and OH (Kartesz 1999). [= Y; = *Sophora japonica* Linnaeus – I, K, Z]



Tephrosia Persoon 1807 (Goat's-rue)

A genus of about 350-400 species, perennial herbs, of tropical and warm temperate regions of the Old World and New World. References: Isely (1998)=I; Ward (2004c)=Z; Wood (1949)=Y. Key adapted from SE.

1 Corolla bicolored, the standard yellow and the wings pink; racemes terminal; stems erect; stamens monadelphous; leaves with (9-) 13-23 (-37) leaflets.
2 Inflorescence reduced, foliose, flowers solitary or in small clusters overtopped by leaves; plants < 25 cm tall; leaflets generally < 10 mm long and < 5 mm wide; [restricted to the West Gulf Coastal Plain of sw. GA, adjacent FL and westward] ..... ***T. mohrii***
2 Inflorescence terminal, not foliose and overtopped by leaves; plants > 25 cm tall; leaflets generally > 10 mm long and > 5 mm wide; [widespread in our area] ..... ***T. virginiana***
1 Corolla unicolored, initially white or pink, darkening in age to a dark maroon or purple; racemes opposite the leaves (the uppermost appearing terminal); stems decumbent or ascending; stamens diadelphous; leaves with (3-) 5-23 (-27) leaflets.
3 Upper stamen fused with the staminal sheath for part or most of its length (submonadelphous); leaves with (9-) 13-23 (-27) leaflets; [plants from s. AL westward] ..... ***T. onobrychoides***
3 Upper stamen completely separate from the staminal sheath (diadelphous); leaves with (3-) 5-17 (-19) leaflets; [plants collectively widespread in our area].
4 Inflorescences with 1-several reduced leaves, mainly borne terminally on the principal axis or branches; bracts generally decisuous..... ..... ***T. rugelii***
4 Inflorescences lacking leaves (sometimes with 1 reduced leaf), mainly borne leaf-opposed; bracts persistent.
5 Petiole 1-4× as long as the lowest leaflets of the leaf; peduncle and rachis of inflorescence strongly flattened (2-angled, or rarely, 3-angled) in cross-section; leaflets averaging 25 mm long and 12 mm wide ..... ***T. florida***
5 Petiole 1/3-1× as long as the lowest leaflets of the leaf; peduncle and rachis of inflorescence terete or inconpicuously 2-4-angled in cross-section; leaflets averaging smaller.
6 Leaves with (3-) 5-7 leaflets; petiole 0-5 mm long; stem and fruit hairs < 0.5 mm long ..... ***T. chrysophylla***
6 Leaves with (7-) 9-17 (-19) leaflets; petiole 2-15 mm long; some stem and fruit hairs > 0.5 mm long.
7 Inflorescence with 1-3 (-5) nodes; plants inconpicuously pubescent with gray hairs (the hairs appressed or spreading, short to fairly long); leaflets (3-) avg. 5-6 (-7) mm wide, mostly acute; [plants of the Coastal Plain of NC and SC] ..... ***T. hispidula***
7 Inflorescence with 2-20 nodes; plants conspicuously tawny long-pilose with rusty brown hairs; leaflets (6-) avg. 8 (-12) mm wide, mostly obtuse; [plants widespread in our area] ..... ***T. spicata***

Tephrosia chrysophylla Pursh, Sprawling Goat's-rue. Sandhills. E. GA s. to s. FL, and west to s. MS. Rather frequent hybrids between *T. chrysophylla* and *T. florida* are intermediate in morphology and have been found in AL< FL, GA, and MS; they have been given a hybrid binomial, *T.* ×*intermedia* (Small) G.L. Nesom & Zarucchi, replacing later name *T.* ×*floridana* (Vail) Isely, which has been in regular use in the southeastern United States (Neson & Zarucchi 2009). [= I, K, SE, WH, Y; = *Cracca chrysophylla* (Pursh) Kuntze – S]

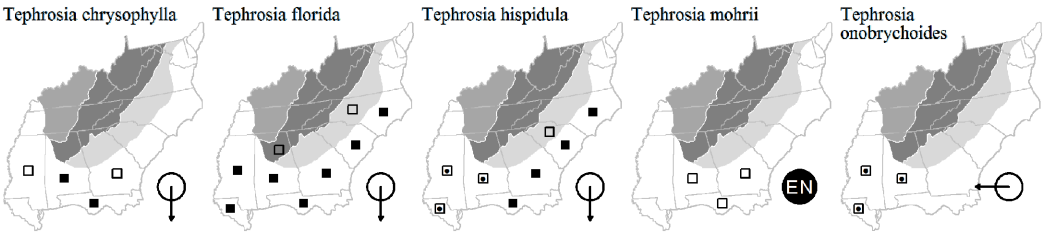
Tephrosia cinerea (Linnaeus) Persoon, Ashen Hoary-pea. Disturbed areas; native of South America. Reported from an 19th century ballast collection from Mobile, AL. [= I, K2, SE] {not keyed; not mapped; rejected as a component of our flora}

Tephrosia florida (F.G. Dietrich) C.E. Wood, Florida Goat's-rue. Pine savannas and other pinelands. May-July; June-September. E. NC south to s. FL, west to se. LA, a Southeastern Coastal Plain endemic. See *T. chrysophylla* for discussion of hybrids between *T. chrysophylla* and *T. florida*. [= RAB, I, K, SE, WH, Y; = *Cracca ambigua* (M.A. Curtis) Kuntze – S]

Tephrosia hispidula (Michaux) Persoon. Pine savannas and other pinelands. May-August; July-October. E. NC (se. VA?) south to c. peninsular FL, west to se. LA, a Southeastern Coastal Plain endemic. Fernald (1950) reports this species from se. VA. [= RAB, F, I, K, SE, WH, Y; = *Cracca hispidula* (Michaux) Kuntze – S]

Tephrosia mohrii (Rydberg) Godfrey, Dwarf Goat's-rue. Sandhills, dry savannas. GA and westward in the East Gulf Coastal Plain. Perhaps not distinct from *T. virginiana*, but not easily dismissed as "little more than a freak" (Wood 1949); see Godfrey & Kral (1958). [= K; < *T. virginiana* – I, SE, WH, Y; = *Cracca mohrii* Rydberg – S; = *T. virginiana* var. *mohrii* (Rydberg) D.B. Ward – Z]

Tephrosia onobrychoides Nuttall. Dry pinelands. S. AL, n. AR, e. OK, south to s. LA, and sc. TX. [= I, K, SE, Y; = *Cracca onobrychoides* (Nuttall) Kuntze – S]



Tephrosia rugelii Shuttleworth ex B.L. Robinson. Sandhills. Ne. and Panhandle FL (Jefferson County) south to s. FL. [= I, K, SE, WH; = *Cracca rugelii* (Shuttleworth ex B.L. Robinson) A.A. Heller – S]

Tephrosia spicata (Walter) Torrey & A. Gray. Woodlands. June-August; July-October. S. DE south to s. FL, west to w. LA, north in the interior to se., sc., and sw. TN and se. KY. [= RAB, C, G, K, SE, W, WH, Y; > *T. spicata* var. *semitonsa* Fernald – F; > *T. spicata* var. *spicata* – F; = *Cracca spicata* (Walter) Kuntze – S]

Tephrosia virginiana (Linnaeus) Persoon, Virginia Goat's-rue. Sandhills, other pinelands, xeric and/or rocky woodlands and forests, outcrops, shale barrens and other barrens, dry roadbanks. May-June; July-October. S. NH west to WI, se. MN, and c. KS, south to c. peninsular FL, c. TX, and nw. TX. [= RAB, C, I, K, SE, W, WV; > *T. virginiana* var. *glabra* Nuttall – F, G; > *T. virginiana* var. *virginiana* – F, G; < *T. virginiana* – I, SE, WH, Y (also see *T. mohrii*); = *Cracca virginiana* Linnaeus – S; = *T. virginiana* var. *virginiana* – Z]

Thermopsis R. Brown ex Aiton & Aiton f. 1811 (Golden-banner)

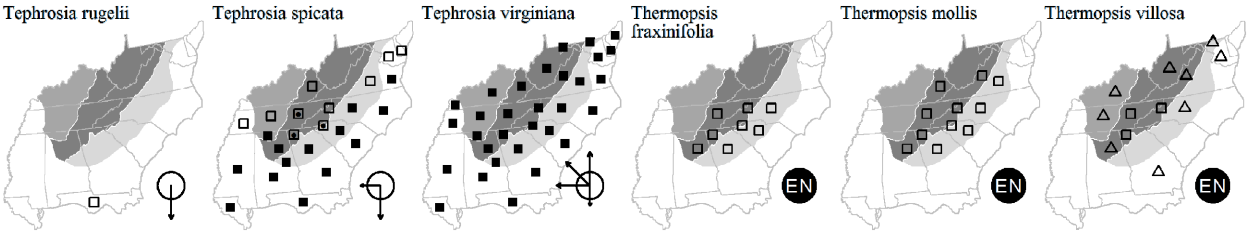
A genus of 8-23 species, perennial herbs, of temperate e. North America, w. North America, and e. Asia. References: Larisey (1940b); Chen, Mendenhall, & Turner (1994)=Y; Isely (1981)=Z; Isely (1998)=I.

1 Legumes erect or strongly ascending, densely villous; stipules clasping, those of the principal leaves (20-) 35-65 mm long, 10-30 mm wide; pedicels 2-3 mm long; plants mostly 6-20 dm tall, strict or few-branched ..... ***T. villosa***
1 Legumes spreading to ascending, glabrate or pubescent; stipules not clasping, those of the principal leaves 12-25 (-32) mm long, 1-5 mm wide; pedicels 4-20 mm long; plants mostly 3-10 dm tall, branched.
2 Plants from a single woody rootstock, mostly 5-10 dm tall; calyx glabrous or very sparsely pubescent, often also glaucous, the lobes often only 1-1.5 mm long; pedicels glabrate, (4-) 7-20 mm long (as long as or longer than the bracts); racemes terminal or lateral; plants flowering (late May-) early June-July; [plants of moderate to high elevations, (300-) 700-2000 m] ..... ***T. fraxinifolia***
2 Plants from extensive rhizomes, mostly 3-6 dm tall; calyx pubescent, the lobes 2-2.5 mm long; pedicels villosulous, 2-6 (-10) mm long (shorter than the bracts); racemes terminal; plants flowering late April-early May (-June); [plants of low to moderate elevations, 200-800 m] ..... ***T. mollis***

Thermopsis fraxinifolia (Nuttall ex Torrey & A. Gray) M.A. Curtis, Ash-leaf Golden-banner. Dry slopes and ridges. Late May-July; July-October. A Southern Appalachian endemic: w. NC and e. TN south to nw. SC and n. GA. In addition to the key characters above, *T. fraxinifolia* tends to have thinner stems than *T. mollis*, to average taller, and to have the inflorescence generally arching to reclining (vs. erect to sometimes arching). The phenologic separation (peak flowering times separated by about 6-7 weeks, generally with a 2 week period between the last flowering of *T. mollis* and the first flowering of *T. fraxinifolia*) provides strong support to the recognition of *T. fraxinifolia* and *T. mollis* at the species level. [= RAB, K, S, W, Y; = *T. mollis* var. *fraxinifolia* (Nuttall ex Torrey & A. Gray) Isely – I, SE, Z]

Thermopsis mollis (Michaux) M.A. Curtis ex A. Gray, Appalachian Golden-banner. Dry slopes and ridges. April-May; June-August. Centered in the Southern Appalachians, but mostly in the Piedmont and lower elevation periphery of the mountains, ranging from sc. VA south through w. and c. NC and e. TN to nw. SC, n. GA, and ne. AL. See comments under *T. fraxinifolia*. [= RAB, C, F, G, K, W, Y; = *T. mollis* var. *mollis* – I, SE, Z; > *T. hugeri* Small – S; > *T. mollis* – S]

Thermopsis villosa (Walter) Fernald & Schubert, Aaron's-rod, Blue Ridge Golden-banner. Floodplains, mesic disturbed areas, woodland edges, roadbanks. May-June; July-September. A Southern Appalachian endemic: w. NC and e. TN to n. GA, and escaped from cultivation more widely, as in w. VA, s. MD, c. TN, and WV probably representing escapes from cultivation. *T. villosa* is a more erect and unbranched plant than our other 2 species. It is generally found in disturbed sites, its natural habitat somewhat of a mystery. [= RAB, C, I, K, SE, W, Y, Z; = *T. caroliniana* M.A. Curtis – S]



Trifolium Linnaeus 1753 (Clover)

A genus of about 240-250 species, annual and perennial herbs, nearly cosmopolitan (primarily north temperate). References: Zohary & Heller (1984)=Z; Isely (1998)=I. Draft key adapted from various published sources, including SE and C.

1 Flowers bright yellow (fading brown); [section *Chronosemium*].
2 Leaves palmately trifoliolate (all leaflets essentially sessile); heads 10-13 mm in diameter; flowers 5-7 mm long ..... ***T. aureum***
2 Leaves pinnately trifoliolate (the lateral leaflets essentially sessile, the terminal leaflet with a petiolule 0.8-3 mm long; heads 5-13 mm in diameter; flowers 2.5-5 mm long.
3 Standard with 5 obvious diagonal veins (striations); heads 8-13 mm in diameter, generally with 20-30 flowers; flowers 3.5-5 mm long; petiolule of the terminal leaflet 1-3 mm long ..... ***T. campestre***
3 Standard inconspicuously veined; heads 5-8 mm in diameter, generally with 5-15 (-20) flowers; flowers 2.5-3.5 mm long; petiolule of the terminal leaflet ca. 1 mm long ..... ***T. dubium***
1 Flowers not bright yellow.
4 Flowers borne on distinct pedicels, (1-) 2-10 mm long, these often curving or reflexing in age; flowers white, fading pink with age in most species; [native and alien species]; [section *Lotoidea*].
5 Plants stoloniferous, all or some of the leaves alternate from ground level and long petioled.
6 Calyx lobes narrowly triangular, about as long as the calyx tube; peduncles axillary along the stolons; stipules scarious-membranaceous; [plant an abundant introduced weed] ..... ***T. repens***
6 Calyx lobes subulate, distinctly longer than the calyx tube; peduncles terminal, either at tips of the stolons, or at tips of erect flowering branches; stipules green, foliaceous; [plants rare natives].
7 Peduncle terminal, at the tip of the stolon, lacking leaves; pedicels 2-3 mm long ..... ***T. calcaricum***
7 Peduncle terminal at tip of erect flowering branches, subtended by a pair of opposite or subopposite, short-petioled leaves; pedicels (2-) 4-8 mm long ..... ***T. stoloniferum***
5 Plants not stoloniferous, clumped (though sometimes with prostrate or lax stems).

8 Calyx lobes narrowly triangular, about as long as the calyx tube (or longer in *T. hybridum*); stipules scarious-membranaceous; [plants introduced].
9 Calyx lobes not scarious-margined, straight, equal to or longer than the tube ..... ***T. hybridum***
9 Calyx lobes scarious-margined, becoming divergent and twisted, about equal to the tube..... ***T. nigrescens***
8 Calyx lobes subulate to lanceolate, distinctly longer than the calyx tube; stipules green, foliaceous; [plants rare natives].
10 Flowers 4-6 mm long; calyx lobes lanceolate, foliaceous, 3-nerved, 0.4-0.8 mm wide..... ***T. carolinianum***
10 Flowers 8-12 mm long; calyx lobes subulate, setaceous, 1-nerved, < 0.4 mm wide.
11 Leaflets 1-2.8× as long as wide; stems erect or ascending; flowers purplish; plant an annual or biennial; [plants of a variety of natural woodlands, widespread in our area]..... ***T. reflexum***
11 Leaflets 3-7× as long as wide; stems prostrate; flowers creamy white and purple-veined; plant a perennial; [plants of shale barrens and other rock outcrops, from VA northward]..... ***T. virginicum***
4 Flowers sessile or on very short pedicels (usually < 1 mm long); flowers pink, purplish, white, or scarlet; [alien species].
12 Plants stoloniferous, all or some of the leaves alternate from ground level and long petioled.
13 All flowers with petals; fruiting heads enlarging, becoming a reddish brown, pubescent ball ca. 2 cm in diameter, remaining aerial; [section *Vesicaria*]..... ***T. fragiferum***
13 Only 2-5 outer flowers of the head with petals, the others lacking petals and sterile; fruiting heads becoming a subterranean bur, buried by curvature and growth of the peduncle; [section *Trichocephalum*]..... ***T. subterraneum***
12 Plants not stoloniferous, the leaves clustered at or near ground level and/or produced on aerial stems.
14 Heads subtended by a pseudo-involucre of 2 (-3) enlarged stipules and/or opposite or subopposite leaves; [section *Trifolium*].
15 Flowers white (fading pink), 7-8 mm long; calyx tube **both** externally glabrous **and** 20-nerved ..... ***T. lappaceum***
15 Flowers red, pink-purple, or bicolored, **either** 11-20 mm long **or** 4-6 mm long; calyx tube not **both** externally glabrous **and** 20-nerved (externally pubescent, or 10-nerved, or both).
16 Flowers 4-6 mm long..... ***T. striatum***
16 Flowers 11-20 mm long.
17 Stipules gradually tapering to a long slender tip, longer than the fused part; calyx densely hirsute; stem soft pubescent with deflexed to spreading hairs ..... ***T. hirtum***
17 Stipules abruptly narrowed to a short awn; calyx glabrous to pilose; stem appressed pubescent..... ***T. pratense***
14 Heads not subtended by a pseudo-involucre of leaves or expanded stipules.
18 Heads axillary, sessile, in the axils of subtending leaves; calyx tube glabrous (except for a few hairs at apex); [section *Lotoidea*].... ..... ***T. glomeratum***
18 Heads terminal or axillary; calyx tube pubescent.
19 Calyx bladdery-inflated in fruit; corolla resupinate (inverted 180 degrees, such that the standard is lowermost); [section *Vesicaria*].
20 Inflorescence with a prominent peduncle; head lobed in fruit ..... ***T. resupinatum***
20 Inflorescence subsessile to shortly peduncled; head spherical in fruit..... ***T. tomentosum***
19 Calyx not bladdery-inflated in fruit; corolla orientation normal (standard uppermost).
21 Corolla 3-6 mm long; [section *Trifolium*]..... ***T. arvense***
21 Corolla 10-18 mm long.
22 Corolla crimson, 10-13 (-15) mm long; floral bracts absent; heads 1-1.5 (-2) cm in diameter; [section *Trifolium*]..... ..... ***T. incarnatum***
22 Corolla white, 15-18 mm long; floral bracts present; heads 2.5-3 cm in diameter; [section *Mistyllus*] ..... ***T. vesiculosum***

* ***Trifolium angustifolium*** Linnaeus, Narrowleaf Clover. Waste areas near wool-combing mills, perhaps only a waif; native of Mediterranean Europe and w. Asia. Reported for SC (Kartesz 1999), based on specimen at NCU. [= I, K] {not yet keyed}

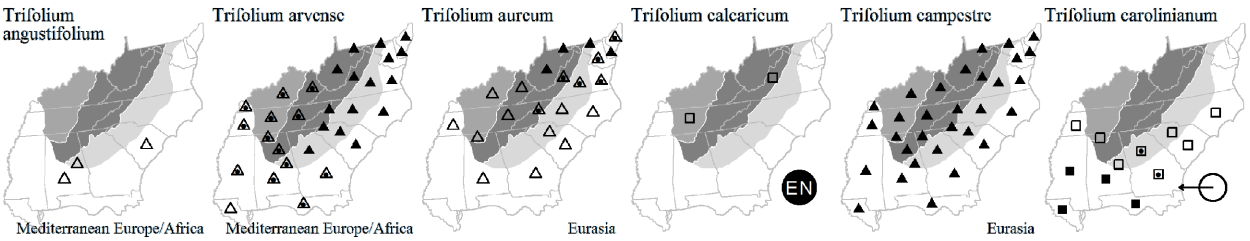
* ***Trifolium arvense*** Linnaeus, Rabbitfoot Clover. Disturbed areas, shale barrens; native of the Mediterranean region. April-August. [= RAB, C, F, G, I, K, S, SE, W, WH, WV]

* ***Trifolium aureum*** Pollich, Large Hop Clover, Yellow Clover. Fields, roadsides, disturbed areas; native of Eurasia. May-August. [= C, I, K, SE, W; = *T. agrarium* Linnaeus – RAB, F, G, S, WV, misapplied]

Trifolium calcaricum J.L. Collins & Wieboldt. Limestone glades. In c. TN (Chester, Wofford, & Kral 1997). For additional information, see Collins & Wieboldt (1992). [= I, K]

* ***Trifolium campestre*** Schreber, Hop Clover. Roadsides, fields, lawns, disturbed areas; native of Eurasia. April-October. [= RAB, C, I, K, SE, W, WH, WV; ? *T. procumbens* Linnaeus – F, G, S, misapplied]

Trifolium carolinianum Michaux, Wild White Clover, Carolina Clover. Open woodlands, woodland edges, pine savannas, thin soils around rock outcrops, disturbed areas. April-July. Se. NC south to n. FL, west to MO, OK, and c. TX. [= RAB, C, F, G, I, K, SE, W, WH; > *T. carolinianum* – S; > *T. saxicola* Small – S]



* ***Trifolium cernuum*** Brotero, Nodding-head Clover. Waste areas near wool-combing mills, perhaps only a waif; native of Mediterranean Europ and n. Africa. [= K] {not yet keyed}

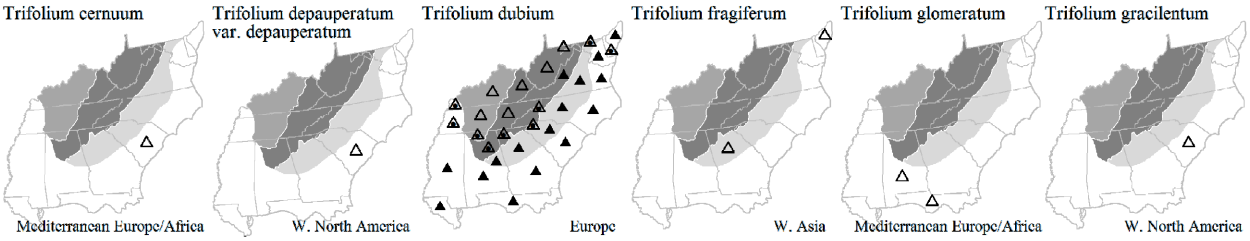
* ***Trifolium depauperatum*** Desvaux *var.* ***depauperatum***, Cowbag Clover, Balloon-sack Clover, Poverty Clover. Waste areas near wool-combing mills, perhaps only a waif; native of w. North America (BC south to CA). [= I, K] {not yet keyed}

* ***Trifolium dubium*** Sibthorp, Low Hop Clover. Roadsides, lawns, disturbed areas; native of Europe. April-September. [= RAB, C, F, G, I, K, S, SE, W, WH, WV]

* ***Trifolium fragiferum*** Linnaeus, Strawberry Clover. Disturbed areas; native of Middle East. Introduced in c. GA (Jones & Coile 1988) and reported from an old collection from se. PA (Rhoads & Klein 1993). [= C, F, G, I, K, SE]

* ***Trifolium glomeratum*** Linnaeus, Cluster Clover. {habitat}; native of Mediterranean region. Also reported for SC by Kartesz (1999), but the specimen is actually *T. cernuum*. [= I, K1, K2, S, SE]

* ***Trifolium gracilentum*** Torrey & A. Gray. Waste areas near wool-combing mills, perhaps only a waif; native of w. North America. [> *T. gracilentum* var. *gracilentum* – K1, K2] {not yet keyed; add synonymy}



* ***Trifolium hirtum*** Allioni, Rose Clover. Roadsides, disturbed areas; native of Eurasia and n. Africa. April-July. A report for VA has no documentation. [= RAB, C, G, I, K, SE]

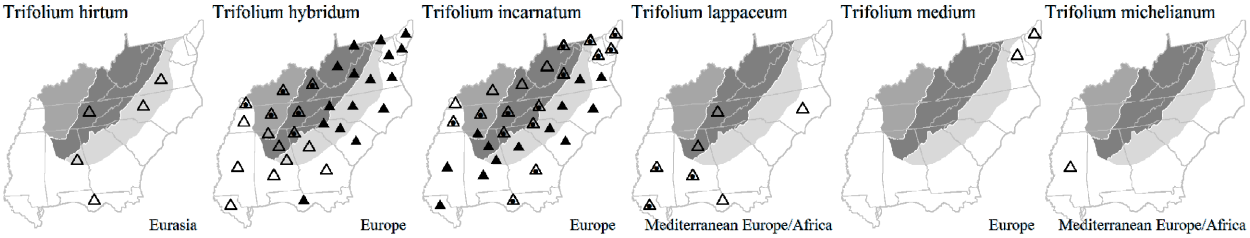
* ***Trifolium hybridum*** Linnaeus, Alsike Clover. Lawns, fields, roadsides, disturbed areas; native of Europe. April-September. [= RAB, C, G, I, K, S, SE, W, WH, WV; > *T. hybridum* var. *hybridum* – F; > *T. hybridum* var. *elegans* (Savi) Boiss. – F]

* ***Trifolium incarnatum*** Linnaeus, Crimson Clover. Fields, disturbed areas; native of Europe. April-June; June-August. [= RAB, C, F, G, I, K, S, SE, W, WH, WV]

* ***Trifolium lappaceum*** Linnaeus, Lappa Clover, Burdock Clover. Disturbed areas; native of Mediterranean Eurasia and Africa. April-August. [= RAB, I, K, S, SE, WH]

* *Trifolium medium* Linnaeus, Zigzag Clover. Reported as introduced in MD and NJ (Kartesz 1999; Kartesz 2010). Native of Europe. [= K] {not keyed; rejected as a component of our flora}

* *Trifolium michelianum* Savi, Big-flower Clover. Disturbed areas; native of Mediterranean Europe. [> *T. michelianum* var. *balansae* (Boiss.) Ponert – K2] {not keyed}



* ***Trifolium nigrescens*** Viviani, Ball Clover. Disturbed areas; native of Mediterranean Europe and n. Africa. Introduced in c. TN (Chester, Wofford, & Kral 1997). [= I, K, S, SE, WH]

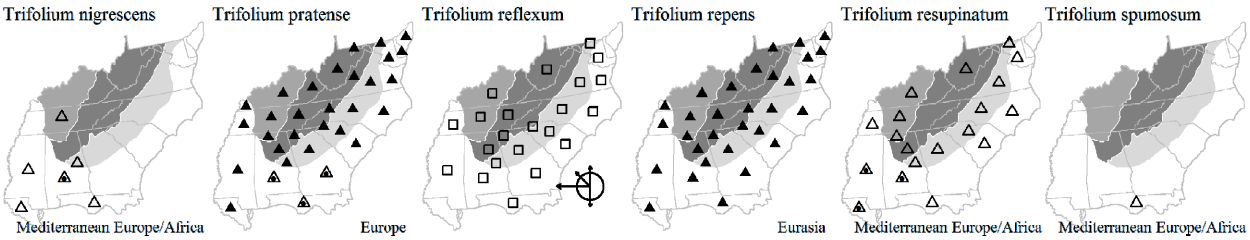
* ***Trifolium pratense*** Linnaeus, Red Clover. Fields, roadsides, disturbed areas; native of Europe. April-September. [= RAB, C, G, I, K, S, SE, W, WH, WV; > *T. pratense* var. *pratense* – F; > *T. pratense* var. *sativum* (P. Miller) Schreber – F]

Trifolium reflexum Linnaeus, Buffalo Clover. Open woodlands, woodland edges, dry shaly places. April-May. [= RAB, C, I, K, S, SE, W, WH, WV; > *T. reflexum* var. *reflexum* – F, G; > *T. reflexum* var. *glabrum* Lojacono – F, G]

* ***Trifolium repens*** Linnaeus, White Clover, Dutch Clover, Ladino Clover. Lawns, roadsides, disturbed areas; native of Eurasia. April-September. [= RAB, C, F, G, I, K, S, SE, W, WH, WV]

* ***Trifolium resupinatum*** Linnaeus, Persian Clover, Reversed Clover. Lawns and disturbed areas; native of Mediterranean region and w. Asia. April-July. [= RAB, C, F, G, I, K, S, SE, WH]

* ***Trifolium spumosum*** Linnaeus, Pink Clover. Disturbed areas; rare, native of Mediterranean Europe. [= K, WH] {not yet keyed}



Trifolium stoloniferum Muhlenberg ex Eaton, Running Buffalo-clover. Dry upland woodlands and prairies. WV, OH, n. IN, IL, MO, and e. KS, south to KY and AR, now extirpated from significant portions of its range. [= C, F, G, I, K, S, SE, WV]

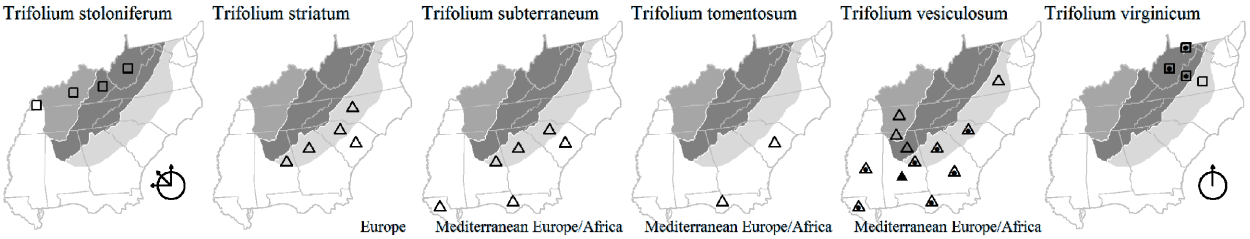
* ***Trifolium striatum*** Linnaeus, Knotted Clover. Roadsides, disturbed areas, waste areas near wool-combing mills; native of Europe. April-August. [= RAB, C, F, G, I, K, S, SE]

* ***Trifolium subterraneum*** Linnaeus, Subterranean Clover. Disturbed areas, waste areas near wool-combing mills; native of Europe, Asia, and n. Africa. Reported for NC and SC by Isely (1990); reported for Piedmont of GA by Jones & Coile (1988), and collected in MS (Stone County) (S.W. Leonard, pers. comm. 2007). [= I, K, SE]

* ***Trifolium tomentosum*** Linnaeus. Waste areas near wool-combing mills, other disturbed areas; native of Mediterranean region. Reported for NC by Isely (1998). [= I, K, WH]

* ***Trifolium vesiculosum*** Savi, Arrowleaf Clover. Roadsides, disturbed areas; native of s. Europe. First reported for South Carolina by Hill & Horn (1997). [= I, K, SE, WH]

Trifolium virginicum Small, Kates Mountain Clover, Shale-barren Clover. Shale barrens, other rock outcrops. May-June. Sc. PA through w. MD south to w. VA and e. WV. [= C, F, G, I, K, SE, W, WV]



Ulex Linnaeus 1753 (Gorse)

A genus of 10-20 species, shrubs, of Europe and n. Africa. References: Isely (1998)=I.

* ***Ulex europaeus*** Linnaeus, Gorse, Furze. Disturbed areas; native of Europe. June. Not cited in Harvill et al. (1992), but naturalized in sandy soils in York County, VA. Also reported from WV and PA. [= C, F, G, I, K, SE]

Vachellia Wight & Arnott 1834 (Acacia)

A genus of about 163 species, of tropical and subtropical America, Africa, Asia, and Australia. Formerly considered part of *Acacia*. References: Isely (1998)=I; Isely (1969)=Z; Ebinger, Seigler, & Clarke (2002)=Y; Seigler & Ebinger (2005)=X; Maslin, Miller, & Seigler (2003).

1 Leaves with 2-4 (-6) pairs of pinnae; each pinna with 10-20 pairs of leaflets ..... ***V. farnesiana*** *var.* ***farnesiana***
1 Leaves with 10-15 (-20) pairs of pinnae; each pinna with 20-30 pairs of leaflets ..... ***V. macracantha***

Vachellia farnesiana (Linnaeus) Wight & Arnott *var.* ***farnesiana***, Sweet Acacia, Huisache. Sandy flats on barrier islands, maritime scrub, shell middens. E. GA, along the coast, south to s. FL, west to TX and Tamaulipas, across the sw. United States and south into Mexico. The GA occurrence appears native; see Duncan (1985). [= X; < *Acacia farnesiana* (Linnaeus) Willdenow – I, K, SE, WH, Z; > *Vachellia farnesiana* (Linnaeus) Wight & Arnott – S; = *Acacia farnesiana* ssp. *farnesiana* – Y; > *Acacia smallii* Isely – I, SE, Z; > *Vachellia densiflora* Alexander ex Small – S]

* ***Vachellia macracantha*** **(**Humboldt & Bonplandt ex Willdenow) Seigler & Ebinger, Apopanax, Longspine Acacia. Planted as an ornamental and rarely naturalized; native of further south in FL. [= X; = *Acacia macracantha* Humboldt & Bonplandt ex Willdenow – I, K, SE, WH, Z]

Vicia Linnaeus 1753 (Vetch, Tare)

A genus of about 150-160 species, annual and perennial herbs, of temperate Eurasia and North America. References: Isely (1998)=I; van de Wouw, Maxted, & Ford-Lloyd (2003)=Y. Key adapted from I.

1 Inflorescence nearly sessile, of 1-4 flowers clustered in the leaf axil; [alien species].
  2 Leaves with 2-6 leaflets, succulent; leaflets 3-7 cm long; legume with pectinate sutures ..... ***V. narbonensis***
  2 Leaves with 4-20 leaflets, not succulent; leaflets 0.3-3.5 cm long; legume not pectinate (except *V. lutea*).
    3 Corolla 5-6 mm long; leaves with 4-6 (-8) leaflets ..... ***V. lathyroides***
    3 Corolla 10-30 mm long; leaflets 6-16 (-20).
      4 Calyx lobes conspicuously unequal; legumes pilose with pustulate-based hairs ..... ***V. lutea***
      4 Calyx lobes more or less equal; legumes glabrous at maturity, or very finely pubescent with non-pustulate-based hairs.
        5 Calyx lobes all shorter than the calyx tube; corolla yellow, often streaked with purple, 25-30 mm long ..... ***V. grandiflora***
        5 Calyx lobes (at least the longer) about as long as the calyx tube; corolla pink, purple, lavender, white, or creamy yellow, 10-25 (-30) mm long.
          6 Standard pubescent dorsally; corolla 15-25 (-30) mm long, creamy yellow to purple; legume pubescent, with a basal stipe ..... ***V. pannonica***
          6 Standard glabrous; corolla 10-25 (-30) mm long, pink, purple, lavender, or whitish; legume glabrous, sessile.
            7 Calyx 7-11 (-12) mm long; corolla pink-purple to whitish, 10-18 mm long; leaflets 4-10× as long as wide ..... ***V. sativa*** *ssp.* ***nigra***

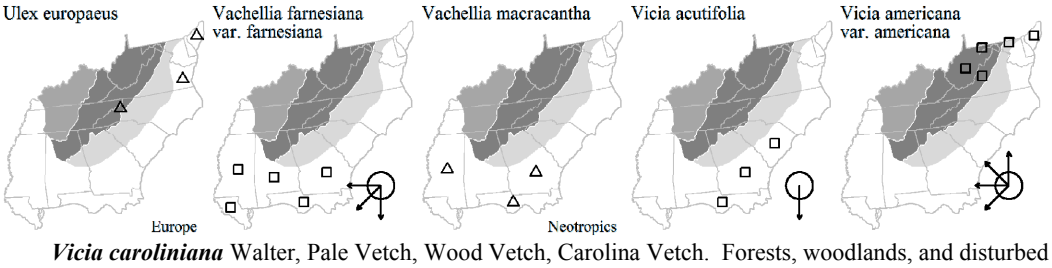
7 Calyx 10-15 mm long; corolla generally pink-purple, 18-25 (-30) mm long; leaflets 2-5 (-7)× as long as wide ..... ***V. sativa*** *ssp.* ***sativa***

1 Inflorescence pedunculate, of 2-many flowers along a well-developed raceme; [alien and native species].
8 Peduncles 1-10 mm long; raceme axis 2-10 mm long, with 2-7 (-10) flowers.
9 Plant a robust annual, 10-20 dm tall; tendrils absent; leaves with (2-) 4-6 leaflets; leaflets 5-10 cm long; corolla 20-30 mm long..... ***V. faba***
9 Plant a trailing perennial, 3-10 dm tall; tendrils present; leaves with 8-16 leaflets; leaflets 2-3.5 cm long; corolla 10-15 mm long..... ***V. sepium***
8 Peduncles usually >10 mm long; raceme axis usually >10 mm long, with (1-) 2-many flowers.
10 Corolla 10-25 mm long.
11 Stipules dimorphic, one of each pair entire, the other palmately lacerate; flowers 1 (-2) per inflorescence ..... ***V. articulata***
11 Stipules of a pair alike; flowers 1-numerous per inflorescence.
12 Flowers 15-22 (-25) mm long; legumes with a basal stipe 2-5 mm long; leaves with 8-16 leaflets ..... ***V. americana*** *var.* ***americana***
12 Flowers 8-16 (-18) mm long; legumes with a basal stipe 1-3 mm long; leaves with 8-22 leaflets.
13 Calyx swollen on one side; plant an annual; inflorescence secund.
14 Plant glabrate or with pubescence of hairs < 1 mm long; lower calyx lobe lanceolate to linear-lanceolate, 1-2 (-2.4) mm long ..... ***V. villosa*** *ssp.* ***varia***
14 Plant conspicuously villous, the hairs 1-2 mm long; lower calyx lobe acicular or weak, 2-4 mm long ..... ***V. villosa*** *ssp.* ***villosa***
13 Calyx not swollen on one side; plant a rhizomatous perennial; inflorescence not secund.
16 Flowers white to lavender, the keel spotted; legumes 4-5 mm wide; inflorescence not second ..... ***V. caroliniana***
16 Flowers blue-violet or purple; legumes 6-8 mm wide; inflorescence generally second..... ***V. cracca***
10 Corolla 2.5-8 (-10) mm long.
17 Plant a rhizomatous perennial.
18 Leaves with 2-4 (-6) leaflets; [plants of s. SC southward, native, of the Coastal Plain].
19 Legumes 2.5-3.0 cm long; leaflets 1.5-4.5 cm long, oblong to linear, 8-20× as long as wide..... ***V. acutifolia***
19 Legumes 0.8-1.5 cm long; leaflets 1-1.5 cm long, usually elliptic, 2-4 (-10)× as long as wide ..... ***V. floridana***
18 Leaves with 10-25 leaflets; [plants collectively widespread in our area, native or alien].
20 Flowers white to lavender, the keel spotted; legumes 4-5 mm wide; inflorescence not second..... ***V. caroliniana***
20 Flowers blue-violet or purple; legumes 6-8 mm wide; inflorescence generally secund ..... ***V. cracca***
17 Plant an annual.
21 Legume symmetrically rounded at the apex; inflorescence with 1-2 (-4) flowers..... ***V. tetrasperma***
21 Legume asymmetrically acute at the apex; inflorescence with 1-15 flowers.
22 Leaves with 2-4 leaflets; legume glabrous to inconspicuously puberulent ..... ***V. minutiflora***
22 Leaves with (8-) 10-16 leaflets; legume glarous or finely hirsute.
23 Legume finely hirsute; calyx 2-2.5 mm long; corolla 2.5-4.5 mm long ..... ***V. hirsuta***
23 Legume glabrous; calyx 2.8-3.7 mm long; corolla 4.5-8 mm long.
24 Racemes (2-) 4-9 (-12) flowered; corolla blue-purple; leaves with (4-) 8-12 (-14) leaflets ..... ***V. ludoviciana*** *ssp.* ***ludoviciana***
24 Racemes 1-6-flowered; corolla pinkish-white or lavender; leaves with (6-) 12-14 (-18) leaflets ..... ***V. ludoviciana*** *ssp.* ***leavenworthii***

Vicia acutifolia Elliott, Fourleaf Vetch. Pond margins, pine flatwoods, ditches. April-May; May-June. Se. SC south to s. FL, west to e. Panhandle FL. [= RAB, GW, I, K, S, SE, WH]

Vicia americana Willdenow *var.* ***americana***, American Vetch, Purple Vetch, Tare. Moist soils. May-June. Var. *americana* ranges from QC west to AK, south to w. VA, s. WV, MO, OK, TX, Mexico. Var. *minor* Hooker occurs in w. North America. The report for AL (Woods & Diamond 2006) has been shown to be a misidentification (Spaulding, pers. comm.). [= C, F, G, I, SE; = *V. americana* ssp. *americana* – K; < *V. americana* – W, WV]

* ***Vicia articulata*** Hornemann, Monantha Vetch, Oneflower Vetch. Perhaps only cultivated; native of Europe. [=I, K, SE]



Vicia caroliniana Walter, Pale Vetch, Wood Vetch, Carolina Vetch. Forests, woodlands, and disturbed areas. April-June; May-July. NY west to WI, south to s. GA, s. MS, and c. TX. [= C, F, G, I, K, SE, W, WH, WV; > *V. caroliniana* – RAB, S; > *V. hugeri* Small – RAB, S]

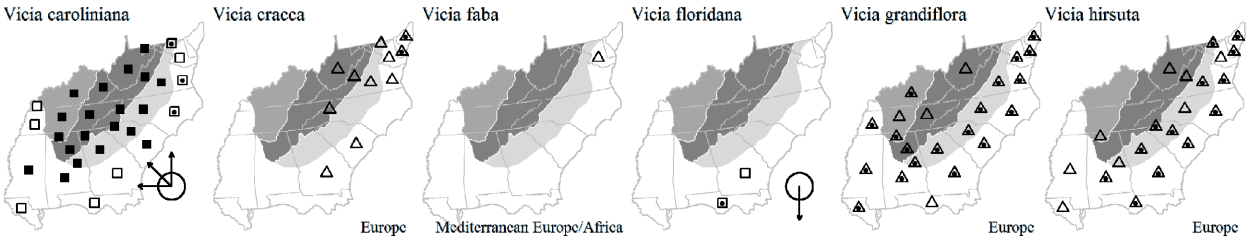
* ***Vicia cracca*** Linnaeus, Tufted Vetch, Cow Vetch, Canada-pea. Disturbed areas; native of Europe. May-July; June-August. [= RAB, C, G, S, SE; > *V. cracca* var. *cracca* – F, I; > *V. cracca* ssp. *cracca* – K]

* ***Vicia faba*** Linnaeus, Horse Bean, Faba Bean, Broad Bean. Disturbed areas; native of Mediterranean Europe. Introduced in se. PA (Rhoads & Klein 1993). [= C, F, G, I, K, SE]

Vicia floridana S. Watson, Florida Vetch. Moist soils of hammocks, ditches, roadbanks. E. GA (McIntosh Co.) south to c. peninsular FL. [= GW, I, K, S, SE, WH]

* ***Vicia grandiflora*** Scopoli, Large Yellow Vetch. Disturbed areas; native of Europe. April-June; May-July. [= C, I, F, G, K, SE, W, WH; > *V. grandiflora* var. *kitaibeliana* W.D.J. Koch – RAB]

* ***Vicia hirsuta*** (Linnaeus) S.F. Gray, Tiny Vetch, Hairy Tare. Disturbed areas, native of Europe. April-June; May-July. [= RAB, C, F, G, I, K, S, SE, WH]



* ***Vicia lathyroides*** Linnaeus, Spring Vetch. Lawns, disturbed areas; native of Europe. April-June; May-July. [= RAB, C, I, F, G, K, SE]

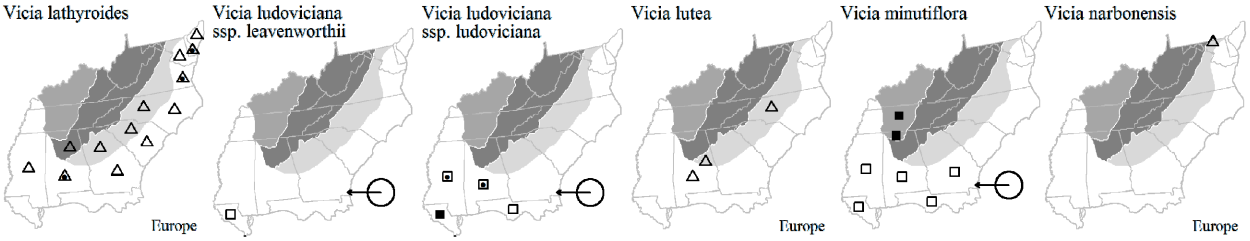
Vicia ludoviciana Nuttall *ssp.* ***leavenworthii*** (Torrey & A. Gray) Lassetter & Gunn. Woodlands. prairies, dunes, disturbed areas. MS and MO west to NM and TX. In our area is Race 2 ("*louisianica*" race) of ssp. *leavenworthii* (Isely 1998). [= I, K, SE] {add to synonymy}

Vicia ludoviciana Nuttall *ssp.* ***ludoviciana***, Louisiana Vetch. Woodlands, prairies, dunes, disturbed areas. AL and Panhandle FL west to OR and CA. In our area is Race 1 ("*ludoviciana*" race) of ssp. *ludoviciana* (Isely 1998). [= I, K, SE; = *V. ludoviciana* – WH] {add to synonymy}

* ***Vicia lutea*** Linnaeus, Yellow Vetch. Disturbed areas; native of Europe. [= I, K, SE]

Vicia minutiflora F.G. Dietrich, Smallflower Vetch. Woodlands, dry hammocks. TN, Panhandle FL, and sw. GA west to OK and TX. [= GW, I, K, SE, WH, Y; = *V. micrantha* Nuttall ex Torrey & A. Gray – F, G, S]

* ***Vicia narbonensis*** Linnaeus, Narbonne Vetch. Disturbed areas; native of Europe. Introduced in MD and DC (Fernald 1950). [= C, F, G, I, K, SE]



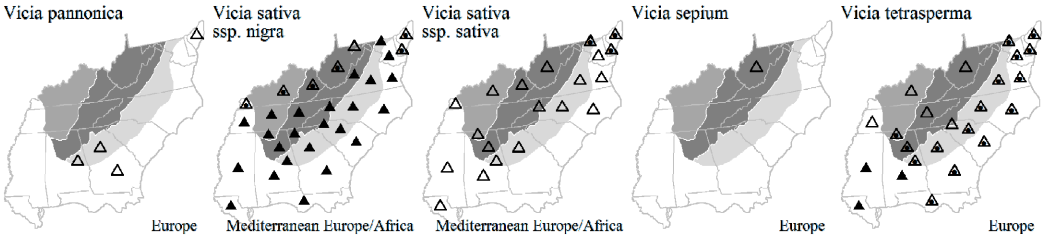
* ***Vicia pannonica*** Crantz, Hungarian Vetch. Disturbed areas; native of Europe. Introduced in c. GA. Reported for NC (Isely 1998). {investigate} [= I, K, SE]

* ***Vicia sativa*** Linnaeus *ssp.* ***nigra*** (Linnaeus) Ehrhart, Narrowleaf Vetch. Disturbed areas; native of Mediterranean Europe. March-June; May-July. [= I, K, SE; = *V. angustifolia* Linnaeus – RAB, C, S, W; = *V. sativa* var. *angustifolia* (Linnaeus) Ehrhart; > *V. angustifolia* var. *angustifolia* – F, G, WV; > *V. angustifolia* var. *segetalis* (Thuill.) Ser. – F, G, WV; > *V. angustifolia* var. *uncinata* (Desv.) Rouy – F]

* ***Vicia sativa*** Linnaeus *ssp.* ***sativa***, Common Vetch. Disturbed areas; native of Mediterranean Europe. April-June; May-July. [= I, K, SE; = *V. sativa* – RAB, C, G, S; > *V. sativa* var. *sativa* – F; > *V. sativa* var. *linearis* Lange – F]

* ***Vicia sepium*** Linnaeus, Bush Vetch, Wild Tare. Disturbed areas; native of Europe. Introduced south to WV and in e. PA (Rhoads & Klein 1993). [= C, G, I, SE; > *L. sepium* var. *sepium* – F, K]

* ***Vicia tetrasperma*** (Linnaeus) Schreber, Slender Vetch, Smooth Tare, Lentil Vetch. Disturbed areas; native of Europe. April-June; May-July. [= RAB, C, G, I, K, S, SE, WH; > *V. tetrasperma* var. *tetrasperma* – F; > *V. tetrasperma* var. *tenuissima* Druce – F]



* ***Vicia villosa*** Roth *ssp.* ***varia*** (Host) Corbière, Winter Vetch. Disturbed areas; native of Europe. May-September. [= I, K, SE; = *V. dasycarpa* Tenore – RAB, C, F, G, W, WV; < *V. villosa* – WH]

* ***Vicia villosa*** Roth *ssp.* ***villosa***, Hairy Vetch, Fodder Vetch. Disturbed areas; native of Europe. May-September. [= I, K, SE; = *V. villosa* – RAB, C, F, G, W, WV; < *V. villosa* – WH]

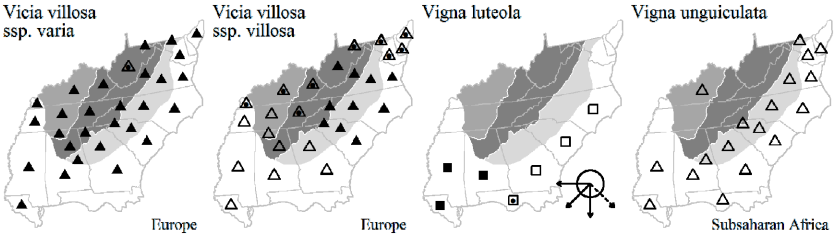
Vigna Savi 1824 (Cow Pea)

A genus of about 100-150 species, annual and perennial herbs, pantropical, rarely extending into warm temperate regions. References: Isely (1998)=I; Maréchal, Mascherpa, & Stainier (1978)=Z.

1 Corolla yellow, 1.5-1.7 cm long; leaves somewhat fleshy-thickened; [plant native or introduced in maritime situations]; [section *Vigna*] ..... ***V. luteola***
1 Corolla pink to purple, 1.5-2.5 cm long; leaves herbaceous; [plant a cultivated introduction]; [section *Catiang*]..... ***V. unguiculata***

Vigna luteola (Jacquin) Bentham, Wild Cow Pea. Edges of freshwater tidal marshes, beaches, hammocks, disturbed areas, railroad embankments, low fields, in the outer Coastal Plain. July-September; August-October. Se. NC south to s. FL, west to se. TX, and in the New World tropics. Often weedy in appearance, and its nativity at a particular location difficult to judge. [= RAB, GW, I, K, Z; ? *V. repens* (Linnaeus) Kuntze – S; = *V. marina* (Burmann) Merrill (the correct name according to some authors, based on uncertain typification)]

* ***Vigna unguiculata*** (Linnaeus) Walpers, Black-eyed Pea, Field Pea, Cow Pea. Cultivated in commercial and home gardens, rarely persistent or occurring as a waif in disturbed areas; native of tropical Africa or Asia. June-August; July-September. [= RAB, I, K; ? *V. sinensis* (Linnaeus) Savi – F, S; > *V. unguiculata* var. *unguiculata* – Z]



Wisteria Nuttall 1818 (Wisteria)

A genus of about 6 species, woody vines, shrubs, and small trees, of temperate e. Asia and e. North America. Some research suggests that the Asian species should be placed in a separate genus (see Isely 1998 and Stritch 1984). References: Isely (1998)=I; Valder (1995)=Z; Stritch (1984)=Y.

Identification notes: Twining direction can be determined by looking at (or imagining) the vine twining around a branch or pole. Look at the pole or branch from the base (from the direction from which the vine is growing). If the vine is circling the branch or pole in a clockwise direction, that is dextrorse; if counterclockwise, that is sinistrorse. Identification of the two alien species and their hybrids is uncertain. Genetic sorting of morphological characters and horticultural selection mean that morphology is only poorly correlated with genetic origin. Trusty et al. (2007) found that 24 of 25 individuals tested from scattered sites around the Southeast showed genetic admixture (sometimes complicated) between *W. floribunda* and *W. sinensis*. Probably the great majority of material in the Southeast could be called *W. ×formosa*; the below key may work poorly or not at all for some material encountered.

1 Legume and ovary glabrous; pedicels 5-10 (-15) mm long; standard reflexed near the middle; seeds reniform; leaflet margins plane; leaflet apices acute to slightly acuminate; [native species of swamps and bottomland forests and thickets]..... ***W. frutescens***
1 Legume and ovary velvety pubescent; pedicels 15-20 mm long; standard reflexed at the base; seeds lenticular; leaflet margins undulate; leaflet apices mainly strongly acuminate; [introduced species, naturalized in a wide variety of situations].
  2 Standard 20-23.5 mm long, 21-23 mm wide; leaflets (7-) 9-11 (-13) per leaf; raceme to 33 cm long, with 25-95 flowers opening nearly simultaneously; vine twining clockwise (dextrorse; from lower left ascending to upper right) ..... ***W. sinensis***
  2 Standard 16-18 mm long, 16-18 mm wide; leaflets 7-17 (-19) per leaf; raceme to 132 cm long, with 25-170 flowers opening nearly simultaneously or sequentially; vine twining counter-clockwise (sinistrorse; from lower right ascending to upper left).
    3 Auricles of the standard's callosity 1.1-1.2 mm long; leaflets (11-) 13-17 (-19) per leaf; raceme to 132 cm long, with the 50-170 flowers opening successively from base to the tip of the inflorescence, those at the base withering before those at the tip have opened ..... ***W. floribunda***
    3 Auricles of the standard's callosity 0.7-0.8 mm long; leaflets 7-17 per leaf; racemes to 36 cm long..... ***W. ×formosa***

* ***Wisteria floribunda*** (Willdenow) A.P. de Candolle, Japanese Wisteria. Commonly cultivated, escaped to urban, suburban, and rural forests and woodlands, native of Japan. April-July; July-November. [= RAB, C, F, G, I, K, SE, WH, Z; = *Kraunhia floribunda* (Willdenow) Taubert – S; = *Rehsonia floribunda* (Willdenow) Stritch – Y]

* ***Wisteria ×formosa*** Rehder [=*W. floribunda* × *sinensis*], Hybrid Asian Wisteria. Cultivated, escaped to urban, suburban, and rural forests and woodlands, a cross of species from China and Japan; commonly cultivated, commonly escaped. April-July; July-November. Trusty et al. (2007, 2008) reveal that much of the invasive *Wisteria* in southeastern United States involves complex hybrids and backcrosses involving *W. floribunda* and *W. sinensis*. [= WH; = *Rehsonia ×formosa* (Rehder) Stritch – Y]

Wisteria frutescens (Linnaeus) Poiret, American Wisteria, Swamp Wisteria, Atlantic Wisteria. Swamp forests, wet thickets. April-May; June-September. E. VA south to n. peninsular FL, west to TX, north in the interior to AR, s. IN, and s. MO. The issue of the distinctiveness of *W. frutescens* and *W. macrostachya* needs further study. Harvill et al. (1992) reports *W. macrostachya* from Northumberland and Shenandoah counties, VA. [= RAB, GW, I, K, SE, W, WH, WV; > *W. frutescens* – C, F, G, Z; > *W. macrostachya* (Torrey & A. Gray) Nuttall ex B.L. Robinson & Fernald – C, F, G, Z; > *Kraunhia frutescens* (Linnaeus) Greene – S; > *Kraunhia macrostachya* (Torrey & A. Gray) Small – S]

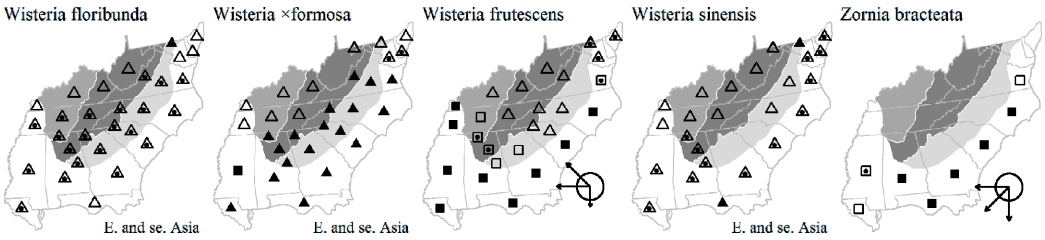
* ***Wisteria sinensis*** (Sims) A.P. de Candolle, Chinese Wisteria. Commonly cultivated, escaped to urban, suburban, and rural forests and woodlands; native of China. April-July; July-November. [= RAB, C, F, I, K, SE, WH; = *Rehsonia sinensis* (Sims) Stritch – Y]

Zornia J. F. Gmelin 1792 (Zornia)

A genus of about 50-90 species, perennial herbs, of tropical and warm temperate regions. References: Isely (1998)=I.

Identification notes: The palmately 4-foliolate leaves are unique in the flora of our area.

Zornia bracteata Walter ex J.F. Gmelin, Zornia. Flatwoods, sandhills, sandy roadsides. June-August; July-October. Se. VA south to s. FL, west to TX and e. Mexico, endemic to the Southeastern Coastal Plain. [= RAB, C, F, G, K, S, SE, WH]



146. POLYGALACEAE R. Brown 1814 (Milkwort Family) [in FABALES]

A family of 17-21 genera and 800-1000 species, trees, shrubs, woody vines, and herbs, nearly cosmopolitan, but most diverse in tropical and subtropical areas. References: Miller (1971b); Eriksen & Persson in Kubitzki, Bayer, & Stevens (2007).

Polygala Linnaeus 1753 (Milkwort)

A genus of 300-400 species, trees, shrubs, and herbs, nearly cosmopolitan in distribution. The circumscription of the genus and its monophyly are uncertain. References: Smith & Ward (1976)=Z; Haines (2010)=Y; Eriksen & Persson in Kubitzki, Bayer, & Stevens (2007).

Identification notes: *Polygala* has a distinctive flower structure which can be confusing. The corolla consists of **3 fused petals**, partly fused into a tubular form, and also fused with the stamens. The lower petal is called the **keel**; it is usually boatlike, and also lacerate, fringed, or lobed at its tip. The calyx is 5-lobed, the lobes usually of 3 distinct sizes. The two lateral sepals are called **wings**; they are generally large and petaloid (colored like petals). The upper sepal is usually the next largest; the two lower sepals are usually the smallest.

1 Fresh flowers orange, yellow, greenish-yellow, or greenish white (if greenish white, then the inflorescence a terminal many-brached cyme); [subgenus *Polygala*, series *Decurrentes*].
  2 Inflorescence a dense pom-pom-like raceme, terminating leafy branches.
    3 Fresh flowers lemon-yellow or greenish yellow; subulate bracts of the inflorescence 4.5-6.5 mm long; plants 3-10 (-15) cm tall; lobes of lower petal (keel) 1.5-2.5 mm long ..... ***P. nana***
    3 Fresh flowers bright orange or bright yellow; subulate bracts of the inflorescence 2-4 mm long; plants 5-80 cm tall; lobes of lower petal (keel) 0.5-1.1 mm long.
      4 Racemes ca. 1.5 cm in diameter; flowers bright orange (rarely individual plants within a population with bright yellow flowers); plants 5-40 cm tall; [widespread] ..... ***P. lutea***
      4 Racemes ca. 2.5 cm in diameter; flowers bright yellow; plants 30-80 cm tall; [of FL] ..... ***P. rugelii***
  2 Inflorescence a terminal, many-branched cyme, the many individual branches loosely to densely flowered.
    5 Fresh flowers cream-white to greenish-white; [of GA southward] ..... ***P. balduinii var. balduinii***
    5 Fresh flowers bright yellow; [collectively widespread in the Coastal Plain of our area].
      6 Plants 4.5-12 dm tall, the stem solitary; basal leaves 3.5-14 cm long, linear-lanceolate, about 15-20× as long as wide, persistent as a basal rosette; stem leaves linear-subulate, sharp-tipped, much reduced from the basal leaves, becoming bractlike upward; seeds glabrous, 0.7-0.9 mm long ..... ***P. cymosa***
      6 Plants 1-4 dm tall, the stems 1-several from the base; basal leaves 3-7 cm long, spatulate, about 10× as long as wide, usually not persistent after flowering; stem leaves narrowly spatulate to linear, blunt-tipped, only slightly reduced from the basal leaves; seeds pubescent, 0.5-0.7 mm long ..... ***P. ramosa***
1 Fresh flowers pink, purple, white, or green (if green or white, then the inflorescence a simple raceme, not a many-branched cyme).
  7 Leaves few, clustered near the tip of the stem; wings 13-20 mm long; stamens 6; [of moist soils of forests in the Mountains]; [subgenus *Chamaebuxus*] ..... ***P. paucifolia***
  7 Leaves many, evenly distributed along the stem, or not at least stronglt clustered near the tip; wings < 10 mm long; stamens 8; [collectively of a wide variety of habitats, but generally not as above, either in more open, drier, or non-montane habitats].
    8 Leaves whorled, at least at the principal lower nodes; annual, from a slender taproot; [subgenus *Polygala*].
      9 Racemes 3-6 mm in diameter, pointed in outline.
        10 Racemes 2-5 cm long, becoming interrupted below through persistence of the fruits on the axis; wings equaling the fruit ..... ***P. ambigua***
        10 Racemes 0.5-1.5 cm long, the fruits falling promptly, thus the inflorescence compact and truncate below; wings shorter than the fruit.
          11 Seeds finely pubescent; pedicels ¼-⅓ as long as the fruit; raceme peduncles 0.5-4 cm long ..... ***P. verticillata** var. **isocycla***
          11 Seeds hirsute; pedicels ⅓-½ as long as the fruit; raceme peduncles 2-7 cm long ..... ***P. verticillata** var. **verticillata***

9 Racemes 8-15 mm in diameter, rounded in outline (somewhat rounded in *P. hookeri*).
12 Racemes loosely flowered, with ca. 10 flowers per cm of length; raceme 7-12 mm in diameter, the tip pointed in outline (obconical apically); full raceme (including the portion with dropped fruits) to 6 cm long.....***P. hookeri***
12 Racemes densely flowered, with ca. 20 flowers per cm of length; raceme 7–20 mm in diameter, the tip rounded to truncate in outline; full raceme (including the portion with dropped fruits) to 4.5 cm long.
13 Bracts of the inflorescence ca. 1 mm long; wings 1.5-2.5 mm wide, acute or short-mucronate at the tip; raceme peduncle (0.8-) 3-5 cm long.....***P. brevifolia***
13 Bracts of the inflorescence 1.5-3 mm long; wings 3-4 mm wide, acuminate, the tips cuspidate; raceme peduncle 0-0.8 (-4.0) cm long.
14 Larger leaves (2-) 3-7 mm wide; raceme peduncles 0-0.5 cm long; racemes 7-15 mm in diameter.....***P. cruciata** var**. aquilonia***
14 Larger leaves 1.5-3 (-4) mm wide; raceme peduncles 0-4 cm long; racemes 12-20 mm in diameter.....***P. cruciata** var**. cruciata***
8 Leaves all alternate; **either** annual, from a slender taproot, the stems solitary, **or** biennial to perennial, from a taproot, the stems solitary to several, **or** perennial, from a thick rhizome, the stems several.
15 Leaves glaucous, somewhat succulent, linear; corolla 7-10 mm long, > 2× as long as the wings; [subgenus *Polygala*].....***P. incarnata***
15 Leaves green, herbaceous, usually broader than linear; corolla < 5 mm long, roughly equal to or shorter than the wings.
16 Annual, the stems solitary; [subgenus *Polygala*].
17 Corolla about 0.5× as long as the wings.....***P. sanguinea***
17 Corolla about 1× as long as the wings.
18 Inflorescence bracts dropping from the axis promptly following flowering.....***P. mariana***
18 Inflorescence bracts persistent.
19 Wings 3-5 mm long; pedicels 1.5-2.5 mm long; racemes 8-13 mm in diameter.....***P. curtissii***
19 Wings 2-2.5 mm long; pedicels 0.5-1.5 mm long; racemes 5-6 mm in diameter.....***P. nuttallii***
16 Perennial or biennial, usually several stems arising together from a rhizome or taproot.
20 Wings white, 2-3 mm long; flowers sessile or subsessile; plants from a thick crown; [subgenus *Polygala*].
21 Larger leaves mostly 15-35 mm wide; capsules 3.5-4.2 mm long; seeds 3.0-3.5 mm long.....***P. senega** var**. latifolia***
21 Larger leaves mostly 2-15 mm wide; capsules 2.5-3.5 mm long; seeds ca. 2.5 mm long.....***P. senega** var**. senega***
20 Wings pink, 4-7 mm long; flowers pedicelled; plants from a taproot.
22 Corolla keel entire at the tip; wings 5-7 mm long, reniform-orbicular; plants lacking cleistogamous flowers; [subgenus *Hebeclada*].....***P. grandiflora** var**. grandiflora***
22 Corolla keel fringed at the tip; wings 4-6 mm long, elliptic; plants producing cleistogamous flowers in loose subterranean or surficial racemes; [subgenus *Polygala*].
23 Flowers mostly 1-4 mm apart; racemes elongating to 2-12 cm long; pedicels 0.5-2.0 mm long; [more northern in distribution].....***P. polygama** var**. obtusata***
23 Flowers mostly 4-6 mm apart; racemes elongating to 8-15 cm long; pedicels 1.5-3.5 mm long; [more southern in distribution].....***P. polygama** var**. polygama***

Polygala ambigua Nuttall, Loose Milkwort. Mt (GA, NC, SC, VA, WV), Pd (DE, GA, NC, SC, VA), Cp (DE, NC, SC, VA): fields, woodlands, openings; uncommon. June-September. ME west to MI, south to GA, AL, and OK. Through most of its range *P. ambigua* has wings 1.3-1.7 mm long; plants from se. VA south to SC and from the Ozarks have wings 2.0-2.6 mm long. These plants have been named as a variety of *P. verticillata*, var. *dolichoptera* Fernald. They may warrant taxonomic recognition, but need additional study, including resolution of our Coastal Plain plants and those of the Ozarks. [= C, G, K, S; = *P. verticillata* Linnaeus var. *ambigua* (Nuttall) Wood – RAB; > *P. verticillata* var. *ambigua* – F, WV; > *P. verticillata* var. *dolichoptera* Fernald – F, WV; < *P. verticillata* – W]

Polygala balduinii Nuttall *var. **balduinii***, White Milkwort, Baldwin's Milkwort. Cp (FL, GA): wet pine savannas; uncommon (rare in GA). E. GA south to s. FL, west to s. MS; e. TX; Cuba; the Bahamas (Andros Island). Var. *carteri* (Small) R.R. Smith & D.B. Ward occurs in s. FL. [= GW, Z; < *Polygala balduinii* – K, WH; = *Pilostaxis baldwinii* (Nuttall) Small – S, orthographic variant; = *Pylostachya balduinii* (Nuttall) Small]

Polygala brevifolia Nuttall, Shortleaf Milkwort, Little-leaf Milkwort. Cp (FL, GA, NC, SC, VA): pine savannas, pocosin margins; uncommon (rare in GA, NC, SC, VA). June-October. NJ south to Panhandle FL, west to s. MS. [= RAB, C, F, G, GW, K, S, WH]

Polygala cruciata Linnaeus *var. **aquilonia*** Fernald & Schubert, Northern Drumheads. Cp (DE), Mt (NC, SC, VA, WV): bogs, damp or wet soil in openings; uncommon (rare in DE). June-October. ME west to MN, south to e. VA, w. NC, n. AL, and TN. [= F, K; < *P. cruciata* – RAB, C, G, GW, S, W, WV; = *P. cruciata* ssp. *aquilonia* (Fernald & Schubert) A. Haines – Y]

Polygala cruciata Linnaeus *var. **cruciata***, Southern Drumheads. Cp (FL, GA, NC, SC, VA): pine savannas, bogs, pocosins; common. June-October. Se. VA south to s. FL, west to TX, inland north to KY. [= F, K; < *P. cruciata* – RAB, C, G, GW, W, WH; > *P. ramosior* (Nash) Small – S; = *P. cruciata* ssp. *cruciata* – Y]

Polygala curtissii A. Gray, Appalachian Milkwort. Mt (GA, NC, SC, VA, WV), Pd (GA, NC, SC, VA), Cp (GA, NC, SC, VA): old fields, thickets, openings; common (uncommon in Mountains). June-October. DE and se. PA (Rhoads & Klein 1993) west to OH, south to SC, GA, and MS. [= RAB, C, F, G, K, S, W, WV]

Polygala cymosa Walter, Tall Pinebarren Milkwort. Cp (DE, FL, GA, NC, SC): pond-cypress savannas, Coastal Plain depression ponds, clay-based Carolina bays, other sites with seasonally flooded hydrology; common (rare in DE). May-July. E. NC south to s. FL, west to s. MS; disjunct in s. DE. [= RAB, C, F, G, GW, K, WH, Z; = *Pilostaxis cymosa* (Walter) Small – S; = *Pylostachya cymosa* (Walter) Small]

Polygala grandiflora Walter *var. **grandiflora***, Showy Milkwort. Cp (GA, NC, SC): sandhills, dry sandy soils of roadsides and fields; uncommon (NC Rare). May-July. S. NC south to s. FL, west to s. MS. [= K; < *P. grandiflora* – RAB, WH; > *Asemeia grandiflora* (Walter) Small – S; > *Asemeia cumulicola* Small – S; < ***Polygala violacea*** Aublet {investigate}]

Polygala hookeri Torrey & A. Gray, Hooker's Milkwort. Cp (FL, GA, NC, SC): pine savannas; rare (NC Rare). June-August. Sw. GA and adjacent Panhandle FL, west to s. MS; disjunct in se. NC and ne. SC. [= RAB, GW, K, S, WH]

Polygala incarnata Linnaeus, Pink Milkwort, Procession Flower. Cp (DE, FL, GA, NC, SC, VA), Pd (DE, GA, NC, SC, VA), Mt (GA, NC, VA): pine savannas, woodlands, fields; common (rare in Mountains, rare in DE). June-July. NY (Long Island) and se. PA (Rhoads & Klein 1993) west to MI, WI, and IA, south to s. FL and TX. [= RAB, C, F, G, GW, K, W, WH; = *Galypola incarnata* (Linnaeus) Nieuwland – S]

Polygala lutea Linnaeus, Orange Milkwort, Red-hot-poker. Cp (DE, FL, GA, NC, SC, VA), Pd (NC): wet savannas, ditches, bogs, other wet areas; common (rare in Piedmont). April-October. NY (Long Island), se. PA (Rhoads & Klein 1993), and NJ south to s. FL, west to e. LA. [= RAB, C, F, G, GW, K, WH, Z; = *Pilostaxis lutea* (Linnaeus) Small – S; = *Pylostachya lutea* (Linnaeus) Small]

Polygala mariana P. Miller, Maryland Milkwort. Cp (DE, FL, GA, NC, SC, VA), Pd (VA): bogs, pine savannas, other open wet habitats; common (rare in Piedmont). June-October. S. NJ south to c. peninsular FL, west to TX; disjunct inland in sw. TN (Chester, Wofford, & Kral 1997). [= RAB, C, G, GW, K; > *P. mariana* – F, S; > *P. harperi* Small – F, S]

Polygala nana (Michaux) A.P. de Candolle, Dwarf Milkwort, Candyroot. Cp (FL, GA, SC), Pd (GA, SC), Mt (GA, NC): longleaf pine flatwoods, other open moist areas; common (rare in NC and SC). E. GA south to s. FL, west to e. TX, with scattered populations inland to n. SC, w. NC, nw. GA, n. AL, c. TN (Chester, Wofford, & Kral 1997), and ne. MS. This species is primarily a Coastal plain species of the deeper south; *P. nana* may be introduced in parts of our area. [= RAB, GW, K, WH, Z; = *Pilostaxis nana* (Michaux) Rafinesque – S; = *Pylostachya nana* (Michaux) Rafinesque]

Polygala nuttallii Torrey & A. Gray, Nuttall's Milkwort. Cp (DE, FL, GA, NC, SC, VA), Pd (DE, GA, NC), Mt (VA): pocosins, pine savannas, also in depression ponds (in Augusta and Rockingham counties, VA); common (uncommon in GA, NC, SC, and VA, rare in Mountains, rare in FL). June-August. MA south to ne. FL and e. Panhandle FL; disjunct inland in w. VA, c. TN (Chester, Wofford, & Kral 1997), sc. KY, and allegedly c. AR. [= RAB, C, F, G, K, S, W, WH]

Polygala paucifolia Willdenow, Gaywings, Fringed Polygala, Flowering Wintergreen, Bird-on-the-wing. Mt (GA, NC, SC, VA, WV), Pd (DE, GA): moist forests at moderate to high elevations; common (rare in DE and SC). April-June; June-September. NB and QC west to SK, south to CT, NY, WI, and in the Appalachians south to w. NC, nw. SC, n. GA, and e. TN. [= RAB, C, F, G, K, W, WV; = *Triclisperma paucifolia* (Willdenow) Nieuwland – S]

Polygala polygama Walter *var.* ***obtusata*** Chodat, Northern Bitter Milkwort. Mt (VA, WV), Pd (VA): woodlands and woodland borders; uncommon. May-July; June-July. ME west to MI and MN, south to NJ, w. VA, OH, c. IN, c. IL, and IA. [= C, F, G, WV; < *P. polygama* – RAB, K, S, W]

Polygala polygama Walter *var.* ***polygama***, Southern Bitter Milkwort, Racemed Milkwort. Cp (FL, GA, NC, SC, VA), Pd (GA, NC, SC), Mt (GA, NC, SC): sandhills, woodlands, woodland borders; common. May-July; June-July. Se. VA, sw. NC, and AR, south to s. FL and TX. [= C, F, G; < *P. polygama* – RAB, K, S, W, WH]

Polygala ramosa Elliott, Short Pinebarren Milkwort, Low Pinebarren Milkwort. Cp (DE, FL, GA, NC, SC, VA), Mt (NC): wet savannas, pocosin margins, bogs; common (rare in DE and VA). June-September. S. NJ south to s. peninsular FL, west to e. TX; disjunct inland (as in Henderson County, NC). [= RAB, C, F, G, GW, K, WH, Z; = *Pilostaxis ramosa* (Elliott) Small – S; = *Pylostachya ramosa* (Elliott) Small]

Polygala rugelii Shuttleworth ex Chapman. Cp (FL): wet pine flatwoods; rare. Extreme e. Panhandle FL and n. peninsular FL south to s. FL. [= GW, K, WH, Z; = *Pilostaxis rugelii* (Shuttleworth ex Chapman) Small – S]

Polygala sanguinea Linnaeus, Blood Milkwort, Field Milkwort. Mt (GA, NC, SC, VA, WV), Pd (DE, NC, VA), Cp (DE, GA?, NC, VA): woodlands, openings, woodland borders; common (uncommon in GA, NC, SC, VA). June-August. NS and MN, south to nw. SC, n. GA, and LA. [= RAB, C, F, G, GW, K, W, WV; *? P. viridescens* Linnaeus – S]

Polygala senega Linnaeus *var.* ***latifolia*** Torrey & A. Gray, Seneca Snakeroot. Mt (VA, WV), Pd (DE), {Mt (GA, NC, SC), Pd (NC, SC, VA): woodlands and openings, especially over calcareous or mafic rocks; uncommon (rare in NC and WV)}. May-June. DE, PA, and MN, south to NC, TN, and MO. Trauth-Nare & Naczi (1998) studied the two varieties of *P. senega* and concluded that the taxa should be recognized at the specific level. The relative distributions, habitats, and phenology of the two taxa need assessment for our area. [= F, G, WV; < *P. senega* – RAB, C, K, S, W]

Polygala senega Linnaeus *var.* ***senega***, Seneca Snakeroot. Mt (WV), {Mt (GA, NC, SC, VA), Pd (NC, SC, VA): woodlands and openings, especially over calcareous or mafic rocks; uncommon (rare in NC)}. April-May. QC west to AB, south to n. GA, TN, AR, and SD. The relative distributions, habitats, and phenology of the two taxa need assessment for our area. [= F, G, WV; < *P. senega* – RAB, C, K, S, W]

Polygala verticillata Linnaeus *var.* ***isocycla*** Fernald, Whorled Milkwort. Cp (FL), Mt (WV), {Mt, Pd, Cp (DE, GA, NC, SC, VA): dry woodlands, woodland borders, openings, fields; uncommon. June-September. The validity and relative distributions, habitats, phenology of the two varieties need additional assessment in the herbarium and the field.} VT west to MB, south to Panhandle FL (Kunzer et al. 2009), s. FL, and TX. [= C, F, G, K, WH, WV; < *P. verticillata* var. *verticillata* – RAB; = *P. verticillata* – S, apparently misapplied; < *P. verticillata* – W]

Polygala verticillata Linnaeus *var.* ***verticillata***, Whorled Milkwort. Mt (WV), {Mt, Pd, Cp (DE, GA, NC, SC, VA): dry woodlands, woodland borders, openings, fields; uncommon. June-September. The validity and relative distributions, habitats, phenology of the two varieties need additional assessment in the herbarium and the field.} ME west to MI, south to w. VA, w. NC, and TN. [= C, F, G, K, WV; < *P. verticillata* var. *verticillata* – RAB; = *P. pretzii* Pennell – S; < *P. verticillata* – W]

Polygala boykinii Nuttall *var.* ***boykinii***, Boykin's Milkwort. Cp (FL, GA): In sc. TN (Chester, Wofford, & Kral 1997) and sw. GA (Jones & Coile 1988). Var. *sparsiflora* Wheelock occurs in s. FL. [= K; = *P. boykinii* – S; < *P. boykinii* – WH] {not yet keyed; synonymy incomplete}

Polygala chapmanii Torrey & A. Gray. Cp (GA): pine savannas, seepage bogs. Panhandle FL and sw. GA west to s. MS. [= GW, K, S, WH] {not yet keyed; synonymy incomplete}

Polygala crenata C.W. James. Cp (FL, GA): wet pine flatwoods, bogs, bayheads; uncommon (rare in GA). FL Panhandle and AL west to TX; reported for GA (Sorrie, pers. comm.). [= GW, K, WH] {not yet keyed; synonymy incomplete}

Polygala leptocaulis Torrey & A. Gray, Swamp Milkwort. Cp (FL): bogs and pond margins; rare. Ne. and Panhandle FL west to e. TX; Mexico, Central America, and South America; Cuba. [= GW, S, WH; = ***P. tenella*** Willdenow]

Polygala leptostachys Shuttleworth ex A. Gray, Georgia Milkwort. Cp (FL, GA): sandhills; rare (GA Special Concern). Ne. FL south to c. peninsular FL, west to sw. GA (Jones & Coile 1988), s. AL (Sorrie & LeBlond 2008), s. MS (Sorrie & Leonard 1999). [= K, S, WH] {not yet keyed; synonymy incomplete}

Polygala setacea Michaux, Coastal Plain Milkwort. Cp (FL, GA): pine flatwoods and bogs; uncommon. E. GA and Panhandle FL south to s. FL. Reported by Small (1933) as occurring north to NC and west to s. MS (apparently an error). [= GW, K, S, WH] {not yet keyed; synonymy incomplete}

147. ROSACEAE A.L. de Jussieu 1789 (Rose Family) [in ROSALES]

A family of about 85-95 genera and 2000-3000 species, trees, shrubs, and herbs, nearly cosmopolitan, but mainly boreal and temperate. References: Potter et al. (2007); Eriksson et al. (2003); Kalkman in Kubitzki (2004); Ertter (2007).

Subfamily Rosoideae
- *Filipendula*
- Supertribe Rosodae
  - *Rosa*
  - *Rubus*
  - Tribe Sanguisorbeae: *Agrimonia, Poterium, Poteridium, Sanguisorba*
  - Tribe Potentilleae: *Potentilla, Alchemilla, Aphanes, Dasiphora, Drymocallis, Fragaria, Sibbaldia*
  - Tribe Coluriae: *Geum*

Subfamily Spiraeoideae
- Tribe Amygdaleae: *Prunus*
- Tribe Neillieae: *Neillia, Physocarpus*
- Tribe Spiraeeae: *Aruncus, Spiraea*
- Supertribe Kerriodae
  - Tribe Kerrieae: *Kerria, Neviusia, Rhodotypos*
- Supertribe Pyrodae
  - *Gillenia*
  - Tribe Pyreae: *Amelanchier, Aronia, Chaenomeles, Cotoneaster, Crataegus, Cydonia, Eriobotrya, Malus, Photinia, Pyracantha, Pyrus, Rhaphiolepis, Sorbus*

1 Herbs or subshrubs (if woody at base, then < 3 dm tall).
- 2 Leaves simple..... **Key A**
- 2 Leaves compound (at least the lower and better developed) ..... **Key B**

1 Trees, shrubs, or woody vines (with arching "canes" or climbing, arching, or scrambling stems).
- 3 Leaves simple..... **Key C**
- 3 Leaves compound ..... **Key D**

Key A – Herbs and subshrubs with simple leaves

1 Leaves crenate, unlobed; inflorescence of a solitary flower; [tribe *Rubeae*] ..... ***Rubus dalibarda***

1 Leaves 3-many lobed; inflorescences cymose.
- 2 Leaf blades 0.3-1.0 cm long and wide, deeply 3-lobed, each lobe further lobed or deeply toothed; petals 0; [tribe *Potentilleae*]..... ***Aphanes***
- 2 Leaf blades 3-8 cm long and wide, 3-lobed, each lobe toothed; petals 5; [tribe *Colurieae*] ..... ***Geum lobatum***

Key B – Herbs and subshrubs with compound leaves

1 Leaves 2- to 3-ternately compound; [tribe *Spiraeeae*] ..... ***Aruncus***

1 Leaves 1-compound, either simply pinnately compound or simply palmately compound,
- 2 Principal (basalmost) leaves pinnately compound, with (5-) 7-many leaflets (stem leaves sometimes 3-foliolate, especially in *Geum*).
  - 3 Principal leaves with leaflets of markedly disparate shape and size (large leaflets alternating with much smaller leaflets, or a large terminal leaflet and much smaller lateral leaflets).
    - 4 Lateral leaflets alternating between small and large, the terminal leaflet similar in size and shape to the larger lateral leaflets; terminal leaflet < 3 cm wide; hypanthium **either** conical or turbinate, armed with hooked bristles, the pistils 2, **or** hemispheric, the pistils >5.
      - 5 Leaves glabrous or sparsely pubescent beneth; flowers many in racemes; hypanthium conical or turbinate, armed with hooked bristles, the pistils 2; [tribe *Sanguisorbeae*]..... ***Agrimonia***
      - 5 Leaves silvery sericeous beneath; flowers solitary and axillary; hypanthium hemispheric, the pistils >5; [tribe *Potentilleae*]..... ***Potentilla anserina***
    - 4 Leaflets variable in size and shape, usually the terminal leaflet much larger than any of the lateral leaflets; terminal leaflet 3-20 cm wide; hypanthium either saucer-shaped or hemispheric to conical; pistils 5 or more.
      - 6 Pistils 5-15, in a circle on a saucer-shaped hypanthium, ripening into upright fruits that resemble follicles but are indehiscent; corolla white or pink; plant 10-20 dm tall; [tribe *Ulmarieae*]..... ***Filipendula***
      - 6 Pistils many, densely covering the hemispheric to conical hypanthium, ripening into achenes terminated by the persistent style; corolla white, cream, pale yellow, bright yellow, lavender, maroon, or purple; plant 2-10 dm tall; [tribe *Colurieae*] ..... ***Geum***

3 Principal leaves with leaflets of generally similar shape and size (the lowest leaflets may be smaller but of similar shape and toothing to the other leaflets).
7 Foliage and stems viscid-pubescent with brownish hairs; inflorescence a cyme; petals 5, cream-colored; [tribe *Potentilleae*] ..... ***Drymocallis***
7 Foliage not viscid-pubescent (if hairy, the hairs not brown or viscid); inflorescence of very many (>100) small flowers in a spike, the rachis hidden by the tightly packed flowers; petals 0; [tribe *Sanguisorbeae*].
8 Leaflets pinnatifid (each leaflet incised nearly to the midvein); stamens 2 or 4 per flower ..... ***Poteridium***
8 Leaflets toothed (the incisions not nearly to the midvein); stamens **either** 4 **or** 15-20 per flower (in well-developed, staminate flowers).
9 Leaflets 0.8-2 cm long; spike 1-2 cm long, 1-2× as long as broad, globose; stamens 15-20 per flower (in well-developed staminate flowers), the filaments 3-4 mm long; sepals green to pinkish-purple; [cultivated, occasionally escaped] ..... ***Poterium***
9 Leaflets 3-10 cm long; spike 6-30 cm long, elongate; stamens 4 per flower, the filaments 8-10 mm long; sepals white (sometimes fading greenish); [native] ..... ***Sanguisorba***
2 Principal (basal-most) leaves palmately compound, with 3-7 (-9) leaflets.
10 Principal leaves subsessile, 3-foliolate; fruit of follicles; leaves cauline; [tribe *Gillenieae*] ..... ***Gillenia***
10 Principal leaves distinctly petiolate, the petiole often longer than the leaflets, 3-7 (-9)-foliolate; fruit of achenes; leaves basal and cauline.
11 Principal leaves 5-7 (-9)-foliolate; [tribe *Potentilleae*] ..... ***Potentilla***
11 Principal leaves 3-foliolate.
12 Plants in flower.
13 Petals yellow.
14 Pistils 2-6; [tribe *Colurieae*] ..... ***Geum***
14 Pistils (10-) numerous; [tribe *Potentilleae*] ..... ***Potentilla***
13 Petals white (or slightly pinkish).
15 Calyx lobes not subtended by bractlets; [tribe *Rubeae*] ..... ***Rubus pubescens***
15 Calyx lobes subtended by 5 sepaloid bractlets; [tribe *Potentilleae*].
16 Leaves evenly serrate with many serrations; [widespread] ..... ***Fragaria***
16 Leaves with 3 (-5) teeth at the apex, otherwise entire; [Mountains] ..... ***Sibbaldia***
12 Plants in fruit (or sterile).
17 Leaflets entire, except for 3 (-5) teeth at the apex; [Mountains] ; [tribe *Potentilleae*] ..... ***Sibbaldia***
17 Leaflets evenly serrate or crenate, each well-developed leaflet with > 7 teeth.
18 Calyx lobes not subtended by bractlets.
19 Fruit an aggregate of dry, non-adherent achenes; leaflets obtuse at apex; [tribe *Colurieae*] ..... ***Geum***
19 Fruit an aggregate of fleshy, adherent drupelets; leaflets acuminate at apex; [tribe *Rubeae*] ..... ***Rubus pubescens***
18 Calyx lobes subtended by 5 sepaloid bractlets; [tribe *Potentilleae*].
20 Fruit an aggregate of dry achenes ..... ***Potentilla***
20 Fruit an accessory fruit of achenes borne on the surface of a fleshy, red receptacle.
21 Fresh fruit reddish inside; leaflets serrate, 2.5-12 cm long; sepaloid bracts narrowing to apex, untoothed ..... ***Fragaria***
21 Fresh fruit whitish inside; leaflets crenate, 2-4 cm long; sepaloid bracts widest at apex, 3-5-toothed ..... ***Potentilla indica***

Key C – Shrubs and trees with simple leaves

1 Ovary superior; fruit dehiscent (aggregate of follicles, or capsule) or indehiscent (drupe, or aggregate of drupelets).
2 Leaves opposite; [tribe *Kerrieae*] ..... ***Rhodotypos***
2 Leaves alternate.
3 Corolla yellow; stems arching, green; [tribe *Kerrieae*] ..... ***Kerria***
3 Corolla white to pink or rose; stems not arching and green.
4 Leaves large, > 10 cm wide, palmately lobed; fruit an aggregate of drupelets; [tribe *Rubeae*] ..... ***Rubus odoratus***
4 Leaves smaller, < 7 cm wide, not lobed, or pinnately lobed; fruit a drupe, a capsule, or an aggregate of follicles.
{Exochorda, Neillia, Neviusia, Physocarpus, Prunus, Rhodotypos, Spiraea}

1 Ovary inferior; fruit indehiscent (pome); [tribe *Pyreae*].
9
9
{Amelanchier, Aronia, Chaenomeles, Crataegus, Cydonia, Eriobotrya, Malus, Photinia, Pyracantha, Pyrus, [Rhaphiolepis]}

Key D – Shrubs and trees with compound leaves

1 Leaflets < 5 mm wide, entire; densely-branched shrub to 1 m tall; flowers yellow; [tribe *Potentilleae*] ..... ***Dasiphora***
1 Leaflets > 10 mm wide, serrate or crenate; shrubs, trees, or woody vines (see below); flowers white, pink, or purplish (rarely yellow in *Rosa*).
2 Leaves 1-pinnately compound, generally with > 11 leaflets; inflorescence a terminal panicle or corymb with numerous (> 100) flowers, the petals white and < 4 mm long; fruit a pome or follicle; upright tree or shrub with unarmed stems.
3 Inflorescence a panicle; fruit a follicle; shrub, to 2 m tall; [tribe *Sorbarieae*] ..... ***Sorbaria***
3 Inflorescence a corymb; fruit a pome; tree, generally > 2 m tall; [tribe *Pyreae*] ..... ***Sorbus***
2 Leaves palmately or 1-pinnately compound, generally with < 11 leaflets; inflorescences axillary or terminal panicles or corymbs with few (<15) flowers, the petals white, pink, or purplish (rarely yellow) and > 6 mm long; fruit a hip or aggregate of drupelets; arching or upright shrubs or climbing or sprawling woody vines, the stems usually armed with prickles.
4 Fruit a hip, developing from a globose to urceolate hypanthium, enclosing the ovaries and achenes, except for the apical orifice; leaflets usually acute to obtuse at the apex; leaflet margins crenulate or serrulate; [tribe *Roseae*] ..... ***Rosa***

4 Fruit an aggregate of drupelets, developing from a flattish or hemispheric hypanthium, with the ovaries and drupelets exposed; leaflets usually acuminate at the apex; leaflet margins serrate or doubly serrate; [tribe *Rubeae*]..... ***Rubus***

Agrimonia Linnaeus 1753 (Agrimony)

A genus of about 10-15 species, herbs, mainly north temperate. References: Kline & Sørensen in FNA (in press); Kline & Sørensen (2008)=Y; Robertson (1974)=Z; Kalkman in Kubitzki (2004). Key adapted from Y.

1 Stem and inflorescence axis lacking sessile or short-stalked glistening glands (but with spreading or ascending non-glandular hairs).
2 Stipules deeply incised, half-ovate; hirsute hairs of the stem 3 mm or longer; 0-1 pair minor leaflets between major; mature fruiting hypanthium as broad as long or broader; hypanthium ridges rarely with eglandular hairs..... ***A. microcarpa***
2 Stipules toothed, not deeply, half-ovate to half-round; hirsute hairs of the stem 3 mm or shorter; 0-3 or 0-1 pair minor leaflets between major; mature fruiting hypanthium as long as broad or longer; hypanthium ridges usually with hirsute eglandular hairs..... ***A. pubescens***
1 Stem and inflorescence with glistening glands, these **either** sessile, **or** short-stalked, **or** both (and also with spreading or ascending non-glandular hairs).
3 Glistening glands of the stem and inflorescence axis short stalked, or both short-stalked and sessile
4 Lower inflorescence rachis with mostly erect hirsute eglandular hairs ca. 2 mm long; minor leaflets rarely only one pair between all major leaflet pairs; roots merely fibrous..... ***A. gryposepala***
4 Lower inflorescence rachis with mostly ascending hirsute eglandular hairs less than 1 mm long; minor leaflets one pair between major leaflet pairs; roots with fusiform tubers..... ***A. rostellata***
3 Glistening glands of the stem and inflorescence axis only sessile.
5 Mid-cauline leaf with 5-7 major leaflets; stipule proximally incised or nearly entire..... ***A. striata***
5 Mid-cauline leaf with 7-13 major leaflets; stipule incised along entire margin.
6 Major leaflets obovate to elliptic, apex obtuse to acute; flowers mostly alternate along inflorescence axis; [Coastal Plain pinelands; e. SC south to c. peninsular FL and west to e. TX]..... ***A. incisa***
6 Major leaflets lanceolate to narrowly elliptic, apex acuminate to rarely acute; flowers mostly sub-opposite along inflorescence axis; [bottomlands, marshes; CT west to s. MI and SD, south to FL, TX, the West Indies and Mexico]..... ***A. parviflora***

Agrimonia gryposepala Wallroth, Common Agrimony. Mt (GA, NC, SC, VA, WV), Pd (DE, NC, SC, VA), Cp (DE): mesic forests, thickets, marshes, bogs, wet meadows, wet forests; common (uncommon in DE and WV, rare in GA). July-August; July-October. ME and ON west to MT, south to NJ, w. NC, e. TN, IN, and KS; also in CA and NM. [= RAB, C, F, FNAG, K, S, W, Y, Z]

Agrimonia incisa Torrey & A. Gray, Pineland Agrimony. Cp (FL, GA, NC?, SC): pinelands, disturbed areas associated with pinelands; rare. July-early September. E. SC south to c. peninsular FL and west to e. TX (also reported from NC, but no specimen has been seen). [= RAB, C, FNA, K, S, WH, Y, Z]

Agrimonia microcarpa Wallroth, Low Agrimony. Cp (FL, GA, NC, SC, VA), Pd (GA, NC, SC, VA), Mt (NC, SC, VA, WV): dry to moist forests and woodlands; uncommon (rare in WV). July-September; August-October. NJ south to n. FL, west to e. TX. [= C, F, FNA, G, K, S, W, WH, Y, Z; = *A. pubescens* Wallroth var. *microcarpa* (Wallroth) Ahles – RAB; > *A. microcarpa* – S; > *A. platycarpa* Wallroth – S]

Agrimonia parviflora Aiton, Southern Agrimony. Mt (GA, NC, SC, VA, WV), Pd (DE, GA, NC, SC, VA), Cp (DE, NC, SC, VA): marshes, bottomland forests, wet pastures; common (rare in DE Coastal Plain). July-September; July-October. CT west to s. MI and SD, south to FL, TX, the West Indies and Mexico. [= RAB, C, F, FNA, G, K, S, W, Y, Z]

Agrimonia pubescens Wallroth, Downy Agrimony. Mt (GA, NC, SC, VA, WV), Pd (DE, GA, NC, SC, VA), Cp (DE, GA, NC, SC, VA): dry to moist forests and woodlands; common (uncommon in DE). July-September; August-October. ME west to MI and SD, south to NC, GA, and OK. [= C, F, FNA, G, Y; = *A. pubescens* var. *pubescens* – RAB; > *A. pubescens* – K, S, W, Z; > *A. bicknellii* (Kearney) Rydberg – K, S, Z]

Agrimonia rostellata Wallroth, Woodland Agrimony. Mt (GA, NC, SC, VA, WV), Pd (DE, GA, NC, SC, VA), Cp (DE, FL, GA, NC, SC, VA): moist to wet forests and woodlands; common (uncommon in DE, rare in FL). July-August; July-October. CT west to IN and KS, south to SC, GA, Panhandle FL, LA, and OK. [= RAB, C, F, FNA, G, K, S, W, WH, Y, Z]

Agrimonia striata Michaux, Roadside Agrimony. Mt (NC*, WV), Pd (DE, GA*): rich forests, floodplains, fields; rare. NL (Newfoundland) west to BC, south to se. PA (Rhoads & Klein 1993), MD, DE, WV, KY, OK, NM, AZ, and Mexico; with scattered occurrences further south w. NC, GA, AL), where probably adventive. [= C, F, FNA, G, K, Y]

* ***Agrimonia eupatoria*** Linnaeus, Medicinal Agrimony. Mt (NC): fields and disturbed areas; rare, apparently naturalized, native of Eurasia. July-September. Introduced at scattered localities in ne. North America. [= C, F, FNA, G, K, Y, Z] {not yet keyed}

Amelanchier Medikus 1789
(Serviceberry, Sarvis, Shadbush, Juneberry, "May Cherry", "Currant")

A genus of about 20-40 species, shrubs and trees, north temperate. References: Campbell, Dibble, Frye, & Burgess in FNA (in press); Robertson (1974)=Z; Kalkman in Kubitzki (2004). Key adapted from FNA.

1 Inflorescences 1-3 (-4)-flowered; leaves imbricate in bud, bases cuneate; petioles 2-10 (-15) mm; [WV northward] ..... ***A. bartramiana***
1 Inflorescences usually 4-many-flowered; leaves conduplicate in bud, bases truncate or rounded to cordate (rarely cuneate); petioles usually at least 10 mm; [collectively widespread].

2 Margins of mature leaves with 2-6 teeth per cm; lateral leaf veins or their forks usually extending into teeth (as readily visible without magnification); ovary summit densely lanuginose.
3 Petals 6-10 mm; hypanthia campanulate ..... ***A. humilis***
3 Petals 11-18 mm; hypanthia saucer-shaped ..... ***A. sanguinea***
2 Margins of mature leaves with 4-6 (-10) teeth per cm; lateral leaf veins mostly becoming indistinct near margin and not entering teeth; ovary summit glabrous, sparsely pubescent, or densely lanuginose.
4 Ovary summit densely lanuginose; expanding leaves densely tomentose below.
5 Petals 2.6-5.8 mm long, 1-3 mm wide, sometimes andropetalous; plants cespitose; primary stems tending to be stiffly erect ..... ***A. nantucketensis***
5 Petals 6-10 mm long, 2.5-4 (-5) mm wide, not andropetalous; plants rhizomatous and in loosely scattered colonies; stems straggling-ascending ..... ***A. spicata***
4 Ovary summit glabrous or sparsely pubescent; expanding leaves glabrous to densely tomentose below.
6 Plants rhizomatous, shrubs 0.2-2.5 m tall; petals 2.6-7.7 mm long.
7 Petals 2.6-5.8 mm long, 1-3 mm wide, sometimes andropetalous; leaves elliptic to oblanceolate or oblong-elliptic; sepals ± recurving ..... ***A. nantucketensis***
7 Petals 5.9-7.7 mm long, 2.6-3.6 mm wide, rarely andropetalous and much narrower than sterile stamens; leaves elliptic or oval to oblong or often obovate; sepals spreading ..... ***A. obovalis***
6 Plants not rhizomatous, shrubs to 8 m tall or trees to 20 m tall; petals (6-) 8-20 mm long.
8 Inflorescences erect; petals 6-12 mm.
9 Young leaves at flowering less than half-expanded and unfolded, green, abaxially densely tomentose; proximal flowering pedicels 0.5-2 cm long; sepals erect or loosely spreading ..... ***A. canadensis***
9 Young leaves at flowering half-expanded or more and unfolding, often reddish, and sparsely pubescent or glabrescent abaxially; proximal flowering pedicels 1-1.5 cm long; sepals ascending to recurving ..... ***A. intermedia***
8 Inflorescences drooping; petals 10-20 mm long.
10 Young leaves at flowering folded, green or brownish, and densely tomentose below; proximal flowering pedicels 0.8-1.7 cm long; pomes maroon-purple, insipid ..... ***A. arborea***
10 Young leaves at flowering unfolding, reddish, and glabrous (or nearly so) below; proximal flowering pedicels 1.5-3 cm long; pomes blackish purple, sweet ..... ***A. laevis***

Amelanchier arborea (Michaux f.) Fernald, Downy Serviceberry. Mt (GA, NC, SC, VA, WV), Pd (DE, GA, NC, SC, VA), Cp (DE, FL, GA, NC, SC, VA): dry to moist forests; common (uncommon in NC and SC Coastal Plain). March-May; May-August. NS west to MN, south to Panhandle FL and e. TX. [= C, F, FNA, G, W; > *A. arborea* var. *arborea* – RAB, K, Z; > *A. arborea* var. *alabamensis* (Britton) G.N. Jones – K, Z; > *A. arborea* var. *austromontana* (W.W. Ashe) Ahles – RAB, K, Z; > *A. canadensis* – S, misapplied; > *A. alabamensis* Britton – S; < *A. arborea* – WH]

Amelanchier bartramiana (Tausch) M.J. Roemer, Oblong-fruited Serviceberry. Mt (WV): {habitat}; rare. May-August; July-September. NL (Labrador) west to MN, south to PA, WV, WI, and MI. [= C, F, FNA, G, K]

Amelanchier canadensis (Linnaeus) Medikus, Eastern Serviceberry. Cp (DE, GA, NC, SC, VA), Pd (DE, NC, SC, VA), Mt (VA): pocosins, acidic wetlands; common (uncommon in NC, SC, and VA Piedmont, rare in VA Mountains). March-April; May-June. NS and NB south to GA, mainly on the Coastal Plain. [= RAB, C, FNA, GW, K, W; > *A. canadensis* var. *canadensis* – F, Z; > *A. canadensis* var. *subintegra* Fernald – F, Z; < *A. canadensis* – G; = *A. oblongifolia* (Torrey & A. Gray) Roemer – S]

Amelanchier humilis Wiegand. Mt (WV): rocky, calcareous areas; rare. QC west to ND, south to montane MD, WV, WI, and MI. [= FNA, K; < *A. sanguinea* var. *sanguinea* – C, G; > *A. humilis* var. *humilis* – F]

Amelanchier intermedia Spach. Mt (NC), {VA}: moist to wet areas; rare. May-June; June-August. NL (Newfoundland) west to MN, south to VA, w. NC, and MI. [= F, FNA; < *A. canadensis* (Linnaeus) Medikus – C, G; = *A.* ×*intermedia* – K]

Amelanchier laevis Wiegand, Smooth Serviceberry. Mt (GA, MD, NC, SC, TN, VA, WV), Pd (DE, NC, VA), Cp (DE, MD, VA), Ip (AL, KY, TN): forests, balds; common (uncommon in DE, rare in Coastal Plain of VA, rare in Piedmont of NC). April-May; June-July. NS west to MN, south to e. VA, w. NC, w. SC, AL, w. TN, and IA. [= C, FNA, G, K, W, S, Z; = *A. arborea* var. *laevis* – RAB; > *A. laevis* var. *laevis* – F]

Amelanchier nantucketensis Bicknell, Nantucket Serviceberry. Pd (VA): rocky areas; rare. March-April; June. NS and ME south disjunctly to n. VA. In Potomac River Gorge, VA and MD (Chris Frye, pers. comm.). See Dibble & Campbell (1995) and Steury, Fleming, & Strong (2008). [= F, FNA, K; *? A. canadensis* × *spicata* – C]

Amelanchier obovalis (Michaux) Ashe, Coastal Plain Serviceberry. Cp (DE, GA, NC, SC, VA), Pd (SC): pocosins, pine savannas; common (rare in SC Piedmont). March-April; May-June. NJ, DE, and PA south to GA. [= RAB, C, F, FNA, G, GW, K, Z]

Amelanchier sanguinea (Pursh) A.P. de Candolle, Roundleaf Serviceberry, New England Serviceberry. Mt (GA, NC, VA, WV), Pd (VA), Cp (VA): uncommon (rare in GA and NC Mountains, rare in VA Piedmont, rare in VA Coastal Plain). April-May; May-June. ME west to MN, south to w. NC, TN, n. AL, and IA. [= RAB, F, FNA, S, W, Z; = *A. sanguinea* var. *sanguinea* – C, G, K]

Amelanchier spicata (Lamarck) K. Koch, Dwarf Serviceberry. Cp (NC, SC, VA), Pd (NC, VA), Mt (VA, WV), {GA}: dry, acidic, rocky sites; uncommon. March-April; May-June. NL (Newfoundland) west to ND, south to w. NC, w. SC, GA, AL, WI, and MI. [= RAB, C, FNA, G; = *A. stolonifera* Wiegand – F, K, S, W, Z]

Aphanes Linnaeus 1753 (Parsley-piert)

A genus of about 20 species, herbs, of tropical and temperate Old World. *Aphanes* has usually been accepted by Europeans as distinct from *Alchemilla*, but Kalkman (in Kubitzki 2004) retains it (with some doubt) in *Alchemilla*, as a subgenus and Eriksson

et al. (2003) and Gehrke et al. (2008) include it in *Alchemilla* based on molecular evidence. *Aphanes* appears to be monophyletic and is morphologically distinctive; Gehrke et al. (2008) prefer a broad circumscripotion of *Alchemilla* to naming an additional monophyletic clade of African species as a separate genus. References: McNeill & Ertter in FNA (in press); Robertson (1974)=Z; Kalkman in Kubitzki (2004); Eriksson et al. (2003).

1 Fruiting hypanthium > 2 mm long; leaf blades 7-10 mm long and wide ..... ***A. arvensis***
1 Fruiting hypanthium < 2 mm long; leaf blades 3-5 mm long and wide ..... ***A. australis***

* ***Aphanes arvensis*** Linnaeus. Cp (DE) disturbed areas; rare, native of Europe. April-June. Also reported for SC and TN by Kartesz (1999), but the only documentation consists of generalized range maps published in Hultén & Fries (1986); rejected as a component of those state's flora without additional documentation. [= C, FNA, K; = ***Alchemilla arvensis*** (Linnaeus) Scopoli – F, G]

* ***Aphanes australis*** Rydberg, Parsley-piert. Pd (GA, NC, SC, VA), Cp (DE, FL, GA, NC, SC, VA), Mt (NC, SC, VA, WV): lawns, fields, pastures, roadsides; common (uncommon in Piedmont of VA and Mountains of NC and VA, rare in DE, FL, and WV), native of Europe. Late March-May. This plant is inconspicuous and often overlooked. [= FNA, S; = *Aphanes microcarpa* (Boissier & Reuter) Rothmaler – C, K, WH, misapplied; = *Alchemilla microcarpa* Boissier & Reuter – RAB, F, G, W, Z, misapplied; = *Aphanes inexspectatus* W. Lippert]

Aronia Medikus 1789 (Chokeberry)

A genus of 3 species, of e. North America (south into Central America). *Aronia* has sometimes been treated as a component of *Sorbus* or *Pyrus*. More recently, Robertson et al. (1991) have included *Aronia* in *Photinia*. Kalkman in Kubitzki (2004) agrees that *Aronia* and *Photinia* should be combined, but points out that *Aronia* is the older name and therefore must be used for the combined genus. Guo et al. (2011) separate *Photinia*, *Aronia*, and *Pourthiaea*. References: Guo et al. (2011)=V; Pankhurst in FNA (in press); Hardin (1973)=Y; Robertson (1974)=Z; Robertson et al. 1991=X; Kalkman in Kubitzki (2004).

Identification notes: All our species of *Aronia* can be distinguished from other shrubs in our flora by the presence of several dark (usually purplish-black) trichomes on the upper surface of the midrib, mostly toward the base of the leaf.

1 Lower surfaces of leaves, twigs, and inflorescence rachis glabrous; fruit black ..... ***A. melanocarpa***
1 Lower surfaces of leaves, twigs, and inflorescence rachis pubescent; fruit bright red or dark purple.
  2 Fruit bright red; leaves densely pubescent beneath ..... ***A. arbutifolia***
  2 Fruit dark purple; leaves sparsely pubescent beneath ..... ***A. prunifolia***

Aronia arbutifolia (Linnaeus) Persoon, Red Chokeberry. Cp (DE, FL, GA, NC, SC, VA), Mt (GA, NC, SC, VA, WV), Pd (DE, GA, NC, SC, VA): bogs, pocosins, wet savannas, swamps, other wet habitats; common. March-May; September-November. NL (Newfoundland) south to c. peninsular FL and west to TX, mainly in the Coastal Plain, but extending inland in the south to WV and KY. [= C, FNA, G, GW, S, V, W; = *Sorbus arbutifolia* (Linnaeus) Heynhold var. *arbutifolia* – RAB; = *Pyrus arbutifolia* (Linnaeus) Linnaeus f. – F, Z; = *Photinia pyrifolia* (Lamarck) K. Robertson & J.B. Phipps – K, WH, WV, X]

Aronia melanocarpa (Michaux) Elliott, Black Chokeberry. Mt (GA, NC, SC, VA, WV), Pd (DE, NC, VA), Cp (VA): balds, forests, and openings and exposed rock outcrops at high elevations, bogs in the Mountains; uncommon (rare in Piedmont). May-June; August-September. Widespread in ne. North America, extending south to n. GA, n. AL, and MO. [= C, FNA, G, GW, S, V; = *Sorbus melanocarpa* (Michaux) Heynhold – RAB; = *Pyrus melanocarpa* (Michaux) Willdenow – F, WV, Z; < *A. melanocarpa* – W (also see *A. prunifolia*); = *Photinia melanocarpa* (Michaux) J.B. Phipps – K, X]

Aronia prunifolia (Marshall) Rehder, Purple Chokeberry. Pd (DE?, NC, VA), Mt (NC, VA, WV), Cp (DE?, VA): balds, bogs, seepages, swamp forests; uncommon, rare south of VA (NC Watch List). April-May; September-October. Widespread but local in ne. North America, south to NC, FL?, and OH. While apparently originating as a hybrid between our other two species, *A. prunifolia* exists in populations independent of the two parent species, apparently reproducing successfully. It seems best to treat a now independent lineage such as this as a separate taxon. [= C, G, GW, V; = *Sorbus arbutifolia* var. *atropurpurea* (Britton) Schneider – RAB; = *Aronia* ×*floribunda* (Marshall) Rehder – FNA; = *Pyrus floribunda* Lindley – F, WV, Z; = *Aronia atropurpurea* Britton – S; < *A. melanocarpa* – W; = *Photinia floribunda* (Lindley) J.B. Phipps – K, X]

Aruncus Linnaeus 1758 (Goat's-beard)

A genus of 2-3 species, perennial herbs, of temperate North America and Europe. References: Mellichamp in FNA (in press); Robertson (1974)=Z; Kalkman in Kubitzki (2004).

Identification notes: *Aruncus dioicus* can be distinguished from the superficially closely similar *Astilbe biternata* by the following characteristics: trichomes of foliage not glandular (vs. glandular in *Astilbe*), stamens 20 (vs. 10), carpels 3-4 (vs. 2), seeds < 1.5-2 mm long (vs. ca. 4 mm long), terminal leaflets usually unlobed (vs. terminal leaflets usually trilobed).

1 Follicles 2.5-3.5 mm long ..... ***[A. sylvester]***
1 Follicles 1.5-2 mm long.
  2 Follicles semi-ovoid, strongly convex on the back, about 1/2 as thick (measured radially) as long; leaves somewhat lustrous, the lower surface glabrous to sparsely pubescent ..... ***A. dioicus*** *var.* ***dioicus***
  2 Follicles nearly cylindric, about 1/3 as thick (measured radially) as long; leaves dull, the lower surface pubescent .....

Aruncus dioicus (Walter) Fernald *var.* ***dioicus***, Eastern Goat's-beard. Mt (GA, NC, SC, VA, WV), Pd (GA, NC, VA), Cp (VA): moist, nutrient-rich forests and woodland borders; common. May-June; June-September. NY (?) and PA west to IN, south to NC, SC, GA, and AL. [= C, F, FNA, K, Z; < *A. dioicus* – RAB, W; = *A. allegheniensis* Rydberg – S]

Aruncus dioicus (Walter) Fernald *var.* ***pubescens*** (Rydberg) Fernald, Midwestern Goat's-beard. Mt (WV): moist, nutrient-rich forests and woodland borders?; rare. May-June; June-September. W. VA, KY, and IL west to IA, south to TN, AR, and OK. The validity of this variety and its attribution to our area (by G, K, and S) need further evaluation. Robertson (1974) states that the "two varieties intergrade completely, and it is questionable whether they should be maintained." [= C, F, FNA, K, Z; < *A. dioicus* – W; = *A. pubescens* Rydberg – S]

* *Aruncus sylvester* Kosteletzky ex Maximowicz is attributed to our area by Small (1933). This European species is occasionally cultivated in e. North America. [= C, G; = *A. dioicus* var. *vulgaris* (Maximowicz) Hara – FNA, K; = *A. aruncus* (Linnaeus) Karsten – S]

Chaenomeles Lindley 1821 (Flowering Quince)

A genus of 3-4 species, shrubs, of montane, temperate e. Asia. References: Catling & Mitrow in FNA (in press); Kalkman in Kubitzki (2004).

* ***Chaenomeles speciosa*** (Sweet) Nakai, Flowering Quince. Pd (NC), Cp (VA), Mt (WV): frequently persisting and rarely spreading from horticultural plantings to suburban woodlands; rare, native of China. January-April. The "fruiting" or Common Quince, *Cydonia oblonga* P. Miller, native of the Caucasus, is widely cultivated in Europe and formerly in e. North America. It has fallen out of favor, and is now rarely cultivated in our area. [= C, FNA, K]

Crataegus Linnaeus 1753 (Hawthorn, Haw, Thornapple)
(contributed by R. Lance)

A genus of 100-500 species, shrubs and small trees, north temperate and Central America, most in e. North America. References: Lance (in prep.)=X; Phipps (1988)=Z; Beadle in Small (1913)=Q; Phipps, O'Kennon, & Lance (2003)= V ; Phipps (1998)=Y; Phipps, Lance, & Dvorsky (2006)=U; Phipps, O'Kennon, & Dvorsky (2006)= N; Lance (1995); Kalkman in Kubitzki (2004).

Identification notes: SUBSTANTIAL CHANGES TO THIS TREATMENT ARE PENDING. All references to leaves and petioles pertain to foliage on short shoots (floreal shoots), unless otherwise specified.

1 Leaf bases cordate, truncate, rounded, or very abruptly contracted from a rounded base ..... **Key A**
1 Leaf base acute to cuneate.
  2 Leaves conspicuously glandular on petiole and teeth, especially when young; twigs and branchlets geniculate ..... **Key B**
  2 Leaves eglandular, or if glandular then twigs relatively straight, not conspicuously geniculate ..... **Key C**

Key A – hawthorns with leaf bases cordate, truncate, rounded, or very abruptly contracted from a rounded base

1 Primary lateral veins of lobed leaves run to sinuses of lobes, as well as to points of lobes.
  2 Leaves thin, dull, hairy at least on petiole, deeply laciniate; fruit oblong ..... ***C. marshallii***
  2 Leaves subcoriaceous, glossy, glabrous, often 3-lobed; fruit globose ..... ***C. phaenopyrum***
1 Primary lateral veins of lobed leaves run only to lobe points.
  3 Leaves small, most < 3 cm; petioles mostly < 1 cm long, conspicuously glandular and twigs geniculate.
    4 Leaves broadly obovate on floreal shoots, 1.5-3 cm long, tomentose, serrations acute; terminal shoot leaves suborbicular, truncate at base ..... ***C. dispar***
    4 Leaves often suborbicular, < 2 cm long, glabrate to pubescent, serrations blunt ..... ***C. lepida***
  3 Leaves and petioles longer, glandular or not, but twigs not geniculate.
    5 Leaf blades on terminal shoots often > 9 cm long.
      6 Petiole eglandular, pubescent or tomentose; leaf veins distinct on adaxial surface, slightly sunken ..... ***C. mollis***
      6 Petiole glandular, sparsely hairy or glabrous; leaf veins not as conspicuous
        7 Leaf blades longer than wide; calyx lobes evenly serrate ..... ***C. coccinea***
        7 Leaf blades often as wide as long; calyx lobes deeply and irregularly serrate ..... ***C. dilatata***
    5 Leaf blades on terminal shoots rarely > 8 cm long.
      8 Leaf shape predominately deltoid, base truncate or very abruptly contracted into petiole.
        9 Lobe tips acuminate, often reflexed; young leaves scabrate adaxially; leaves thin.
          10 Stamens 5 to 10 ..... ***C. macrosperma***
          10 Stamens 15 to 20 ..... ***C. schuettei***
        9 Lobe tips acute or obtuse, not reflexed; young leaves hairy or glabrous; leaves firm.
          11 Fruit calyx sessile; leaves may bear hairs when young; stamens usually 10 ..... ***C. iracunda***
          11 Fruit calyx elevated; leaves glabrous; stamens usually 20 ..... ***C. pruinosa***
      8 Leaf shape predominately ovate or broadly ovate, base rounded or abruptly narrowed
        12 Leaves pubescent throughout; petioles conspicuously glandular; terminal shoot leaves very shallowly lobed ..... ***C. triflora***

12 Leaves sparsely pubescent abaxially, or glabrous; petioles slightly glandular or eglandular; terminal shoot leaves distinctly lobed.
13 Petioles eglandular; fruit calyx sessile.
14 Leaves thin, dull yellow-green; hairs scattered along veins of abaxial side, esp. when young; fruit 10-15mm diameter ..... ***C. aemula***
14 Leaves firm, glossy or bright green, with hair tufts in abaxial main vein axils; fruit usually < 10 mm diameter..... ***C. viridis***
13 Petioles glandular; fruit calyx elevated.
15 Stamens 5 to 10.
16 Anthers white or yellow; sepals glandular or toothed beyond middle ..... ***C. boyntonii***
16 Anthers purple; sepals wholly glandular-serrate..... ***C. buckleyi***
15 Stamens 15 to 20.
17 Leaves mostly unlobed on floreal shoots, shallowly lobed (1/4 – 1/3 to midrib) on terminal shoots ..... ***C. mendosa***
17 Leaves shallowly lobed on floreal shoots, lobed 1/3-1/2 to midrib on terminal shoots..... ***C. pulcherrima***

Key B – hawthorns with acute to cuneate leaf bases; leaves conspicuously glandular on petiole and teeth; and twigs and branchlets geniculate

1 Leaves mostly widely elliptic or broadly obovate, base acute to short-cuneate.
2 Leaves sharply-toothed and shallowly lobed.
3 Leaves sparsely hairy to glabrous ..... ***C. alleghaniensis***
3 Leaves tomentose ..... ***C. dispar***
2 Leaves with short, blunt teeth, mostly unlobed.
4 Leaves < 2 cm long; twigs very slender; thorns mostly < 2 cm ..... ***C. lepida***
4 Leaves > 2 cm long; twigs stiff; thorns > 2 cm.
5 Fruit yellow..... ***C. flava***
5 Fruit red.
6 Branches mostly ascending and crooked ..... ***C. aprica***
6 Branches recurved or drooping..... ***C. visenda***
1 Leaves mostly obovate or spatulate, base cuneate to attenuate.
7 Leaves and pedicels glabrous; branches slender, strongly weeping ..... ***C. lacrimata***
7 Leaves and pedicels variously hairy, at least when young; branches drooping or recurved.
8 Leaves obscurely toothed to entire on margin, especially lower half of blade ..... ***C. lassa***
8 Leaves toothed along most of margin.
9 Leaf base attenuate or long-cuneate; apex 3-lobed or with 3 distinct points.
10 Fruit small, usually < 8mm, often with calyx elevated ..... ***C. anisophylla***
10 Fruit usually 10 mm or more, calyx sessile ..... ***C. senta***
9 Leaf base cuneate; apex short-pointed; rarely lobed on floral shoots.
11 Leaf teeth acute; twigs moderately slender, branchlets rigid ..... ***C. alabamensis***
11 Leaf teeth blunt, glandular; twigs slender, branchlets flexuose ..... ***C. munda***

Key C – Leaves eglandular, or if glandular then twigs relatively straight, not conspicuously geniculate

1 Leaves spatulate or oblanceolate, < 13 mm wide; petiole winged to base; pyrenes < 4 mm long ..... ***C. spathulata***
1 Leaves not as above, or pyrenes > 4 mm long.
2 Leaves with hair tufts in abaxial main vein axils; [typically of wet or floodplain habitats].
3 Inflorescence simple, 1 to 5-flowered; fruit > 1 cm diameter, mature in late spring..... ***C. aestivalis***
3 Inflorescence compound, 5 to 20-flowered; fruit usually < 1 cm, mature in autumn.
4 Petiole 5-12 mm long; terminal shoot leaves rarely lobed..... ***C. crus-galli***
4 Petiole > 15 mm long; terminal shoot leaves rarely unlobed..... ***C. viridis***
2 Leaves glabrous or with hairs scattered, not in tufts; [typically of upland habitats].
5 Pyrenes of fruit channeled or pitted on inner side.
6 Leaves thin, dull yellow-green, usually pubescent at least abaxially; pedicels tomentose ..... ***C. calpodendron***
6 Leaves firm, dark green or lustrous, glabrous or slightly hairy abaxially, veins conspicuously impressed and reticulate adaxially; pedicels glabrous or pubescent..... ***C. succulenta***
5 Pyrenes of fruit plane on inner side.
7 Leaves mostly < 3 cm long; calyx lobes foliaceous, deeply toothed; spines slender..... ***C. uniflora***
7 Leaves commonly > 3 cm long and not with above combination of characters.
8 Thorns short (< 2 cm), or spinose spur shoots present; fruit black; leaves with reticulate veins adaxially; main lateral veins run to sinuses and lobe tips in lobed leaves..... ***C. brachyacantha***
8 Thorns usually > 2 cm long; fruit not black; leaves not as above.
9 Petioles eglandular.
10 Leaves widely obovate, with rounded lobes and blunt teeth; calyx lobes broadly triangular ..... ***C. margarettae***
10 Leaves not widely obovate; lobes acute or lacking; calyx lobes elongate.
11 Leaves mostly ovate or broadly elliptic.
12 Petiole and leaf underside glabrous or sparsely hairy ..... ***C. aemula***
12 Petiole and leaf underside pubescent to tomentose ..... ***C. mollis***
11 Leaves mostly obovate or oblong-elliptic.
13 Leaf veins impressed adaxially, prominent abaxially; leaves dull green.

14 Leaves pubescent abaxially; branches dark gray; fruit usually <12 mm; calyx and fruit stem hairy ..... ***C. collina***
14 Leaves sparsely hairy to glabrous abaxially after maturity; branches ashy gray; fruit 12-22 mm; calyx and fruit stem glabrous..... ***C. punctata***
13 Leaf veins obscure; leaves lustrous.
15 Leaves, petioles, pedicels hairy..... ***C. berberifolia***
15 Leaves, petioles, pedicels glabrous ..... ***C. crus-galli***
9 Petioles glandular (3 or more glands visible).
16 Leaves distinctly hairy or pubescent abaxially.
17 Leaves lobed 1/3- 2/3 to midrib on terminal shoots; fruit calyx elevated ..... ***C. intricata***
17 Leaves shallowly lobed to unlobed on terminal shoots; fruit calyx sessile.
18 Leaves thin; inflorescence simple, 3 to 5-flowered; stamens usually 30 or more ..... ***C. triflora***
18 Leaves firm; inflorescence compound, > 5-flowered; stamens 20 or fewer.
19 Leaves shallowly lobed on terminal shoots, usually > 5cm wide..... ***C. harbisonii***
19 Leaves unlobed, most < 5 cm wide.
20 Leaf veins slightly impressed adaxially; fruit calyx deeply glandular-serrate; petiole conspicuously glandular ..... ***C. ashei***
20 Leaf veins distinctly impressed adaxially; fruit calyx remotely serrate to entire; petiole sparsely glandular..... ***C. collina***
16 Leaves sparsely hairy to glabrous.
21 Stamens 5-10 ..... ***C. intricata***
21 Stamens 15-20.
22 Leaves shallowly lobed on terminal shoots (1/4-1/3 to midrib), usually unlobed on floreal shoots..... ***C. mendosa***
22 Leaves shallowly to moderately lobed on all shoots.
23 Leaves mostly ovate-lanceolate ..... ***C. sargentii***
23 Leaves ovate or widely ovate.
24 Twigs short; petiole often winged ½ its length; fruit often 10 mm or more in diameter..... ***C. pallens***
24 Twigs elongate; petiole winged 1/3 or less of length; fruit usually < 10 mm in diameter ..... ***C. pulcherrima***

Crataegus aemula Beadle, Rome Hawthorn. Cp, Pd (GA, SC): upland hardwood and pine-hardwood forests, over sandstone, calcareous rock or circumneutral clay soils; uncommon (but may be locally abundant). April; September. Nw. GA and ne. AL principally, disjunct in McCormick Co, SC. Related to *C. iracunda* Beadle, but foliage of *C. aemula* differs in having frequent rounded bases, thin texture, yellow-green coloration. Fruits are lustrous light red, 12-18 mm diameter. *C. aemula* has been shown to be triploid, possibly apomictic, producing a high percentage of fertile seed with little seedling variation. The possibility of its being of hybrid origin between *C. iracunda* Beadle and *C. collina* Chapman has been suggested. [= K, Q, X; < *C. macrosperma* – S]

Crataegus aestivalis (Walter)Torrey & A. Gray, Mayhaw, Eastern Mayhaw. Cp (GA, NC, SC): swamp forests, generally where flooded for much of the year, often flowering and fruiting while standing in water, often associated with *Taxodium distichum, Nyssa aquatica, Nyssa biflora*, and *Planera aquatica*; uncommon but sometimes locally abundant; occasionally growing as groves or stands in 'mayhaw flats'. March-April; June-July. Se. NC south to n. FL and se. AL. A historic record of *C. aestivalis* in VA appears to be based on a single specimen collected 22 July 1934 by M.L. Fernald & B. Long, in Princess Anne County; this specimen is actually *C. crus-galli*. A related species, *C. opaca* Hooker & Arnott, occurs west of the range of *C. aestivalis*, in similar habitats. Plants with copious growth of reddish pubescence on the leaf undersides are included under *C. rufula*. The fruits of all three species are traditionally gathered for preserves, pies, and jelly. See Phipps (1988) for extensive additional discussion of *C. aestivalis* and relatives. [= RAB, K, X, Z; < *C. aestivalis* – S]

Crataegus alabamensis Beadle, Alabama Hawthorn. Pd (GA, SC), Cp (GA, NC, SC): sandhills, upland pine and pine-oak forests, rocky woodlands, xeric or subxeric habitats with sandy or well-drained clay soils; uncommon. April; August-September. E. NC, c. SC south to n. FL, west to c. MS. Often reaching treelike proportions (4-8 m tall, trunk 10-30 cm diameter). Some local genotypes may produce palatable fruit to 22 mm in diameter. The typical form of *C. alabamensis* has pubescent foliage and tomentose inflorescence parts, but the similar *C. florens*, *C. attrita*, and *C. teres* are progressively more glabrate, in this order; they may be interpreted as separate species as in Phipps & Dvorsky (2008). [= X; < *C. flava* Aiton – RAB, K, S; > *C. adunca* Beadle - Q; > *C. attrita* Beadle – Q; > *C. florens* Beadle - Q; > *C. fortis* Beadle - Q; > *C. teres* Beadle – Q]

Crataegus alleghaniensis Beadle, Allegheny Hawthorn. Mt, Pd (GA, NC, SC), Cp (GA, SC); upland pine and pine-oak forests, disturbed woodlands, rocky bluffs and slopes; uncommon. April; August-September. W. and sc. NC to c. SC, c. GA, west to c. AL, ne. MS, e. TN. A variable species if broadly considered, displaying leaf and flower characters which suggest intermediacy between members of series *Intricatae* and *Apricae*. The stamen counts can vary from 10 in typical *C. allegheniensis*, 12-17 in *C. ignava* and *C. extraria*, and 20 in *C. cullasagensis*, *C. agrestina*, and *C. frugiferans*. A narrower view might hold some of this synonomy to specific levels. [= X; < *C. flava* Aiton – RAB; > *C. allagheniensis* – Q; > *C. ignava* Beadle – K, Q; >*C. extraria* Beadle – K, Q; > *C. impar* Beadle – K,Q; > *C. cullasagensis* Ashe – Q; > *C. agrestina* Beadle – Q; > *C. mira* Beadle – Q; > *C. frugiferans* Beadle (= *C. rigens* Beadle) – Q]

Crataegus anisophylla Beadle. Cp (GA): upland pine forests, pine-oak scrub, sandhills, disturbed woodlands, roadsides, abandoned fields; uncommon. Late March-April; late August-September. Se GA to c. peninsular FL, west to s. AL. This is a poorly understood taxon among the group of hawthorns often categorized under *C. flava* Aiton in many earlier floral treatments. Related to *C. lassa* Beadle. [= X; > *C. anisophylla* – Q; > *C. viaria* Beadle – Q; > *C. cirrata* Beadle – Q; > *C. versuta* Beadle – K, Q; > *C. resima* Beadle – K, Q < *C. flava* – S]

Crataegus aprica Beadle, Sunny Hawthorn Mtn, Pd, Cp (GA, NC, SC) {VA?}: upland pine forests, pine-oak forests, mixed hardwood forests over rocky or sandy substrates, abandoned fields, roadsides; common. Late March-April; September. NC south to s. GA and n. Fl, west to e. AL and e. TN. This species is most common in the southern Appalachians of NC andSC

and extending to the sandhills region of SC. The 10 stamens separate this species from the closely related and similar *C. sororia*, and both these taxa have long been included under the collective name of *C. flava* Aiton in many earlier treatments (see discussion of *C. flava*) [=W, X, Phipps 2007; < *C. flava* Aiton – RAB; > *C. aprica* – Q; > *C. shallotte* Ashe]

Crataegus berberifolia Torrey & Gray *var.* ***berberifolia***, Barberry Hawthorn. Pd, Cp (GA, NC, SC, VA): mixed hardwood and pine forests of uplands, usually in subxeric to xeric habitats, especially over basic to calcareous soils; common. April-May; August-October. C. VA south to n. FL, west to TX, MO; most common in LA, s. AR. Closely related to *C. crus-galli* and differing primarily from that species by the consistent pubescence or stiff hairs on foliage, twigs, floral and fruit parts. 10-stamened forms of the normally 20-stamened *C. berberifolia* have been called *C. engelmannii* Sargent, which see below. [= C, K, Q, S, X]

Crataegus berberifolia Torrey & Gray *var.* ***engelmannii*** (Sargent) Eggleston Pd, Cp (GA, NC, SC): mixed hardwood and pine forests of uplands, usually in subxeric to xeric habitats, especially over basic to calcareous soils; common. April-May; August-October. Similar to the typical variety in most respects except for the presence of 10 stamens. Appears most common in MO and AR, mixed sporadically with the species eastward to e. TN, c. NC. [> *C. engelmannii* Sargent - Q; > *C. berberifolia* var. *engelmannii* (Sargent) Eggleston; > *C. torva* Beadle - Q; > *C. sinistra* Beadle - Q]

Crataegus boyntonii Beadle, Boynton Hawthorn. Mt, Pd (GA, NC, SC, VA}: upland forest understories, pastures, rock outcrops, shrubby thickets; uncommon. W. VA south to c. GA, west to n. MS, n. to IL, KY, and WV. April-May; September-October. Related to *C. intricata* Lange, from which *C. boyntonii* differs chiefly in having an abundance of broadly ovate to deltoid leaves 5-8 cm long and 3-5 cm wide, more robust thorns, and more treelike habit (4-6 m tall, less prone to develop root suckering and multiple stems). [= Q, X; < *C. flabellata* – RAB; = *C. boyntoni* – F, G, orthographic variant; < *C. intricata* Lange – C, K]

Crataegus brachyacantha Sargent & Engelmann, Blueberry Hawthorn. Cp (GA): open pinelands; rare (GA Special Concern). April; September. In sw. GA, one historic record, disjunct from a main range further west (primarily LA and e. TX). The only eastern hawthorn bearing black fruit, appearing blue due to an exterior waxy bloom. [= K, Q, S, Y, X]

Crataegus buckleyi Beadle. Buckley Hawthorn. Mt, Pd (GA, NC, SC): upland pine and hardwood forests, rock outcrops; uncommon. April-May; August-October. W. NC, w. SC, n. GA west to n. AL, north to e. TN (and perhaps WV and VA). Most similar to *C. boyntonii* Beadle, but with purplish anthers, more glandular-serrate calyx lobes, russet fruit, and smaller leaves (3-6 cm long × 2-4 cm wide). [= Q, X; < *C. flabellata* –RAB; < *C. intricata* Lange – C, K]

Crataegus calpodendron (Ehrhart) Medikus, Pear Hawthorn. Mt (VA, NC), Pd (GA, NC, SC): mixed hardwood forests, open slopes, wooded ravines, streamsides, especially over basic or calcareous rocks; uncommon. May-early June; September-October. From a generally northern range, the southern limits extend down the Appalachian region and adjacent Piedmont of VA to n. GA, c. AL, n. MS and AR. Often found as a solitary specimen, or in very small local populations. One of the latest hawthorns in our area to flower. Fruit production appears scant in its southern range. [= RAB, C, K, S, W, X; > *C. calpodendron* var. *calpodendron* – F, G; > *C. calpodendron* var. *microcarpa* (Chapman) Palmer – F, G; > *C. calpodendron* var. *globosa* (Sargent) Palmer – F, G; > *C. chapmanii* Beadle – Q; > *C. tomentosa* Du Roi]

Crataegus coccinea Linnaeus, Scarlet Hawthorn. Mt, Pd (NC, VA): deciduous forest understories, pastures, upland thickets; rare. May; October. Distributed southward along the Appalachian Plateau from a predominately northern range. The combination of large, pubescent leaves (9-12 cm long) on terminal shoots, evenly toothed calyx lobes, and 5-10 stamens per flower are distinctive. *C. coccinea* may attain treelike proportions, to 10 m tall. [= RAB, C, X; > *C. pennsylvanica* W.W. Ashe – F, G; > *C. pedicellata* Sargent – K, W]

Crataegus collina Chapman, Hillside Hawthorn. Mt (GA, NC, SC, VA), Pd (GA, NC, SC): hillside forests and young woodlands, especially over calcareous rocks; uncommon. March-April; August-October. Sw. VA west to KS, south to c. GA, s. AL, c. MS, AR and OK Closely allied to *C. punctata* Jacquin, but more widespread in range and habitat tolerance across the Southeast. The fruits rarely reach 12 mm in diameter, whereas those of *C. punctata* often range from 12-23 mm. *C. collina* occupies sub-xeric uplands in the Appalachian Region and is tolerant of lowland floodplains in GA, AL, TN. It is one of the earliest hawthorns to flower in spring. Foliage may be conspicuously pubescent in some local genotypes. [= S, W, X; > *C. collina* var. *collina* – F, G; > *C. collina* var. *collicola* (W.W. Ashe) – F, G; > *C. collina* – Q; > *C. ingens* Beadle – Q; > *C. amnicola* Beadle – Q; < *C. punctata* Jacquin – RAB, C]

Crataegus colonica Beadle. Cp, Pd (GA,NC, SC): scrublands, roadsides, xeric woodlands with sandy soils; uncommon. Late March-April; August-September. Se. & sc. NC south and west to e. GA, perhaps to n. FL. A poorly understood taxon, appearing closely related to *C. integra* Beadle, but with smaller flowers and fruit and an abundance of long thorns (2-5 cm). The thorniness of the plants combined with the obovate, nearly entire-margined leaves and pyriform-shaped fruit is usually diagnostic. A similarly thorny entity but with leaves distinctly serrated is *C. pexa* Beadle (see *C. munda* Beadle).

Crataegus craytonii Beadle, Crayton Hawthorn. Mt (GA, NC, VA): wooded slopes, roadsides, streamsides; rare. Late April-May; September. Sw. VA, w. NC to n. GA, n. AL, possibly e. TN. A poorly known taxon, appearing most closely related to *C. intricata* Lange, but unique in its combination of 20 stamens and distinctly pubescent foliage and inflorescence parts. Alternatively, this hawthorn could be assigned varietal status within *C. intricata*, but it has not been published as such in any floral treatments. [= Q]

Crataegus crus-galli Linnaeus *var.* ***crus-galli***, Cockspur Hawthorn. Mt, Pd, Cp (GA, NC, SC, VA): pastures, thickets, disturbed woodlands and forests, fencerows; common. April-May; September-October. Ranges throughout the eastern US, except c. and s. peninsular FL. *C. crus-galli* sometimes forms extensive local colonies and likely apomictic clonal populations. Variation occurring in this wide-ranging species, mostly in size and shape of leaves and minor flower and fruit characters, has accounted for an extensive synonymy, with most earlier names applied by Charles Sargent. Plants having 3 to 5 styles and as many pyrenes have been alternatively placed under *C. reverchonii* Sargent, these also exhibiting a tendency to have smaller, more often suborbicular leaves (see *C. reverchonii*). Typical forms of *C. crus-galli* tend to have 1 to 2 styles and pyrenes, and with a range of leaf shapes from narrow to nearly suborbiculate. [= C, W, X; < *C. crus-galli* – RAB; > *C. crus-galli* – K; > *C. macra*

Beadle - Q; > *C. regalis* Beadle var. *regalis* – F; > *C. algens* Beadle – Q; > *C. arborea* Beadle – K; > *C. canbyi* Sargent; > *C. crus-galli* var. *crus-galli* – F, G; > *C. crus-galli* var. *exigua* (Sargent) Eggleston – G; > *C. crus-galli* var. *macra* (Beadle) Palmer – F, G;; ? *C. crus-galli* – S]

Crataegus crus-galli Linnaus *var.* ***pyracanthifolia*** (Aiton) Sargent. Cp (GA, NC, SC, VA): bottomland forests, swamp borders, lowlands; uncommon though at times locally abundant. April-May; October. DE south to n. FL, west to MO, e. TX. The narrow leaves may be glabrous or pubescent on the abaxial side, varying as local genotypes. [> *C. crus-galli* var. *pyracanthifolia* (Aiton) Sargent – F, G; > C .limnophylla Sargent – K; > *C. pyracanthoides* Beadle var. *arborea* (Beadle) Palmer – G; > *C. pyracanthoides* Beadle – Q]

Crataegus dispar Beadle, Aiken Hawthorn. Cp (FL, GA, SC), Pd (GA, SC): upland pine or pine-oak forests, usually of sub-xeric to xeric conditions, in well-drained clay or sandy soils; uncommon. Late March-April; September. Nc & sc SC and adjacent e. GA; single sporadic collections known from Panhandle FL and ne. AL. A distinctive species with its deeply cut and serrated, tomentose leaves, often pale bluish-green in color. [= K, Q, X]

Crataegus disperma Ashe, Two-seed Hawthorn. Mt (VA) {NC ?}: upland forests, pastures, brushy hillsides; uncommon. May; September-October. PA west to IN, south in the Appalachians to VA, e. KY. *C. disperma* is of presumed hybrid origin between *C. crus-galli* and *C. punctata*, since characters appear intermediate. It sometimes appears in mixed populations of the putative parent species, but its reproductive biology is poorly known. Similar to other hawthorns of presumed hybrid origin, it may be apomictic, but no large local populations are known. It is keyed here due to its persistent inclusion in several floral treatments in the past. [= F, K; > *C.* ×*disperma* Ashe – K]

Crataegus dodgei Ashe, Dodge Hawthorn. Mt (NC) {VA ?}: mesic hardwood forests, streamside thickets, pastures; rare. May; September-October. A northern species predominately of the Great Lakes Region, east to CT, sporadic southward in the Appalachians to WV and possibly e. TN, w. VA, with one collection in Ashe Co, NC. [= *C. mercerencis* Sargent]

Crataegus flava Aiton, Yellow Hawthorn. Cp (FL, GA, SC), Pd (SC, GA): dry woodlands; rare. A problematic taxon, originally described from a plant under cultivation in Europe, and assumed native from central SC s. to n. FL; few naturally-occurring plants have been located in the Southeastern US which match closely the type specimen. The likelihood of the type of *C. flava* being of hybrid origin, involving members of the *Apricae* or *Intricatae* series seems probable. Unfortunately, the name *C. flava* Aiton and the ambiguous taxon which it historically represents has been widely misapplied and confused for more than a century. It is included here primarily due to historical significance, since no recent authentic field collections are known. [= Q, X; < *C. flava* Aiton– RAB, K, S; > *C. elliptica* Aiton]

Crataegus incilis Beadle. Cp (FL, GA): mixed pine and hardwood forests, wooded hills, rocky woods; uncommon. Late March-April; August-September. Sw. GA and Panhandle FL, west to s. MS, north to ne. AL. *C. incilis* is usually a shrubby relative of *C. pulcherrima* with a strong suckering habit and slender shoots exhibiting thin, distinctly laciniate-lobed leaves. The 4 or 5 pairs of lobes per leaf, acute or cuneate leaf base and 5-8mm fruit are also characteristic. It has been collected most extensively in the vicinity of Little River Canyon, AL and sporadically elsewhere in the known range. [> *C. concinna* Beadle - Q]

Crataegus integra Beadle. Cp (GA, SC): pine forests, sandy scrublands, xeric woodlands with deep sandy soils; uncommon. Late March-April; August-September. C. SC south to peninsular FL throughout the Lake Wales Ridge, west to sw & c. AL SC, n. GA, wc. AL. *C. integra* Beadle is only marginally distinct from the range of variation seen in *C. lassa* Beadle, the major distinction being in foliage; *C. integra* having a proportionally wider leaf shape, shorter petioles, and a tendency to have nearly entire leaf margins. There are, however, graduations of leaf morphology toward the synonymy included under *C. lassa* Beadle, so that an alternative taxonomic option might be to include *C. integra* within a broader view of *C. lassa*. It is pertinent to note that the inclusion of *C. integra* under the name of *C. flava* Aiton became affiliated as early as 1895 by Nash, as *C. flava* var. *integra* (Aiton) Nash. [= X; < *C. flava* Aiton – RAB; >< *C. flava* Aiton– K; > *C. dolosa* Beadle – Q; > *C. sodalis* Beadle – Q; > *C. constans* Beadle – Q; >*C. audens* Beadle - Q]

Crataegus intricata Lange *var.* ***boyntonii*** (Beadle) Kruschke, Boynton Hawthorn. Mt, Pd (GA, NC, SC, VA): upland forest understories, pastures, rock outcrops, shrubby thickets; uncommon. W. VA south to c. GA, west to n. MS, n. to IL, KY, and WV. April-May; September-October. *C. boyntonii* differs from typical *C. intricata* by having an abundance of broadly ovate to deltoid leaves 5-8 cm long × 3-5 cm wide, and more robust thorns. [= Q, X; < *C. flabellata* – RAB; = *C. boyntoni* – F, G, orthographic variant; < *C. intricata* Lange; > *C. intricata* var. *boyntonii* (Beadle) Kruschke– C, K]

Crataegus intricata Lange *var.* ***intricata***, Entangled Hawthorn. Mt, Pd (GA, NC, SC, VA): pastures, wooded hills, rock outcrops, thickets; common. Late April-May; August-October. Widespread range from northern states s. to c. SC, c. GA, c. AL, n. MS, west to AR and OK. Broadly defined, a variable species incorporating many minor forms and potentially apomictic local clones. The basic defining characters are the presence of 10 stamens with pale anthers, hard greenish or ruddy-blushed fruits with an elevated calyx, and glabrous, slightly glandular foliage. Leaf shape is highly variable. Some variants commonly having yellow fruits are *C. fortunata* Sargent and *C. straminea* Beadle, conspicuous pubescence is seen in *C. biltmoreana* Beadle and *C. craytonii* Beadle, and shallowly lobed leaves often occur in *C. rubella* Beadle; these have been treated as varieties here (except for *C. craytonii*), but have been variously interpreted in other floras. Typically, *C. intricata* exhibits a shrubby habit, and may form colonies by root sprouts. It is most common in the Appalachian region. [= C, K, S, W, X; < *C. flabellata* – RAB; > *C. intricata* var. *intricata* – F, G; >*C. foetida* Ashe]

Crataegus intricata Lange *var.* ***biltmoreana*** (Beadle), Biltmore Hawthorn. Mt, Pd (GA, NC, SC, VA): wooded hills, rock outcrops, thickets; uncommon. Late April-May; September-October. VT south to c. GA, west to AR, MO. The leaf shape is variable, but the hairiness of its vegetative and floral parts, as well as the normally deeply glandular-serrate calyx lobes make this taxon fairly distinctive among the Intricatae series. [> *C. biltmoreana* Beadle – F, G, Q; > *C. confusa* Sargent – F; *C. villicarpa* Sargent – F]

Crataegus iracunda Beadle, Red Hawthorn. Cp, Pd (GA, NC, SC, VA): swamps, bottomlands, moist slopes; wooded hills; uncommon (though locally abundant). April-May; September-October. Southern range limits appear to extend south to c. SC, GA, AL (and possibly MS). A difficult species to distinguish vegetatively, appearing most closely allied to *C. macrosperma*

Ashe. The typically scabrous young leaves, 10 pink to purplish stamens, and firm-textured fruit with sessile calyx can vary among some local populations of *C. iracunda* to the extent that it may be confused with *C. schuettei*, *C. pruinosa*, or *C. boyntonii*. [= K, X; < *C. flabellata* (Bosc) K. Koch – RAB, C; > *C. iracunda* var. *iracunda* – F, G; > *C. iracunda* var. *silvicola* (Beadle) Palmer – F, G; > *C. iracunda* – Q; > *C. silvicola* Beadle – Q; > *C. drymophila* Sargent; > *C. populnea* Ashe – F, G; > *C. riparia* Ashe; > *C. sectilis* Ashe; > *C. shallotte* Ashe]

Crataegus lassa Beadle, Sandhill Hawthorn. Cp, Pd (GA, NC, SC): pine forests, oak-pine scrub, upland scrublands, xeric woodlands, especially in deep sand and soils of rapid drainage; common. Here *C. lassa* is broadly defined to include a wide range of minor species, most described by Beadle. Late March-April; August-September. *C. lassa* is most often shrubby in habit (2-4 m tall), with a rounded or open crown reaching close to the ground, commonly with multiple stems. [= X; < *C. flava* Aiton – RAB; >< *C. flava* – K; > *C. lassa* – Q; > *C. lanata* Beadle – Q; > *C. laxa* Beadle; > *C. frugalis* Beadle – Q; > *C. integra* Beadle – Q; > *C. dolosa* Beadle – Q; > *C. inops* Beadle – Q; > *C. meridiana* Beadle – Q; > *C. colonica* Beadle – Q; > *C. insidiosa* Beadle – K, Q; > *C. pulla* Beadle – Q; > *C. egens* Beadle – Q; > *C. pearsonii* Ashe – K, Q; > *C. michauxii* Persoon – Q, S]

Crataegus lepida Beadle. Cp (GA): xeric, sandy soils of open pinelands, wiregrass-dominated roadsides and forest edges, oak-pine scrub; uncommon. Late March-April; August-September. S. GA south to c. peninsular FL. Allied to *C. munda*, *C. lepida* is distinctive in bearing a preponderance of oval to orbicular, 1-2 cm leaves. [= X; > *C. lepida* – Q; > *C. condigna* Beadle – K, Q]

Crataegus macrosperma Ashe, Fanleaf Hawthorn. Mt, Pd, Cp (GA, NC, SC, VA): mesic or subxeric hardwood forests, wooded slopes, rock outcrops, pastures, thickets, mountain balds and rocky summits; common. April-early May; September-October. VA south to c. GA, west to n. LA, w. KY, and WV. *C. macrosperma* is often confused with *C. pruinosa* (Wendl.) K. Koch and *C. iracunda* Beadle, due to similar leaf shape, but *C. macrosperma* appears consistent in its adaxially scabrous young leaves, 5-10 stamens, and soft-textured mature fruit. The pyrenes are not unusually large (5-8 mm), despite the name. [= K, W, X; < *C. flabellata* (Bosc) K. Koch – RAB; > *C. flabellata* – C; > *C. macrosperma* var. *macrosperma* – F, G; > *C. macrosperma* var. *roanensis* (W.W. Ashe) Palmer – F, G; > *C. macrosperma* – Q; > *C. brainerdii* – C, misapplied to material in our area; > *C. roanensis* Ashe – Q; < *C. macrosperma* – S]

Crataegus margarettae Ashe. Mt (VA): mesic hardwood forests, streamside thickets, pastures; rare. April-May; September-October. WV {TN, w. VA} west to MO, IO, north to WI and MI. *C. margarettae* is related to the wide-ranging *C. chrysocarpa* Ashe, but is distinctive in its widely obovate to nearly orbicular leaves, rounded or obtuse lobes, cuneate base, and petioles often as long as the blade. [= *C. margaretta* – Q, S, X; > *C. margaretta* var. *margaretta* – F, G; > *C. margaretta* var. *brownii* (Britton) Sargent – F; > *C. margaretta* var. *brownei* – G (orthographic variant); < *C. chrysocarpa* Ashe – C; > *C. chrysocarpa* – K; = *C. margarettiae* – K, orthographic variant]

Crataegus marshallii Eggleston, Parsley Hawthorn, Parsley Haw. Cp (GA, NC, SC, VA), Pd (GA, NC, SC): swamp forests (especially over calcareous soils), alluvial forests, dry and mesic upland slopes (especially over mafic or calcareous rocks). April-early May; September-October. Se. VA south to c. peninsular FL, west to e. TX, and north in the interior to sc. TN, n. AL, n. MS, w. TN, s. IL, se. MO, nc. AR, and se. OK (Phipps 1998); common. *C. marshallii* is distinctive and immediately recognizable among *Crataegus*, by its deeply lobed leaves, small flowers, and small fruits (4-6 mm long by about 3 mm wide, with only 1-3 pyrenes). [= RAB, C, F, G, K, S, W, X, Y; = *C. apiifolia* (Marshall) Michaux – Q]

Crataegus mendosa Beadle. Cp, Pd (GA), {SC}: mesic hardwood forests, mixed pine-hardwood forests, upland wooded hills over calcareous substrates and well-drained clays; uncommon. Lower Piedmont and upper Coastal Plain of sc. SC, wc. GA, ne. and c. AL, and c. and s. MS. April; September. Allied to *C. pulcherrrima* Ashe, and perhaps only a variety of it, *C. mendosa* is distributed well northward and eastward beyond the bulk of the range of *C. pulcherrima*. Related *C. venusta* Beadle and *C. austrina* Beadle occur in central AL. [= K, N, Q, S, X]

Crataegus mollis Scheele, Downy Hawthorn. Mt (VA), Pd (GA): mesic forests, alluvial forests, wooded uplands over basic or calcareous soils; rare in our area. Late March-April; September-October. The unusual occurrence of this species in the Mountains of VA is atypical of the majority of the range, which is north and west of VA and AL; ME to ND, s to s.TX, e. to nw. GA. *C. mollis* shows wide variabiliy in size and shape of leaves and fruit, but the tomentose young petioles and pubescent leaf undersides are consistent. The fruits of some local genotypes can reach 24 mm diameter, among the largest of the genus in the U.S. *C. mollis* often reaches treelike dimensions, to 10 m tall and trunk diameters to 30 cm. [= C, S, X; > *C. mollis* var. *mollis* – F, G; > *C. mollis* – K, Q; > *C. cibaria* Beadle – Q; > *C. gravida* Beadle – Q; > *C. cibilis* Ashe; > *C. meridionalis* Sargent – K; *?*> *C. albicans* W.W. Ashe – S]

Crataegus munda Beadle. Mt, Pd, Cp (GA, NC, SC): xeric or subxeric forests, scrublands, disturbed woodlands; uncommon. Late March-April; September-October. NC south to n. FL, west to s. and c. AL. *C. munda* as here considered includes in synonomy several shrubby taxa with small (1-3 cm), predominately spatulate leaves, slender geniculate twigs, and inflorescences of 1 to 3 (-5) flowers. [= X; < *C. flava* Aiton – RAB, W; > *C. munda* – K, Q; > *C. geniculata* Ashe – Q; > *C. yadkinensis* Ashe – Q; > *C. pexa* Beadle – Q; > *C. invicta* Beadle – K, Q; > *C. floridana* Sargent – S]

Crataegus pallens Beadle. Mt (NC): subxeric forests, slopes, rock outcrops, especially over mafic or calcareous substrates; rare. Late April-May; September-October. W. NC, e. TN, ne. AL, and perhaps n. GA. *C. pallens* is allied to *C. intricata* Lange, as well as exhibiting characters affiliated with *C. pulcherrima* Ashe. The oblong-ovate leaves with 2 to 3 pairs of straight-sided lobes, 15-20 stamens, yellowish oval fruit, dark furrowed bark, and somewhat twiggy crown atop these multi-stemmed shrubs is here considered diagnostic. A closely related taxon, *C. pinetorum* Beadle (Pineland Hawthorn), of ne. AL and uncertain distribution beyond, exhibits subglobose reddish fruit on pedicels 1-2 cm. [= Q, X; < *C. flabellata* – RAB; < *C. intricata* Lange – K, S]

Crataegus phaenopyrum (Linnaeus f.) Medikus, Washington Hawthorn. Mt, Pd (GA, NC, SC, VA), Cp (NC, SC, VA): upland forests, floodplain forests, pastures, thickets, disturbed areas; uncommon (though locally abundant). May-early June; September-October. One of our most distinctive hawthorns, and commonly cultivated across the eastern U.S. Native range presumed to be PA s. to n. FL, w. to IL, MO, MS; naturalized populations originating from widespread cultivation may be

involved in parts of this range, and expansions elsewhere. [= RAB, C, G, K, W, X; > *C. youngii* Sargent – F; > *C. phaenopyrum* – F, S; > *C. populifolia* – S]

Crataegus pruinosa (Wendl.) K. Koch, Frosted Hawthorn. Mt, Pd (NC, SC, GA, VA), Cp (NC, SC, GA): upland forests, pastures, rock outcrops, mountain summits and balds, floodplain forests; uncommon (though locally abundant). April-May; September-October. Broadly defined, a variable species with many closely related taxa here considered synonymous. This species may occur as a lone shrub or tree, or become colonial in regularly disturbed areas. The presence of a waxy bloom on the mature fruit (pruinose) is not a dependable trait, and fruits can vary from green to bright red, glaucous or not. Foliage and floral parts are usually entirely glabrous on plants in our area. [= C, S, W, X; < *C. flabellata* – RAB; > *C. pruinosa* var. *pruinosa* – F, G; > *C. pruinosa* var. *delawarensis* (Sargent) Palmer – F, G; > *C. rugosa* – F, G; > *C. pruinosa* – K; > *C. arcana* Beadle – K, Q; > *C. rustica* Beadle – Q; > *C. vicinalis* Beadle – Q; > *C. gattingeri* Ashe – F; > *C. gattingeri* var. *gattingeri* – G; > *C. gattingeri* var. *rigida* Palmer – G; > *C. georgiana* Sargent – Q]

Crataegus pulcherrima Ashe, Beautiful Hawthorn. Cp (GA), Mt (GA): upland hardwood forests and hardwood-pine mixtures, ravines, mesic slopes, especially over iron-rich soils and rolling terrain with soils high in clay or loam content; uncommon (though locally abundant). Se. GA, c. Panhandle FL, west to LA (and perhaps e. TX), north to c. MS and n. AL. April; September-October. Defined broadly, *C. pulcherrima* includes many closely related species described by Beadle, most not clearly distinct and here considered synonymous. Some may deserve varietal status following further study. Foliage of *C. pulcherrima* display a consistency of evenly-lobed leaves with straight, parallel primary veins and obscure secondary venation. The inflorescences are compound, with 20 stamens per flower; fruits are usually small (5-10 mm diameter), with dense flesh; bark of main trunk brown, furrowed. [= X; > *C. pulcherrima* – K, N, Q; > *C. macilenta* Beadle – Q; > *C. lenis* Beadle – Q; > *C. ancisa* Beadle – K, Q; > *C. opima* Beadle – N, Q; > *C. inanis* Beadle – K, Q; > *C. illustris* Beadle – Q; > *C. incilis* Beadle – N, Q; < *C. intricata* Lange – S]

Crataegus punctata Jacquin, Dotted Hawthorn. Mt. (VA, NC): high elevation forests, balds, rock outcrops; uncommon (though locally abundant). The majority of range is north of our area, with southern limits along the higher Appalachian elevations of NC, TN, (perhaps n. GA), and west to KY, MO, and IL. May; September-October. *C. punctata* is considered here distinct from *C. collina*, which has a wider Southeastern range and habitat tolerance. *C. punctata*, often in company with *C. macrosperma*, comprises the majority of hawthorn forests, "orchards," and thickets seen in the high elevations of the North Carolina Blue Ridge, in openings and disturbed *Picea rubens* and *Abies fraseri* forests. [= K, Q, W, X; < *C. punctata* – RAB, C; > *C. punctata* var. *punctata* – F, G; > *C. punctata* var. *aurea* Aiton – F, G; > *C. punctata* var. *canescens* Britton – F, G; > *C. punctata* var. *pausiaca* (W.W. Ashe) Palmer – F, G; *? C. punctata* – S]

Crataegus sargentii Beadle, Sargent's Hawthorn. Pd (GA): mesic upland forests over calcareous or circumneutral substrates; rare. W. GA, c. and n. AL (and perhaps se. TN). April; September. *C. sargentii* displays intermediate characteristics between the range of variation seen in *C. intricata* and that of *C. pulcherrima*. It is also on the northern range limits of the latter group. Although this might suggest hybrid origin, the genetics of *C. sargentii* has not been carefully investigated. Fruit production is usually scant in *C. sargentii*, and seed viability appears to be very low. [= K, X; > *C. sargentii* – N, Q; > *C. eximia* Beadle – N, Q; > *C. gilva* Beadle – N, Q; < *C. intricata* Lange – S]

Crataegus schuettei W.W. Ashe, Schuette's Hawthorn. Mt (VA, NC): mesic hardwood forests; uncommon (though may be locally abundant). April-May; September-October. *C. schuettei* occupies a range predominately north of our area, in NH, NY, WI, n. IL, n. WV; known to extend s. to w. NC (and perhaps also to e. TN and n. GA), but the extent of distribution is poorly understood. Closely related to *C. macrosperma*. Foliage of juvenile shoots of *C. schuettei* in w. NC often are laciniate, with deep, acute sinuses nearly reaching the midrib. [= K, X; < *C. flabellata* (Bosc) K. Koch – RAB, C; > *C. basilica* Beadle – F, G, Q, W]

Crataegus senta Beadle. Mt (NC), Cp (SC) {GA?}: upland hills, disturbed forests, pastures; uncommon. W. NC and c. SC (perhaps south to GA and n. FL). April-May; September. *C. senta* appears to be one of the most northerly distributed hawthorns allied closely to the group to which *C. alabamensis* Beadle, *C. lassa* Beadle, and *C. lacrimata* Small belong. The drooping branches, red fruit, and small, sharply 3-lobed or 3-pointed, obovate leaves are distinctive. [= Q, X; < *C. flava* Aiton – RAB, K, S, W; > *C. pentasperma* Ashe]

Crataegus spathulata Michaux, Littlehip Hawthorn. Cp (GA, NC, SC, VA), Pd (GA, NC, SC), Mt (GA, NC, SC): bottomland forests, extending upslope to drier sites especially on mafic or calcareous substrates; uncommon in NC, common southward. April-May; September-October. E. NC south to Panhandle FL, west to e. TX, north in the interior to w. NC, c. TN, s. MO, and e. OK (Phipps 1988). This species is distinctive for its small spatulate leaves (tending to be trilobed) and thin, flaking bark (multicolored green, brown, and brownish gray). [= RAB, C, F, G, K, Q, S, W, X, Y]

Crataegus succulenta Schrader ex Link, Fleshy Hawthorn. Mt (NC, VA): high elevation rocky summits, mesic forests, high pastures, especially over basic soil or mafic substrates; rare. May; October. Widespread across the northern U.S. states, extending s. along the Appalachians to WV, w. VA, w. NC, and s. in the interior to MO. An attractive species, with bright red fruit, obovate to orbicular leaves with reticulate venation, widely spreading branches, and numerous long thorns (5-9 cm long). [= RAB, C, K, S, W, X; > *C. succulenta* var. *succulenta* – F, G; > *C. succulenta* var. *neofluvialis* (Ashe) Palmer – F, G; > *C. neofluvialis* Ashe – Q; > *C. vernans* Ashe]

Crataegus triflora Chapman, Threeflower Hawthorn. Mt, Pd, Cp (GA): wooded ravines and slopes under mesic forests, limestone outcrops, flatwoods, prairies; rare. April-May; September-October. Nw. and wc. GA, west to AL, MS, LA; (possibly in TN?). Usually a multi-stemmed shrub 1-3 m tall, but occasionally to 6 m. *C. triflora* produces some of the largest flowers in the genus (to 3 cm diameter), though frequently only 3 flowers borne per inflorescence; occasional vigorous plants may bear 3-6 flowers per inflorescence. The orange-red, soft fruit is palatable and may reach 22 mm diameter. [= K, W, X; > *C. triflora* – Q, U; > *C. austromontana* Beadle – Q, U]

Crataegus uniflora Muenchhausen, Oneflower Hawthorn. Mt, Pd, Cp (GA, NC, SC, VA): upland forests, disturbed lands, roadsides, rock outcrops, often in xeric or sub-xeric conditions; common. April-May; September-October. PA and NJ south to n. FL, w. to e. TX, OK, and MO. Normally a shrubby species, 0.5-2 m in height, though local forms may reach 4 m, particularly in

n. FL. Among minor variations in foliage, consistent are the slender thorns (2-7 cm long) and foliaceous calyx lobes persistent on the fruit. [= RAB, C, F, G, K, S, W, X; > *C. uniflora* – Q; > *C. gregalis* Beadle – Q; > *C. arenicola* Ashe; > *C. raleighensis* Ashe – Q]

Crataegus viridis Linnaeus, Green Hawthorn. Pd, Cp (GA, NC, SC), Mt (SC, VA): swamps, bottomland forests, alluvial woodlands, wet flatwoods, and uplands where soils are often basic to calcareous; common. Late March-late April; September-November. DE w. to n. MO, south to central peninsular FL and central TX One of our largest hawthorn species, frequently reaching treelike proportions (5-10 m tall, trunk 10-40 cm diameter). The orange-red fruits often persist on the bare branches into winter, sometimes until the following spring. Bark of the trunk is usually mottled with patterns of gray, reddish-brown, and greenish-gray coloration, due to the dehiscing layers of scales and plates. [= RAB, C, S, W, X; > *C. viridis* var. *viridis* – F, G, K; > *C. viridis* var. *ovata* (Sargent) Palmer – F, G; > *C. viridis* var. *lanceolata* (Sargent) Palmer – F, G; > *C. viridis* – Q; > *C. interior* Beadle – Q; > *C. vulsa* Beadle – K, Q; > *C. penita* Beadle – K, Q]

Crataegus visenda Beadle. Pd, Cp (GA, NC, SC): upland pine and pine-oak forests, disturbed lands, wooded hills with clay or sandy soils, often in xeric or sub-xeric conditions; uncommon. April; late August-September. Central & upper Coastal Plain of NC south to n. FL, west to s. & e. MS, n. AL, and nw. GA. *C. visenda* is related closely to *C. aprica* Beadle, but the foliage tends to have a higher percentage of nearly orbicular blades and branches are more recurved or drooping. Often attaining the dimensions of a small tree (4-8 m tall and with a trunk 7-20 cm diameter). [= X; < *C. flava* Aiton – RAB, S; >< *C. flava* – K; > *C. visenda* – Q; > *C. tristis* Beadle – K, Q; > *C. segnis* Beadle – Q; > *C. arrogans* Beadle – K, Q; > *C. sodalis* Beadle – Q]

Crataegus ashei Beadle, Ashe Hawthorn. Cp (AL): prairies, hardwood forests, pine-hardwood flats, especially over calcareous clay soils; rare. C. and s. AL west to c. and s. MS and e. LA (s. TN?). April; September. Related to *C. triflora* Chapman and *C. harbisonii* Beadle. [= Q, U, X; < *C. harbisonii* Beadle – K]

Crataegus austrina Beadle. C. AL. [= Q, X; =? *C. tecta* Beadle – N]

Crataegus dilatata Sargent, Broadleaf Hawthorn. Reported from a single county in WV, otherwise bulk of range is in PA & areas northward. May; October. Related to *C. coccinioides*, which is occasionally cultivated but restricted in natural range to the lower Midwest. [= C, X]

Crataegus harbisonii Beadle, Harbison Hawthorn. Rare, endemic to c. and w. TN and currently known only from Davidson Co, TN: hardwood forests understories, over limestone; very rare. Late April-May; Sept.-Oct. Related species *C. ashei* Beadle has a more southern distribution in AL, MS, and LA. *C. harbisonii* appears to be extirpated from nearly all of its former range, even though once described as common in the Nashville area. [= Q, S, U, X; < *C. harbisonii* Beadle – K]

Crataegus lacrimata Small, Weeping Hawthorn. Xeric, sandy soils , in scrublands and in association with sparse stands of *Pinus clausa* or *Pinus palustris*. Endemic to the western FL Panhandle; perhaps in adjacent sandhill scrub of AL. Late March-April; August-September. The combination of conspicuously slender weeping branches, small spatulate leaves, glabrous character, and treelike habit in *C. lacrimata* is unique among a large group of related hawthorns which occupy sandy habitats in the Coastal Plain. [= Q, X]

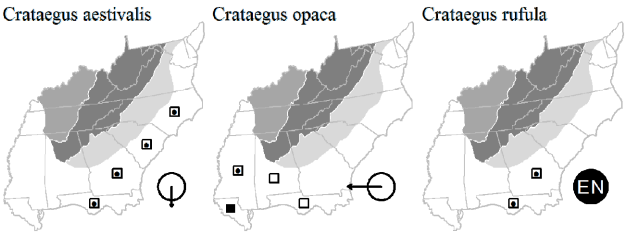
* ***Crataegus monogyna*** Jacquin, English Hawthorn. Reported for VA in W. [= C, F, G, K] {not yet keyed}

Crataegus opaca Hooker & Arnott, Western Mayhaw. Cp (FL): swamp forests, and cultivated as single trees or in plantations for the fruit. February-March; April-May. FL (Escambia and Santa Rosa counties) (Kunzer et al. 2009) west to e. TX. [= K, X]

Crataegus pinetorum Beadle. In AL and TN. [= K, N, Q, X]

Crataegus rufula Sargent, Florida Mayhaw. Cp (GA): flatwoods ponds, river swamps; uncommon. [= K, Z; > *C. maloides* Sargent – S] {not yet keyed; synonymy incomplete}

Crataegus venusta Beadle. C. AL. [= N, Q, X; < *C. sargentii* Beadle – K]



Cydonia P. Miller 1754 (Quince)

A monotypic genus, a shrub, probably native of the Caucasus. References: Catling & Mitrow in FNA (in press); Kalkman in Kubitzki (2004)=Z.

* *Cydonia oblonga* P. Miller, Edible Quince. Reported for MD (FNA, Kartesz 1999). [= FNA, K, Z; = *Pyrus cydonia* Linnaeus]

Dasiphora Rafinesque 1840 (Shrubby-cinquefoil)

Molecular phylogenetic studies indicate that this genus is more closely related to *Alchemilla*, *Aphanes*, *Drymocallis, Fragaria*, *Sibbaldiopsis*, and other genera outside our area than to *Potentilla* (Eriksson et al. 2003). References: Robertson (1974)=Z; Eriksson et al. (2003); Kalkman in Kubitzki (2004); Ertter (2007).

Dasiphora fruticosa (Linnaeus) Rydberg ssp. *floribunda* (Pursh) Kartesz, Shrubby-cinquefoil, Golden-hardhack. This species is widespread in the western and northern parts of North America, south to n. NJ, e. and n. PA, s. OH, IN, IL, IA, SD, NM, AZ, and CA. It was reported for western NC ("near Ducktown, in Turtletown, Cherokee County, N.C.") by Gattinger (1901), but corroborating specimen documentation is lacking. [= K; < *Potentilla fruticosa* Linnaeus – C, G, Z; > *Potentilla fruticosa* var. *fruticosa* – F; = *Pentaphylloides floribunda* (Pursh) A. Löve]

Drymocallis Fourrier ex Rydberg 1908 (Drymocallis, Wood-beauty)

A genus of about 30 species, best segregated from *Potentilla*. Molecular phylogenetic studies indicate that this genus is more closely related to *Alchemilla*, *Aphanes*, *Dasiphora, Fragaria*, *Sibbaldiopsis*, and other genera outside our area than to *Potentilla* (Eriksson et al. 2003). References: Ertter in FNA (in press); Ertter (2007)=Z; Eriksson, Donoghue, & Hibbs (1998); Eriksson et al. (2003); Kalkman in Kubitzki (2004).

Drymocallis arguta (Pursh) Rydberg, Tall Drymocallis, Tall Wood-beauty. Mt (VA, WV): greenstone barrens, other barrens; rare. QC west to NT, south to w. VA, IN, MO, and AZ. Reported for e. TN by Gattinger (1901); the documentation unknown. [= FNA, Z; = *Potentilla arguta* Pursh – F, G, WV; > *P. arguta* var. *arguta* – C; > *P. arguta* ssp. *arguta* – K]

Eriobotrya Lindley 1821 (Loquat)

A genus of about 30 species, trees and shrubs, native to e. Asia. References: Phipps in FNA (in press).

* ***Eriobotrya japonica*** (Thunberg) Lindley, Loquat, Japanese-medlar. Cp (FL, GA): suburban woodlands; uncommonly cultivated, rarely naturalized, native of ec. China. Reported for Lowndes County, GA (Carter, Baker, & Morris 2009). Also reported for LA. [= FNA, K, WH]

Exochorda Lindley 1858 (Pearlbush)

A genus of about 4 species, shrubs, of e. Asia. References: Haines in FNA (in press); Kalkman in Kubitzki (2004).

* ***Exochorda racemosa*** (Lindley) Rehder, Pearlbush. Pd (GA, NC, SC, VA), Cp (DE, LA, MS, NC): disturbed areas, woodland borders; rare, native of China. First reported for South Carolina by Hill & Horn (1997). [= C, FNA, G, K]

Filipendula P. Miller 1754 (Queen-of-the-Prairie)

A genus of about 15 species, herbs, north temperate in e. and nw. North America, Europe, and Asia. References: Schanzer in FNA (in press); Schanzer (1994)=Y; Robertson (1974)=Z.

1 Lateral leaflets lobed and toothed; flowers pink; fruit straight; rootstock with long subterranean runners; [native plant of wetlands, also sometimes cultivated]; [section *Albicoma*] ..... ***F. rubra***
1 Lateral leaflets merely coarsely toothed; flowers white; fruit twisted; rootstock short, without runners; [introduced species, sometimes escaped]; [section *Filipendula*] ..... ***F. ulmaria***

Filipendula rubra (Hill) B.L. Robinson, Queen-of-the-Prairie. Mt (NC, VA, WV), Pd (VA): bogs, wet meadows, over mafic or calcareous rocks; rare. June-July; July-September. PA west to n. IL and MN, south to WV, w. VA, w. NC, e. TN (Roane County, fide Gattinger 1901), and MO (reports from GA appear to be unsubstantiated). The closest relatives are the other two members of section *Albicoma*: *F. palmata* (Pallas) Maximowicz and *F. angustifolia* (Turczaninow) Maximowicz, both of ne. Asia. [= RAB, C, F, FNA, G, GW, K, S, W, WV, Y, Z]

* ***Filipendula ulmaria*** (Linnaeus) Maximowicz, Meadowsweet, Queen-of-the-Meadow. Mt (WV): disturbed areas; rare, native of Europe. Cultivated and sometimes escaped or persistent. It is reported for KY, WV, PA, and NJ (Kartesz 1999). [= FNA, WV, Y; > *F. ulmaria* var. *ulmaria* – C, F, G; > *F. ulmaria* ssp. *ulmaria* – K]

Fragaria Linnaeus 1753 (Strawberry)

A genus of about 10 species, herbs, of temperate Eurasia, North America, and South America. References: Staudt in FNA (in press); Kalkman in Kubitzki (2004).

1 Fruit (at least the larger on a plant) usually > 1.5 cm thick; petals 10-15 mm long; leaves evergreen; [cultivated, rarely persistent] ..... ***F. ×ananassa***
1 Fruit 1-1.5 cm thick; petals 3-10 mm long; leaves deciduous (at least tardily so); [native].
  2 Achenes set in pits on the mature receptacle; calyx lobes appressed to the developing fruit (after petal drop); petals (5-) 7-10 mm long; principal lateral veins diverging from the midrib of the leaflet at an angle of ca. 30 degrees; terminal tooth of leaflets > ½ as wide as the adjacent teeth, as long as or surpassing them in length ..... ***F. virginiana***
  2 Achenes superficial on the mature receptacle; calyx lobes spreading to reflexed from the developing fruit (after petal drop); petals 3-7 mm long; principal lateral veins diverging from the midrib of the leaflet at an angle of ca. 45 degrees; terminal tooth of leaflets < ½ as wide as the adjacent teeth, and surpassed by them in length.
    4 Long hairs of the petioles and peduncles ascending to appressed ..... ***F. vesca** var. **americana***
    4 Long hairs of the petioles and peduncles spreading to retrorse ..... ***[F. vesca** var. **vesca]***

* ***Fragaria* ×*ananassa*** Thuillier (pro sp.) [*chiloensis* × *virginiana*], Garden Strawberry, Cultivated Strawberry. Cp (GA, NC, SC, VA), Pd (GA, NC, SC, VA), Mt (GA, NC, SC, VA, WV): gardens, persistent on garden edges; commonly cultivated; rare. An octoploid garden hybrid of the two octoploid species, *F. chiloensis* and *F. virginiana*. [= RAB, F, FNA; = *F.* ×*ananassa* var. *ananassa* – K; = *F. ananassa* – C, WV; = *F. chiloensis* Duchesne var. *ananassa* – G]

Fragaria vesca Linnaeus *var.* ***americana*** Porter. Mt (NC, VA, WV), Pd (DE), Cp (DE, VA): woods, fields, roadsides; uncommon (rare in NC and VA). April-June. NL (Newfoundland) and BC south to e. VA, w. NC, TN, MO, NE, CO, NM, and AZ. [= C, F, G; < *F. vesca* – RAB; = *F. vesca* ssp. *americana* (Porter) Staudt – FNA, K, W; = *F. americana* (Porter) Britton – S; > *F. vesca* var. *americana* – WV; > *F. vesca* var. *alba* (Ehrhart) Rydberg – F]

Fragaria virginiana P. Miller, Wild Strawberry. Mt (GA, NC, SC, VA, WV), Pd (DE, GA, NC, SC, VA), Cp (DE, FL, GA, NC, SC, VA): grasslands, roadsides, pastures, woodlands, grassy balds; common (rare in FL). April-June. NL (Newfoundland) west to MB, south to FL and TX. [= RAB, C, W, WH; > *F. virginiana* var. *virginiana* – F, G; > *F. virginiana* var. *illinoensis* (Prince) Gray – F, G; > *F. virginiana* var. *australis* Rydberg – G; > *F. virginiana* ssp. *virginiana* – FNA, K; > *F. virginiana* ssp. *grayana* (Vilmorein ex J. Gay) Staudt – FNA, K; > *F. virginiana* – S; > *F. australis* (Rydberg) Rydberg – S; > *F. grayana* Vilmorin ex J. Gay – S]

Fragaria vesca Linnaeus var. *vesca*. NL (Newfoundland), QC and MI south to PA, WV (?), KY, and IL. [= C, F, G; = *F. vesca* ssp. *vesca* – FNA, K]

Geum Linnaeus 1753 (Avens)

A genus of 40-60 species, herbs, mainly of north temperate areas. Many researchers have advocated breaking *Geum* into varying numbers of segregate genera; even the most conservative divisions place *G. radiatum* in a genus separate from our other species (such as *Parageum*; see synonymy) and some would place *G. vernum* in *Stylipus*. Molecular studies (Smedmark 2006; Smedmark & Eriksson 2002) make a strong case for a broad circumscription of *Geum*, including *Waldsteinia*, as many of the segregates are complexly and reticulately interrelated. References: Rohrer in FNA (in press); Phipps in FNA (in press); Robertson (1974)=Z, Bolle (1933)=Y; Král (1966)=X; Smedmark (2006)=V; Weakley & Gandhi (2009)=Q; Smedmark & Eriksson (2002); Kalkman in Kubitzki (2004). [including *Parageum* and *Waldsteinia*]

1 Style deciduous; leaves 3-foliolate or 3-lobed, lacking small leaflets towards the base; [subgenus or genus *Waldsteinia*]
- 2 Leaves trilobed (the sinuses cleft 1/4 to 3/4 the way to the midrib); leaves rather densely pubescent with stiff hairs, these distributed on the veins and on the intervein surfaces; [of a small area at the southern terminus of the Southern Appalachians in n. GA, nw. SC, and sw. NC) ..... ***G. lobatum***
- 2 Leaves trifoliolate (fully divided), and also typically additionally lobed; leaves sparsely pubescent with stiff hairs, these distributed mostly or strictly on the veins, the intervein surfaces glabrous to very sparsely pubescent; [more widespread].
  - 3 Petals 2.5-4 mm long (about as long as the sepals), 1-1.5 mm wide; [of VA and KY southwards]..... ***G. donianum***
  - 3 Petals 4-10 mm (longer than the sepals), 2-6 mm wide; [of VA and KY northwards]..... ***G. fragarioides***

1 Style persistent; leaves various (see below).
- 4 Style straight or slightly sinuous, neither jointed nor tightly twisted, the tip straight; basal leaves with a cordate or reniform terminal lobe 7-15 cm wide and 1-several lateral lobes generally < 1 cm long (rarely to 2 cm long); cauline leaves much reduced, flabellate, with clasping base and rounded apex; leaves thick, subcoriaceous, the upper surface dark green and glossy; petals 13-20 mm long, bright yellow; [of crevices and ledges on high elevation cliffs (less commonly grassy balds)]; [subgenus *Micracomastylis*; genus *Parageum*]..... ***G. radiatum***
- 4 Style with a tight kink or twist, the straight portion above the kink more-or-less deciduous, leaving a hook; basal leaves variable, trifoliate, pinnatifid, simple or with a large terminal lobe (to 8 cm wide) and much smaller lateral lobes; cauline leaves trifoliate to simple, mostly sessile or petiolate base, with acute or acuminate apex; leaves herbaceous, the upper surface medium green, not notably glossy; petals 1-10 mm long, white, cream, pale yellow, bright yellow, lavender, maroon, or purple; [of mesic to boggy forests, or less commonly, grassy balds (*G. geniculatum*)].
  - 5 Calyx lobes 2-4 mm long, lacking bractlets between the lobes; head of achenes elevated above the calyx on a 1-2 mm stipe; flowering April-May; fruiting May-June; [subgenus or genus *Stylipus*] ..... ***G. vernum***
  - 5 Calyx lobes 3-15 mm long, with bractlets between the lobes; head of achenes more-or-less sessile; flowering May-August; fruiting late May-September; [subgenus or genus *Geum*].
    - 6 Portion of the style above the kink 3-7 mm long; calyx campanulate, cup-like in flower and fruit (sometimes becoming slightly and irregularly reflexed late in fruit), the calyx lobes 5-10 mm long, green to purple; petals yellow or often with a substantial suffusion of rose, lavender, or purple; lower portion of style with long, gland-tipped hairs.
      - 7 Portion of the style above the kink 4-7 mm long; calyx lobes 5-10 mm long, green or purple-darkened; [of nw. NC and adjacent TN] ..... ***G. geniculatum***
      - 7 Portion of the style above the kink 3-4 mm long; calyx lobes 9-15 mm long, purple; [of ne. WV northward]..... ***G. rivale***
    - 6 Portion of the style above the kink 1-2 mm long; calyx reflexed soon after anthesis, the calyx lobes 3-9 mm long, green; petals white, cream, or yellow; lower portion of style glabrous or with long, eglandular hairs.
      - 8 Larger stipules > 10 mm wide, coarsely toothed or even lobed; mid-cauline leaves very coarsely toothed, with 1-5 teeth per cm of margin..... ***G. virginianum***
      - 8 Larger stipules 2-10 (-12) mm wide, entire to toothed; mid-cauline leaves less coarsely toothed, with 3-7 teeth per cm of margin.
        - 9 Plant in flower.
          - 10 Petals bright yellow, 5-9 mm long..... ***G. aleppicum***
          - 10 Petals white or cream (often drying pale yellow), 2-7 (-7.5) mm long.
            - 11 Petals (3-) 4-7 (-7.5) mm long; pedicels puberulent (sometimes also slightly hirsute); [of moist to dry forests] ..... ***G. canadense***

11 Petals (2-) 2.5-4 (-5.5) mm long; pedicels densely hirsute with spreading or slightly reflexed hairs, and also puberulent; [of wetlands] ..... ***G. laciniatum***

9 Plant in fruit.

12 Pedicel predominantly puberulent, also sometimes with scattered longer hairs; cauline leaves mostly 3-foliolate or simple; receptacle densely hispid with yellowish, stiff hairs (best seen by removing a several achenes to expose the receptacle surface); [widespread and common in our area, primarily occurring in moist to wet forests] ..... ***G. canadense***

12 Pedicel moderately to densely hirsute with spreading to reflexed hairs 1-2.5 mm long, and also puberulent; cauline leaves mostly pinnately compound, the leaflets mostly elongate and often also laciniately divided; receptacle glabrous or sparsely to densely hispid; [rare in our area, occurring in the Mountains of NC and the Mountains, Piedmont, and Coastal Plain of VA, primarily in bogs and boggy meadows].

13 Hairs on the achene extending upward onto the lower portion of the style; pedicel sparsely hirsute with spreading hairs; receptacle densely hispid ..... ***G. aleppicum***

13 Hairs on the achene absent **or** at least not extending upward onto the lower portion of the style; pedicel densely hirsute with spreading to reflexed hairs; receptacle glabrous to sparsely hispid ..... ***G. laciniatum***

Geum aleppicum Jacquin, Yellow Avens. Mt (NC, VA, WV), Pd (VA): bogs and boggy meadows; rare. June-July; July-August. Circumboreal, in North America south to NJ, w. NC, ne. TN (Chester, Wofford, & Kral 1997), IN, IL, IA, and NM. The report for GA (Jones & Coile 1988) is in error. American plants are sometimes separated from Eurasian ones as var. *strictum* (Aiton) Fernald. [= RAB, FNA, GW, K, W, Y, Z; > *G. aleppicum* var. *strictum* (Aiton) Fernald – C, F, G]

Geum canadense Jacquin. Mt (GA, NC, SC, VA, WV), Pd (DE, GA, NC, SC, VA), Cp (DE, NC, SC, VA): moist slope forests, bottomland forests, swamp forests; common. May-July; July-November. NS west to ND, south to c. GA and TX. Some authors have recognized a number of varieties in *G. canadense* (see synonymy); some (at least) of these may warrant recognition. [= RAB, C, FNA, G, GW, S, W, Z; > *G. canadense* var. *canadense* – F, K, WV, Y; > *G. canadense* var. *brevipes* Fernald – F, Y; > *G. canadense* var. *camporum* (Rydberg) Fernald & Weatherby – F, Y; > *G. canadense* var. *grimesii* Fernald & Weatherby – F, Y]

Geum donianum (Trattinick) Weakley & Gandhi, Southern Barren Strawberry. Pd (GA, NC, SC, VA), Mt (GA, NC, SC, VA), Cp (NC, SC): forests, streambanks; uncommon (rare in Coastal Plain and Mountains). (January-) March-May; May-June. PA south to GA, AL, and TN. [= Q; = *Waldsteinia fragarioides* (Michaux) Trattinick var. *parviflora* (Small) Fernald – C, F; = *Waldsteinia fragarioides* ssp. *doniana* (Trattinick) Teppner – K, Z; < *W. fragarioides* – RAB, W, Y; = *W. parviflora* Small – G; = ***Waldsteinia doniana*** Trattinick – FNA, S; < *Geum fragarioides* (Michaux) Smedmark – V]

Geum fragarioides (Michaux) Smedmark, Northern Barren Strawberry. Pd (NC, VA), Mt (WV): forests, streambanks; rare. Late March-May; May-June. NB west to MN, south to NC, TN, IN, MO, and AR. [= Q; = *Waldsteinia fragarioides* (Michaux) Trattinick var. *fragarioides* – C, F; < *W. fragarioides* – RAB, W, WV, Y; = *W. fragarioides* ssp. *fragarioides* – K, Z; = ***Waldsteinia fragarioides*** – FNA, G, S; < *Geum fragarioides* (Michaux) Smedmark = V]

Geum geniculatum Michaux, Bent Avens. Mt (NC): seeps, seepy boulderfield forests, grassy balds, cliff bases, banks of cool streams up to about 5 m wide, at high to moderate elevations on Grandfather Mountain (Avery, Watauga, and Caldwell counties, NC), the Roan Mountain massif (Avery and Mitchell counties, NC and Carter County TN), and Rich Mountain (Watauga County, NC); rare, though locally fairly common (US Species of Concern, NC Threatened). Late June-August; August-September. *G. geniculatum* is apparently restricted to the few highest peaks in nw. NC and ne. TN: the Roan Mountain massif (Roan High Knob, Roan High Bluff, Round Bald, Jane Bald, Grassy Ridge, Little Hump Mountain, Big Yellow Mountain, and Big Hump Mountain), Grandfather Mountain, and Rich Mountain. It may be found on a few other peaks, such as Snake Mountain. The distribution of this species is peculiar. While limited to the several highest and coldest mountains in the Southern Appalachians, it extends downslope on Roan Mountain and Grandfather Mountain nearly to their bases, in environmental situations that are apparently duplicated on many other Southern Appalachian peaks. Perhaps *G. geniculatum* was more widespread in the Southern Appalachians in the cooler, moister conditions of the post-Pleistocene, but became restricted to the few coldest peaks during the warmer, drier conditions of the Hypsithermal Interval (7000-2000 B.C.). Following climatic cooling, it was able to disperse downslope from its several refugia, but has not dispersed successfully to other peaks. *G. geniculatum* is most closely related to the circumboreal *G. rivale*, with which it shares such characteristics as purplish, non-reflexed sepals, a relatively long terminal style segment, upper pedicel with long glandular hairs, and basal style segment with long glandular hairs. [= RAB, FNA, K, S, W, Y, Z]

Geum laciniatum Murray, Rough Avens. Mt (NC, SC, VA, WV), Cp (DE, VA), Pd (DE, VA): bogs and wet meadows; uncommon (rare in NC, SC, and VA). June-July; July-August. Two varieties are sometimes recognized: var. *laciniatum* has glabrous achenes and is generally more northern and more restricted in distribution than var. *trichocarpum*, which has achenes sparsely to densely pubescent with long stiff trichomes, and ranges from NS west to s. ON, south to MD, VA, w. NC, TN, OH, IL, MO, and KS. The difference appears to be that of a single trait, uncorrelated with other traits, and with largely overlapping geographic distributions; the varieties are not recognized here. [= RAB, C, FNA, GW, W, Y; > *G. laciniatum* var. *laciniatum* – F, G, K, WV, Z; > *G. laciniatum* var. *trichocarpum* Fernald – F, G, K, Z]

Geum lobatum (Baldwin ex Elliott) Smedmark, Lobed Barren Strawberry. Mt (GA, NC, SC), Pd (GA, SC): forests, streambanks; rare. March-May; May-June. Sw. NC south to nw. SC and n. and c. GA. Some populations appear to be morphologically intermediate between *G. lobatum* and *G.donianum*; further study is needed. [= Q, V; = ***Waldsteinia lobata*** (Baldwin ex Elliott) Torrey & A. Gray – FNA, K, S, Y, Z]

Geum radiatum Michaux, Spreading Avens, Cliff Avens. Mt (NC): high elevation rocky summits, in thin soil at tops of cliffs and on ledges (where not trampled), in pockets of soil on nearly vertical portions of cliffs, in open grassy balds, around *Rhododendron catawbiense* in grassy balds, or in grassy areas at bases of cliffs (where succession by shrubs is prevented by accumulation of seepage ice and by stone fall); rare. June-August; July-September. Ranging from Ashe County, NC (Phoenix Mountain) south and west to Sevier County, TN (Mount Leconte) and Transylvania County, NC (the Devil's Courthouse), restricted to "pseudo-alpine" rock outcrops and grassy meadows near the summits of the higher peaks of the Southern Blue

Ridge, notably Bluff Mountain, Three Top Mountain, Phoenix Mountain, and The Peak (Ashe County, NC), Grandfather Mountain (Watauga and Avery counties, NC), Grassy Ridge (Avery County, NC), Roan High Bluff (Mitchell County, NC), Mount Craig in the Black Mountains (Yancey County, NC), Craggy Pinnacle, Craggy Dome, and Craggy Gardens (Buncombe County), the Devil's Courthouse (Transylvania County, NC), and Mount Leconte (Sevier County, TN). *G. radiatum* is closely related to three other taxa, these siblings also restricted in range and endemic to mountainous areas, collectively showing a relictual distribution: *G. peckii* Pursh (of alpine meadows and moist, rocky slopes of NS and the higher peaks of NH and ME), *G. calthifolium* Menzies ex Smith var. *calthifolium* (of wet snow-melt meadows of w. BC, w. YT, s. AK, and the Aleutians), and *G. calthifolium* var. *nipponicum* (of wet snow-melt meadows of s. Kamchatka and Japan). It is illegal to collect *G. radiatum* without federal and state permits, and there is no justification (scientific or otherwise) for additional collections from known sites. This is one of the few plant species that has been seriously depleted by collection by scientists (several hundred herbarium sheets from Roan Mountain alone!), though recreational over-use of its habitats, and possibly also pollution and break-up of adjoining spruce-fir forests, are the more critical threats to its continued existence. [= RAB, FNA, K, W, Z; = *Sieversia radiata* (Michaux) Greene – S; = ***Parageum radiatum*** (Michaux) H. Hara – X; = *Acomastylis radiata* (Michaux) Bolle – Y]

Geum rivale Linnaeus, Water Avens, Purple Avens. Mt (WV): calcareous bogs, swamps, seepages, and wet meadows; rare. Circumboreal, in North America from NL (Labrador), Keewatin, and BC south to NJ, MD, WV (Pocahontas, Preston, Randolph, and Tucker counties), OH, IN, IL, MN, SD, NM, and WA. It is most closely related (in our area) to *G. geniculatum*. [= C, F, FNA, G, K, WV, Y]

Geum vernum (Rafinesque) Torrey & A. Gray, Spring Avens. Mt (NC, VA), Pd (DE*, NC, VA): seepages, swamps, roadsides, disturbed areas; common (uncommon in DE, NC, and VA), probably both native and introduced in our area, the native occurrences now being supplemented by its spread along roads from further west. April-May; May-June. [= RAB, C, F, G, GW, K, W, WV, Y, Z; = *Stylypus vernus* Rafinesque – S]

Geum virginianum Linnaeus, Cream Avens. Mt (NC, SC, VA, WV), Pd (DE, NC, SC, VA), Cp (DE, NC, VA): bottomland forests, moist slope forests, swamp forests, and extending upslope to mesic or even dry sites, especially over mafic rocks; common (uncommon in NC Piedmont and Coastal Plain, rare in DE). June-August; July-November. MA and NY west to IN, south to SC and TN. [= RAB, C, F, FNA, G, GW, K, W, WV, Y, Z; > *G. virginianum* – S; > *G. hirsutum* Muhlenberg ex Link – S]

Gillenia Moench 1802 (Indian-physic, Bowman's-root)

A genus of 2 species, herbs, of e. North America. The contention that *Gillenia* is a later homonym of *Gillena* and must therefore be rejected for the later name *Porteranthus* has been ruled against (see Robertson 1974; Brummitt 1988; Parkinson 1988). References: Nesom in FNA (in press); Robertson (1974)=Z; Kalkman in Kubitzki (2004).

1 Stipules ovate, 10-20 (125) mm long; lower leaf surface densely glandular; leaves trifoliate, the leaflets of the lower leaves laciniate-toothed to divided ..... ***G. stipulata***
1 Stipules linear, 6-8 mm long; lower leaf surface glabrous or sparsely glandular; leaves trifoliate, the leaflets of the lower leaves merely toothed, like the upper leaves ..... ***G. trifoliata***

Gillenia stipulata (Muhlenberg ex Willdenow) Nuttall, Midwestern Indian-physic. Pd (GA, NC, VA), Mt (GA, WV): dry to mesic woodlands and forests, especially over circumneutral soils derived from diabase (in NC) or greenstone (in VA); uncommon (rare in GA, NC, and VA). May-June; July-October. NY to KS, south to nw. GA and TX, and disjunct east of the Blue Ridge in sc. VA, c. NC, and c. GA. [= RAB, F, FNA, G, WV; = *Porteranthus stipulatus* (Muhlenberg ex Willdenow) Britton – C, K, S, W, Z]

Gillenia trifoliata (Linnaeus) Moench, Mountain Indian-physic. Mt (GA, NC, SC, VA, WV), Pd (DE, GA, NC, SC, VA), Cp (VA): moist forests, roadbanks, forest edges; common (rare in DE). April-June; August-October. ON west to MI, south to SC, AL, nc. GA, and MO. [= RAB, F, FNA, G, WV; = *Porteranthus trifoliatus* (Linnaeus) Britton – C, K, S, W, Z]

Kerria A.P. de Candolle 1818 (Kerria)

A monotypic genus, a shrub, of China and Japan. References: Henrickson & Weakley in FNA (in press); Kalkman in Kubitzki (2004).

* ***Kerria japonica*** (Linnaeus) A.P. de Candolle, Kerria, Japanese-rose. Pd (NC, SC, VA), Cp (VA): woodland borders, suburban woodlands; rare, native of China. April-May. Single and "doubled" forms are cultivated. [= C, F, FNA, G, K]

Malus P. Miller 1754 (Apple, Crabapple)

A genus of 30-50 species, trees and shrubs, north temperate. References: Robertson (1974)=Z; Kalkman in Kubitzki (2004).

1 Twigs thorny; leaves folded in bud; leaves often lobed; [native, sometimes weedy]; [subgenus *Chloromeles*].
  2 Leaves permenantly pubescent beneath; pedicels and hypanthium pubescent; [western, disjunct east to KY and MS] ..... ***M. ioensis***
  2 Leaves glabrous or nearly so; pedicels and hypanthium glabrous or wiith scattered long hairs; [widespread in our area].
    3 Leaves elliptic to elliptic-lanceolate, 2.5-8 cm long, 1-4 cm wide, mostly > 2× as long as wide, subacute to obtuse at the tip ..... ***M. angustifolia***

3 Leaves ovate to ovate lanceolate, 4-10 cm long, 2-7 cm wide, mostly < 2× as long as wide, acute to acuminate at the tip .... ***M. coronaria***
1 Twigs not thorny; leaves involute or convolute in bud; leaves unlobed; [cultivated and persistent or escaping]; [subgenus *Malus*].
4 Leaves densely pubescent in bud, permanently pubescent beneath; fruits large, > 5 cm in diameter ("apples") ..... ***M. pumila***
4 Leaves glabrous or nearly so; fruits small, < 3 cm in diameter ("crabapples").
5 Twigs glabrous; calyx deciduous; fruit ca. 1 cm in diameter ..... ***M. baccata***
5 Twigs pubescent; calyx persistent; fruit ca. 2 cm in diameter ..... ***M. prunifolia***

Malus angustifolia (Aiton) Michaux, Wild Crabapple. Cp (DE, FL, GA, NC, SC, VA), Pd (GA, NC, SC, VA), Mt (GA, NC, SC, VA, WV): forests, woodlands, fence-rows, dry hammocks; common (uncommon in Piedmont and Mountains, uncommon in FL, rare in WV). April-May; August-September. NJ, PA, OH, s. IL, and se. MO, south to n. peninsular FL, Panhandle FL and e. TX. [= RAB, S, W, WH; = *Pyrus angustifolia* Aiton – C, G, WV, Z; > *Pyrus angustifolia* var. *angustifolia* – F; > *Pyrus angustifolia* var. *spinosa* (Rehder) L.H. Bailey – F; > *M. angustifolia* var. *angustifolia* – K; > *M. angustifolia* var. *puberula* Rehder – K]

* ***Malus baccata*** (Linnaeus) Borkhausen, Siberian Crabapple. Mt (WV), Pd (DE), {KY, MD}: suburban woodlands; rare, native of e. Asia. [= *Pyrus baccata* Linnaeus – C]

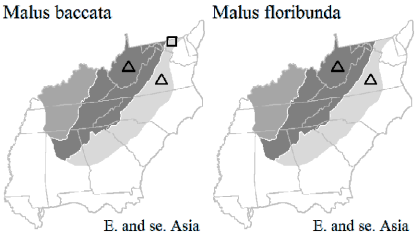
Malus coronaria (Linnaeus) P. Miller, Wild Crabapple. Mt (GA, NC, SC, VA, WV), Pd (DE, GA, NC, SC, VA), Cp (DE, GA, NC, SC): forests, woodlands, fencerows; common. May; September-October. NY, ON and WI south to GA, AL, and AR. [= RAB, K, W; = *Pyrus coronaria* Linnaeus – C, Z; > *Pyrus coronaria* Linnaeus var. *coronaria* – F, WV; > *Pyrus coronaria* Linnaeus var. *elongata* Rehder – F; > *Pyrus coronaria* Linnaeus var. *dasycalyx* (Rehder) Fernald – F; > *Pyrus coronaria* Linnaeus var. *lancifolia* (Rehder) Fernald – F, WV; = *Pyrus lancifolia* L.H. Bailey – G; > *Malus bracteata* L.H. Bailey – S; > *Malus coronaria* (Linnaeus) P. Miller – S; > *Malus lancifolia* Rehder – S; > *Malus coronaria* (Linnaeus) P. Miller var. *dasycalyx* Rehder]

* ***Malus floribunda*** Siebold ex Van Houtte, Japanese Flowering Crabapple. Mt (WV): disturbed areas; rare, native of Japan. [= K] {not yet keyed}

Malus ioensis (Wood) Britton *var.* ***ioensis***, Prairie Crabapple. Mt (WV): forests, woodlands, fence-rows; rare. MI, MN, e. SD, and w. NE, south to w. WV, KY, s. MS, se. LA, and c. TX. [= K; < *Pyrus ioensis* (Wood) L.H. Bailey – C, F, G; < *M. ioensis* – WV]

* ***Malus prunifolia*** (Willdenow) Burkhardt, Chinese Crabapple. Pd (VA), Mt (WV), {SC}. [= K; = *Pyrus prunifolia* Willdenow – C]

* ***Malus pumila*** P. Miller, Common Apple. Mt (NC, SC, VA, WV), Pd (DE, NC, SC, VA), Cp (DE, NC, SC, VA): commonly cultivated throughout, especially in the Mountains and Piedmont, and long persistent; uncommon, native of Asia. April-May; July-October. [= RAB, K, W; = *Pyrus malus* Linnaeus – C, F, G, WV, Z; = *Malus malus* (Linnaeus) Britton – S; = *Malus domestica* Burkhart]



Neillia D. Don 1825 (Lace Shrub)

A genus of about 3 species, shrubs, of e. Asia. Oh & Potter (2005) present strong evidence for the inclusion of *Stephanandra* in *Neillia*. References: Weakley & Wright in FNA (in press); Oh (2006)=Z; Oh & Potter (2005); Kalkman in Kubitzki (2004).

* ***Neillia incisa*** (Thunberg) S.H. Oh, Lace Shrub. Pd (VA): suburban woodlands; rare, establishing from horticultural plantings, native of Japan and Korea. [= FNA, Z; = *Stephanandra incisa* (Thunberg) Zabel – K]

Neviusia A. Gray 1858 (Snow-wreath)

A genus of 2 species, shrubs, of e. North America and California. References: Kalkman in Kubitzki (2004).

Neviusia alabamensis A. Gray, Alabama Snow-wreath. Mt (GA): limestone woodlands, where there is seasonal moisture; rare. Sc. TN (Chester, Wofford, & Kral 1997), nw. GA (Jones & Coile 1988), and n. AL; disjunct in AR and MO. [= K, S]

Photinia Lindley 1821 (Photinia, Redtip)

A genus of about 40 species, trees and shrubs, of Asia and Central America. References: Nesom in FNA (in press); Kalkman in Kubitzki (2004). [also see *Aronia* and *Pourthiaea*]

1 Leaves evergreen, coriaceous, (6-) 9-20 cm; inflorescences 4-18 cm wide; pedicels without lenticels ..... ***P. serratifolia***
1 Leaves deciduous, herbaceous, 4-9 cm long; inflorescences 3-6 cm wide, pedicels with warty lenticels ..... [see ***Pourthiaea***]

* ***Photinia serratifolia*** (Desfontaines) Kalkman, Taiwanese Redtip. Cp (AL, LA, MS), Pd (AL), Mt (AL), {GA}: suburban woodlands; uncommonly cultivated and rarely naturalizing, native of e. Asia. Also reported from MS and LA as long-persistent and weakly naturalizing. [= FNA, K]

Physocarpus (Cambessèdes) Rafinesque 1838 (Ninebark)

A genus of 3-5 species, shrubs, of North America and ne. Asia. References: Alexander in FNA (in press); Robertson (1974)=Z; Kalkman in Kubitzki (2004).

1 Follicles stellate-pubescent ..... ***P. opulifolius*** *var.* ***intermedius***
1 Follicles glabrous ..... ***P. opulifolius*** *var.* ***opulifolius***

Physocarpus opulifolius (Linnaeus) Maximowicz *var.* ***intermedius*** (Rydberg) B.L. Robinson, Midwestern Ninebark. Cp (FL), Pd (SC, NC?): mesic hammocks, streambanks; rock outcrops; rare. W. NY west to MN and CO, south to SC, FL, AL, and AR. It is unclear whether the southern species recognized by Small (1933) are best allied with this taxon. Additional study is needed. [= C, F, G, K, Z; < *P. opulifolius* – RAB, W, WH; = *P. intermedius* (Rydberg) C.K. Schneider – FNA; > *Opulaster alabamensis* Rydberg – S; > *Opulaster stellatus* Rydberg – S; > *Opulaster intermedius* Rydberg]

Physocarpus opulifolius (Linnaeus) Maximowicz *var.* ***opulifolius***, Eastern Ninebark. Mt (NC, SC, WV), Pd (DE, NC, SC), {GA, VA}: stream banks, riverside thickets, rock outcrops, cliffs, especially over mafic or calcareous rocks; common. May-July. QC west to WI, south to SC, TN, and n. IL. [= C, F, G, K, Z; < *P. opulifolius* – RAB, W, WV; = *P. opulifolius* – FNA; > *Opulaster opulifolius* (Linnaeus) Kuntze – S; > *Opulaster australis* Rydberg – S]

Potentilla Linnaeus 1753 (Cinquefoil, Five-fingers, Potentilla)

A genus of 400-500 species, depending on the controversial circumscription. References: Ertter, Elven, Reveal, & Murray in FNA (in press); Robertson (1974)=Z; Eriksson, Donoghue, & Hibbs (1998); Eriksson et al. (2003); Kalkman in Kubitzki (2004).

1 Flowers in terminal cymes; leaves palmately 3-9-foliolate.
  2 Leaves 3-foliolate; [section *Rivales*].
    3 Petals and sepals subequal; stamens (15-) 20; achenes usually ridged ..... ***P. norvegica***
    3 Petals much shorter than the sepals; stamens 5-10 (-15); achenes smooth ..... ***P. rivalis***
  2 Leaves 5-9-foliolate.
    4 Leaves (5-) 7-9-foliolate; petals 8-15 mm long, pale (sulphur) yellow; [section *Rectae*] ..... ***P. recta***
    4 Leaves 5 (-7)-foliolate; petals 3-7 (-8) mm long, medium yellow; [section *Terminales*].
      5 Leaves pubescent beneath, the green surface not concealed; petals 4-5 mm long ..... ***P. intermedia***
      5 Leaves densely tomentose beneath, the surface concealed; petals **either** 2.5-4 mm long **or** 5-7 (-8) mm long.
        6 Pubescence of the stem and veins of the leaf undersurface tomentose only; lower leaf surface silvery-white tomentose; leaves revolute; petals 2.5-4 mm long ..... ***P. argentea***
        6 Pubescence of the stem and veins of the leaf undersurface tomentose and also with long, spreading hairs; lower leaf surface somewhat to strongly grayish-tomentose; leaves not revolute; petals 5-7 (-8) mm long ..... ***P. inclinata***
1 Flowers solitary, on naked, axillary pedicels; leaves **either** palmately 3-5-foliolate **or** pinnately (5-) 7-21 (-31)-foliolate.
  7 Leaves pinnately (5-) 7-21 (-31)-foliolate; [section *Anserinae*] ..... ***P. anserina***
  7 Leaves palmately 3-5-foliolate.
    8 Leaves 3-foliolate; fruit strawberry-like, fleshy and red, consisting of an expanded fleshy receptacle bearing superficial achenes; [formerly genus *Duchesnea*] ..... ***P. indica***
    8 Leaves primarily 5-foliolate on a plant (some poorly developed leaves may be 3-4-foliolate); fruit a head of achenes, dry; [section *Potentilla*].
      9 Plants lacking rhizomes; petals (6-) 8-12 mm long; anthers 1.3-2.0 mm long ..... ***P. reptans***
      9 Plants with horizontal rhizomes; petals 4-10 mm long; anthers 0.6-1.0 mm long.
        10 Terminal leaflet toothed for > ½ its length; plant flowering at 2nd node of stolon, typically with 2 leaves and 1 pedicel at each subsequent node; plants only flowering on elongating stolons ..... ***P. simplex***
        10 Terminal leaflet toothed for < ½ its length; plant flowering at 1st node of stolon, typically with only 1 leaf and pedicel at each subsequent node; plants often flowering on short stolons obscured by basal leaves.
          11 Middle leaflet of larger leaves 1.5-4 cm long; plants silky-pilose, the pubescence appressed or loosely ascending ..... ***P. canadensis*** *var.* ***canadensis***
          11 Middle leaflet of larger leaves 3-6 cm long; plants long-villous, the pubescence loosely spreading to reflexed ..... ***P. canadensis*** *var.* ***villosissima***

* ***Potentilla anserina*** Linnaeus, Silverweed. Lawns, disturbed areas. Circumboreal, south in North America to MA, NY, nw. PA, OH, IN, IL, IA, NE, NM, AZ, and CA; also scattered further south, apparently as an introduction, as in Sevier County, TN (Chester, Wofford, & Kral 1997), se. PA (Rhoads & Klein 1993), MD (BONAP 2010), and n. NJ (BONAP 2010). [= C, F, G; > *Potentilla anserina* ssp. *anserina* – FNA; = *Argentina anserina* (Linnaeus) Rydberg – K]

* ***Potentilla argentea*** Linnaeus, Silvery Five-fingers, Hoary Five-fingers. Mt (NC, VA, WV), Pd (NC, VA), Cp (NC, VA): disturbed areas; uncommon (rare in NC and VA), naturalized from Europe. May-July. [= RAB, C, F, FNA, G, W; > *P. argentea* var. *argentea* – K]

Potentilla canadensis Linnaeus *var.* ***canadensis***, Running Five-fingers. Mt (GA, NC, SC, VA, WV), Pd (DE, GA, NC, SC, VA), Cp (DE, GA, NC, SC, VA): woodlands, forests, fields, lawns, disturbed areas; common. March-May; April-June. The relative distributions and habitats of the two varieties obscure. [= F, G, K; < *P. canadensis* – RAB, C, FNA, W; = *P. pumila* Poiret – S]

Potentilla canadensis Linnaeus *var.* ***villosissima*** Fernald, Hairy Five-fingers. Pd (NC): woodlands, forests, fields, lawns, disturbed areas; uncommon. March-May; April-June. The relative distributions and habitats of the two varieties obscure. [= F, G, K; < *P. canadensis* – RAB, C, FNA, W; = *P. caroliniana* Poiret – S]

* ***Potentilla inclinata*** Villars. Cp (NC): disturbed areas; rare, naturalized from Europe. May-June. [= C, FNA, K; *? P. canescens* Bess. – RAB, F, G]

* ***Potentilla indica*** (Andrews) T. Wolf, Indian-strawberry. Cp (DE, FL, GA, NC, SC, VA, WV), Pd (DE, GA, NC, SC, VA), Mt (GA, NC, SC, VA): disturbed areas, lawns, gardens; common (uncommon in FL and WV), native of Asia. February-frost. *Duchesnea* is apparently not closely related to *Fragaria*, and is best combined with *Potentilla*, which does have other species with accrescent fruits (Eriksson, Donoghue, & Hibbs 1998). The strawberry-like fruit is not sweet; it can also be distinguished from *Fragaria* by its whitish interior flesh. The leaves are more coarsely toothed than *Fragaria*. [= *Duchesnea indica* (Andrews) Focke – RAB, C, F, G, K, S, W, WH, WV]

* ***Potentilla intermedia*** Linnaeus. Mt (NC, VA), Pd (VA), Cp (VA), {MD}: disturbed areas; rare, naturalized from Europe. May-July. [= RAB, C, F, FNA, G, K]

Potentilla norvegica Linnaeus, Strawberry-weed, Rough Cinquefoil. Mt (GA, NC, VA, WV), Cp (DE, NC, VA), Pd (DE, GA, NC, SC, VA): pastures, fields, disturbed areas, especially where moist; common (uncommon in GA, NC, SC, and VA Piedmont, uncommon in GA, NC, SC, and VA Coastal Plain). Late May-frost; June-frost. This species is apparently a complex circumboreal species complex, with both native and introduced elements now present in NC. [= RAB, C, FNA, G, W, WV; > *P. norvegica* var. *norvegica* – F; > *P. norvegica* ssp. *monspeliensis* (Linnaeus) Ascherson & Graebner – K; > *P. monspeliensis* Linnaeus – S; > *P. norvegica* ssp. *hirsuta* (Michaux) Hylander]

* ***Potentilla recta*** Linnaeus, Sulphur Five-fingers. Mt (GA, NC, SC, VA, WV), Pd (DE, GA, NC, SC, VA), Cp (DE, FL, GA, NC, SC, VA): disturbed areas; common (rare in FL), naturalized from Europe. April-July; May-August. [= RAB, C, F, FNA, G, K, W, WH, WV]

* ***Potentilla reptans*** Linnaeus, Creeping Five-fingers. Pd (DE), Mt (WV), Cp (VA): disturbed areas; uncommon (rare in WV), native of Eurasia. June-August. Also reported for VA (Cronquist 1991, Kartesz 1999) and occurs as well in se. PA (Rhoads & Klein 1993). [= C, F, FNA, G, K]

* ***Potentilla rivalis*** Nuttall, Brook Five-fingers. Mt (VA, WV), Pd (VA), Cp (VA): habitat not known; rare, adventive from further west. [= C, FNA, G, K; > *P. millegrana* Engelmann ex Lehmann – F; > *P. rivalis* var. *millegrana* (Engelmann ex Lehmann) S. Watson]

Potentilla simplex Michaux, Old-field Five-fingers. Cp (DE, FL, GA, NC, SC, VA), Mt (GA, NC, SC, VA, WV), Pd (DE, GA, NC, SC, VA): woodlands, fields, disturbed areas; common (rare in FL). April-June; April-July. NL (Newfoundland) and MN south to Panhandle FL, AL, and TX. [= RAB, C, FNA, G, K, W, WV; > *P. simplex* var. *simplex* – F; > *P. simplex* var. *argyrisma* Fernald – F; > *P. simplex* var. *calvescens* Fernald – F; > *P. simplex* – S; > *P. canadensis* – S, misapplied]

Poteridium Spach 1846 (American Burnet)

A genus of 2 species, herbs, of c. and w. North America. References: Weakley in FNA (in press); Robertson (1974)=Z; Nordborg (1966, 1967)=Y; Kalkman in Kubitzki (2004).

* ***Poteridium annuum*** (Nuttall ex Hooker) Spach, Prairie Burnet. Cp (SC): roadsides; rare, native of sc. United States. April-May. [= FNA; = *Sanguisorba annua* (Nuttall ex Hooker) Torrey & A. Gray – RAB, G, K, Z]

Poterium Linnaeus 1753 (Salad Burnet)

A genus of 6 or more species, herbs, of Eurasia, n. Africa, and North America. References: Weakley in FNA (in press); Robertson (1974)=Z; Nordborg (1966, 1967)=Y; Kalkman in Kubitzki (2004).

* ***Poterium sanguisorba*** Linnaeus ssp. ***muricatum*** (Spach) Rouy, Salad Burnet, Garden Burnet, Fodder Burnet. Mt (NC, VA, WV), Cp (DE, VA): cultivated as an herb and salad green, escaped to moist, disturbed areas; rare, native of Europe. June-July. [= FNA; = *Sanguisorba minor* Scopoli ssp. *muricata* (Spach) Nordborg – K, Y, Z; < *Sanguisorba minor* – RAB, C, F, G, WV; < *Poterium sanguisorba* Linnaeus – S; = *Poterium polygamum* Waldstein & Kitaibel]

Pourthiaea Decaisne 1874 (Photinia)

A genus of about 25 species, shrubs, of e. Asia. Guo et al. (2011) indicate that *Pourthiaea* should be separated from both *Photinia* and *Aronia*. References: Guo et al. (2011).

* ***Pourthiaea villosa*** (Thunberg) Decaisne, Oriental Photinia. Mt (NC), Pd (DE, NC): uncommonly cultivated, sometimes escaping to suburban woodlands; uncommon (rare in NC), native of e. Asia. [= Z; = *Photinia villosa* (Thunberg) A.P. de Candolle – FNA, K]

Prunus Linnaeus 1753 (Plum, Cherry, Sloe, Peach, Apricot)

A genus of about 200 species, trees and shrubs, nearly cosmopolitan, but especially in north temperate regions. References: Rohrer in FNA (in press); Robertson (1974)=Z; McVaugh (1951)= Y; Catling, McKay-Kuja, & Mitrow (1999)=X; Shaw & Small (2004); Kalkman in Kubitzki (2004).

1 Flowers in elongate racemes of (12-) 20-many flowers.
  2 Leaves evergreen, entire or serrate with few or rather many (but widely spaced) prominent teeth; petioles lacking 2 glands near junction with leaf blade; [native in maritime situations from e. NC southward, but cultivated and escaped inland); [**laurel cherries**, subgenus *Laurocerasus*] ..... ***P. caroliniana***
  2 Leaves deciduous, regularly and rather finely toothed; petioles with 2 glands near the junction with the leaf blade; [collectively widespread, native and alien]; [**black cherries**, subgenus *Padus*] ..... **Key A**
1 Flowers solitary, in fascicles, in umbellate or corymbose inflorescences, or in short racemes (*P. mahaleb*) of 1-12 flowers.
  3 Flowers and fruit pedicellate, the pedicel > 4 mm long; fruit glabrous, ovary glabrous or pubescent initially.
    4 Stones globose, not 2-edged; sepals hairy or not; inflorescences subtended by leafy bracts arising from the same bud as the flowers (except *P. pensylvanica*, *P. susquehanae*, and *P. pumila* var. *depressa*); **cherries** ..... **Key B**
    4 Stones somewhat to strongly flattened, 2-edged; sepals hairy on the upper surface (except *P. domestica, P. insititia,* and *P. cerasifera*); inflorescences without leafy bracts arising from the same bud as the flower; **plums** ..... **Key C**
  3 Flowers and fruit sessile or on a pedicel < 2 mm long
    5 Fruit scarlet-red, 1 cm in diameter; twigs densely tomentose; fruit and ovary glabrous or somewhat pubescent (but not velvety); leaves < 5 (-7) cm long; petals white (pink in bud), < 13 mm long; [subgenus *Lithocerasus*, section *Armeniacocerasus*] ..... ***[P. tomentosa]***
    5 Fruit yellow, peach, or orange-colored, > 2 cm in diameter; twigs glabrous; fruit and ovary velvety pubescent; leaves > 5 cm long; petals white or pink, > 11 mm long.
      6 Leaves 8-15 cm long, > 4× as long as wide, falcate; fruit peach-colored, > 5 cm in diameter; [**peach**; subgenus *Amygdalus*] ..... ***P. persica***
      6 Leaves 5-10 cm long, 1-1.5× as long as wide, not falcate; fruit yellow to orange, 3-5 cm in diameter; [**apricots**; subgenus *Prunus*, section *Armeniaca*]
        7 Twigs reddish-brown; fruits 3-5 cm in diameter, the flesh sweet when ripe ..... ***P. armeniaca***
        7 Twigs bright green; fruits 2-3 cm in diameter, the flesh sour and/or bitter when ripe ..... ***P. mume***

KEY A – BLACK-CHERRIES, subgenus *Padus*

1 Petals 6-10 mm long; hypanthium pubescent within; stone sculptured; [alien, rarely naturalizing] ..... ***P. padus***
1 Petals 4-7 mm long; hypanthium glabrous within; stone smooth; [native].
  2 Leaf teeth triangular, pointing outwards; leaves dull above; sepals conspicuously glandular-eroded on the margin, not persistent on the fruit; colonial, thicket-forming shrub from rhizomes; [montane in our area] ..... ***P. virginiana*** *var.* ***virginiana***
  2 Leaf teeth curved, appressed; leaves shiny above; sepals entire or slightly glandular-eroded on the margin, persistent on the fruit; small to large tree, not clonal; [collectively widespread].
    3 Leaves mostly 1.5-2× as long as wide, often blunt-tipped (except in shoot leaves); lower leaf surface rather uniformly pubescent, the midrib lacking conspicuous tufts or fringes; branchlets reddish hairy ..... ***P. alabamensis***
    3 Leaves mostly 2-2.5× as long as wide, slightly acuminate; lower leaf surface glabrous except for tufts or fringes along the midrib; branchlets glabrous ..... ***P. serotina*** *var.* ***serotina***

Key B – CHERRIES, subgenera *Cerasus* and *Lithocerasus*

1 Plants shrubs, to 1.5 (-3) m tall; [subgenus *Lithocerasus*; section *Microcerasus*].
  2 Inflorescences of 1-2 flowers; [exotic, persistent from cultivation] ..... ***P. glandulosa***
  2 Inflorescences of 2-4 flowers; [native].
    3 Youngest twigs glabrous; leaf blades (1.6-) 3-4× as long as wide; plants decumbent; stones fusiform, (5.5-) 7.3-9.5 (-10.2) mm long; [plants of calcareous shores and gravel bars] ..... ***P. pumila*** *var. depressa*
    3 Youngest twigs minutely pubescent; leaf blades mostly 1.7-2.5× as long as wide; plants erect, stones mostly orbicular, (5.3-) 5.8-7.8 (-9.2) mm long; [plants of acid sandy or rocky upland sites] ..... ***P. susquehanae***
1 Plants trees, well over 3 m tall when mature; [subgenus *Cerasus*].
  4 Leaf serrations single to double, the tips of the serrations acuminate to attenuate.
    5 Leaf serrations attenuate; tree with upright form; [section *Sargentiella*] ..... ***P. serrulata***
    5 Leaf serrations acuminate; tree usually with weeping form; [section *Microcalymma*] ..... ***P. subhirtella***
  4 Leaf serrations small and obscure or well-developed but rounded to acute.
    6 Petals 4-7.5 mm long; fruit < 1 cm in diameter; [section *Phyllomahaleb*].
      7 Inflorescence with a central axis, thus nearly or actually racemose; fruit blackish; leaves 1-1.5× as long as wide; [exotic tree] ..... ***P. mahaleb***
      7 Inflorescence umbellate to corymbose, the central axis absent or poorly developed; fruit red; leaves 2-5× as long as wide; [native tree] ..... ***P. pensylvanica***
    6 Petals 9-15 mm long; fruit 1.3-2.5 cm in diameter; [section *Eucerasus*].
      8 Leaves 7-15 cm long, persistently hairy beneath, at least along the midrib and veins; pair of petiolar glands on the petiole near the blade; fruit sweet when ripe ..... ***P. avium***
      8 Leaves 4-8 cm long, glabrous beneath once fully-expanded; pair of petiolar glands on the base of the leaf blade; fruit sour when ripe. ..... ***P. cerasus***

KEY C – PLUMS, subgenus *Prunus*

1 Flowers 1-2 (-3) per inflorescence; stone somewhat sculptured; [exotic]; [section *Prunus*].
2 Leaves 4-6 cm long; fruits 2-3 cm long, yellow to red when ripe; inflorescence of a solitary flower ..... ***[P. cerasifera]***
2 Leaves 5-10 cm long; fruits 3-7 cm long, blue-black, yellow, or greenish when ripe; inflorescence of (1-) 2-3 flowers.
3 Fruit 5-7 cm long; single-trunked small to medium tree, usually thornless ..... ***P. domestica*** *var.* ***domestica***
3 Fruit 3-4 cm long; thicket-forming shrub to small tree, often thorny ..... ***P. domestica*** *var.* ***insititia***
1 Flowers (3-) 4-5 per inflorescence; stone nearly smooth; [native]; [section *Prunocerasus*].
4 Leaf teeth gland-tipped (or with a scar where the gland has fallen); sepals with marginal glands (except *P. angustifolia*); fruit yellow to red when ripe.
5 Leaves 3-6 cm long, often folded longitudinally; sepals lacking marginal glands ..... ***P. angustifolia***
5 Leaves 5-13 cm long, not folded; sepals with marginal glands.
6 Leaves < 2× as long as wide; petals 10-15 mm long; [of w. VA northward] ..... ***P. nigra***
6 Leaves > 2× as long as wide; petals 4-7 mm long; [of mw. United States, eastward into KY, TN, MS, and present as an introduction still farther eastward in NC, SC, VA, and GA].
7 Leaf teeth triangular, ascending, the gland terminal; flowers opening with the leaves ..... ***P. hortulana***
7 Leaf teeth depressed, the gland near the sinus; flowers opening before the leaves ..... ***P. munsoniana***
4 Leaf teeth glandless; sepals without marginal glands; fruit yellow, red, purple-red, purple, or black when ripe
8 Petals 10-15 mm long; leaves 6-10 cm long, acuminate; fruit 2-2.5 cm long, red or yellow.
9 Leaves narrowly to broadly cuneate at the base; petiole usually lacking glands near its junction with the leaf blade; sepals glabrous on the lower side ..... ***P. americana***
9 Leaves broadly rounded at the base; petiole usually with glands near its junction with the leaf blade; sepals pubescent on the lower side ..... ***P. mexicana***
8 Petals 4-9 mm long; leaves 4-8 cm long, obtuse, acute, or slightly acuminate; fruit 1.0-1.5 cm long, dark purple, black (rarely yellow or red).
10 Twigs and pedicels pubescent, often densely so; leaf apices acute to obtuse, rarely rounded; leaf blades mostly < 2× as long as wide; shrubs to 2.5 m tall; [Coastal Plain of e. VA northwards] ..... ***P. maritima***
10 Twigs and pedicels usually glabrous, but occasionally pubescent; leaf apices acute, sometimes acuminate; leaf blades mostly > 2× as long as wide; shrubs or small trees, 2-6 m tall; [either inland in the Mountains and Piedmont from nw. NC northward, or Coastal Plain, Piedmont, and Mountains of s. NC, SC, GA, FL, AL, MS, LA, and westward].
11 Plants often suckering and forming thickets, less often single plants, shrubs or less often trees; leaf apices short acuminate (to merely acute); pedicels usually < 10 mm long; [Mountains and Piedmont from nw. NC northward] ..... ***P. alleghaniensis*** *var.* ***alleghaniensis***
11 Plants usually not suckering, often single plants but sometimes in small colonies, generally trees; leaf apices mostly acute; pedicels usually > 10 mm long; [Coastal Plain, Piedmont, and Mountains of s. NC, SC, GA, FL, AL, MS, LA, and westward] ..... ***P. umbellata***

Prunus alabamensis C. Mohr, Alabama Black Cherry. Cp (AL, FL, GA, SC), Pd (GA), Mt (AL, GA): sandhills, other xeric sandy or rocky forests and woodlands, often associated with *Pinus palustris* (even in the Piedmont and Mountains); uncommon (rare north of GA). April-May; July-August. C. SC, nw. GA, n. AL south to Panhandle FL and s. AL; the NC record is based on a misidentified specimen. [= K; = *Prunus serotina* Ehrhart var. *alabamensis* (C. Mohr) Little – RAB, WH; > *Padus alabamensis* (C. Mohr) Small – S; > *Padus cuthbertii* Small – S; > *Padus australis* Beadle – S; = *Prunus serotina* ssp. *hirsuta* (Elliott) McVaugh – FNA, Y, Z]

Prunus alleghaniensis Porter *var.* ***alleghaniensis***, Allegheny Plum, Allegheny Sloe. Mt (NC, VA, WV), Pd (VA): dry rocky woodlands, shale barrens, primarily over calcareous or mafic rocks; rare. MA and NY south to w. VA, w. NC, and e. TN. Var. *davisii* (W. Wight) Sargent is endemic to MI. [= K; < *Prunus alleghaniensis* – C, F, G, W, WV; = *Prunus umbellata* Elliott var. *alleghaniensis* {in press} – FNA]

Prunus americana Marshall, Wild Plum. Mt (GA, NC, SC, VA, WV), Pd (DE, GA, NC, SC, VA), Cp (DE, FL, GA, NC, SC, VA): upland forests, bottomland forests, fencerows; common (uncommon in FL). March-April; July-August. ME to SK, south to n. peninsular FL, LA, OK, NM, and AZ. [= C, FNA, K, S, W, WH, WV, Z; = *Prunus americana* var. *americana* – RAB, F, G]

Prunus angustifolia Marshall, Chickasaw Plum. Cp (DE, FL, GA, NC, SC, VA), Pd (DE, GA, NC, SC, VA), Mt (GA, VA, WV): roadsides, fencerows, abandoned fields, especially sandy; common (uncommon in DE and FL, rare in WV). March-April; May-early July. NJ, PA, IN, IL, MO, NE, and CO, south to FL, TX, and e. NM. The original native distribution is unclear; much of its eastern distribution may be the result of early spread by native Americans. [= RAB, C, FNA, G, S, W, WH, WV, Z; > *Prunus angustifolia* var. *angustifolia* – F, K]

* ***Prunus armeniaca*** Linnaeus, Apricot. Cp (VA): persistent around old home sites; rare, native of n. China. [= C, FNA, K; = *Armeniaca vulgaris* Lamarck]

* ***Prunus avium*** Linnaeus, Sweet Cherry, Mazzard Cherry, Bing Cherry. Pd (DE, NC, VA), Mt (VA, WV), Cp (VA), {NC, SC}: common (uncommon in DE Piedmont, rare in DE Coastal Plain), native of Eurasia. [= RAB, C, F, FNA, G, K, S, W, WV, Z; = *Cerasus avium* (Linnaeus) Moench]

Prunus caroliniana (P. Miller) Aiton, Carolina Laurel Cherry. Cp (FL, GA, NC, SC), Pd* (GA*), Mt* (GA*): native in maritime forests and sandy hammocks near the coast, escaped from cultivation to fencerows and suburban forests and thickets in more inland areas; common (uncommon in GA, NC, SC). March-April; September-October. Se. NC south to FL, west to TX, near the coast. [= RAB, FNA, K, WH, Z; = *Laurocerasus caroliniana* (P. Miller) M. Roemer – S]

* ***Prunus cerasus*** Linnaeus, Sour Cherry, Pie Cherry. Mt (NC, VA, WV), Pd (DE, VA), Cp (VA), {GA}: commonly cultivated, disturbed areas; fencerows, suburban forests; rare, native of Eurasia. April-May; June. [= RAB, C, F, FNA, G, K, S, W, WV, Z; = *Cerasus vulgaris* P. Miller]

* ***Prunus domestica*** Linnaeus *var.* ***domestica***, European Plum. Pd (VA): suburban forests; rare, native of Europe. Introduced at scattered locations; reported for Manassas National Battlefield Park (Virginia Botanical Associates 2005); also reported for MD, PA, NJ. Depypere et al. (2009) found that *P. domestica* and *P. insititia* were genetically very similar, but generably separable morphologically; they favored combining the two into a single species based on their similarity, variability and likely origin from complicated hybridization and domestication by man. [= K; = *Prunus domestica* ssp. *domestica* – C; < *Prunus domestica* – FNA]

* ***Prunus domestica*** Linnaeus *var.* ***insititia*** (Linnaeus) Fiori & Paoletti, Damson, Bullace. Cp (DE), Pd (VA): uncommonly cultivated, suburban woodlands; rare, native of Europe. [= K; = *P. insititia* Linnaeus – F, G, Z; = *Prunus domestica* ssp. *institia* (Linnaeus) C.K. Schneider – C; = *Prunus domestica* Linnaeus var. *insititia* (Linnaeus) Fiori & Paoletti – K; < *Prunus domestica* – FNA]

* ***Prunus glandulosa*** Thunberg, Dwarf Flowering Almond. Cp (NC), Mt (WV): persisting at abandoned homesites; rare, native of c. and n. China and Japan. [= FNA, K; = *Cerasus glandulosa* (Thunberg) Sokolov]

* ***Prunus hortulana*** L.H. Bailey, Wild-goose Plum. Mt (VA, WV), Pd (VA), Cp (VA): disturbed areas; rare, presumably introduced only, native from s. OH, n. IN, n. IL, se. IA, and e. KS south to n. KY, n. AR, and ne. OK. [= C, F, FNA, G, K, S, WV, Z]

* ***Prunus mahaleb*** Linnaeus, Mahaleb Cherry, Perfumed Cherry, St. Lucie Cherry, Rock Cherry. Mt (NC, VA, WV), Pd (DE, NC, VA): roadsides, old homesites; rare, native of Europe. April-May; July. [= RAB, C, F, FNA, G, K, W, WV, Z; = *Cerasus mahaleb* (Linnaeus) P. Miller]

Prunus maritima Marshall, Beach Plum. Cp (DE, MD, VA*?): ocean dunes and sandy coastal soils (from e. MD northward), disturbed dune-like area on shore of Chesapeake Bay (in e. VA); uncommon (rare in MD and VA). Native from NB south to e. MD, along the coast; somewhat disjunct in e. VA in an ambiguously native occurrence. [= C, FNA; > *Prunus maritima* var. *maritima* – K; > *Prunus maritima* – F, G]

* ***Prunus mume*** (Siebold) Siebold & Zuccarini, Japanese Apricot. Pd (NC): suburban forests; rare, native of s. Japan. April-March. Documented as naturalizing in Battle Park, University of North Carolina, Chapel Hill, where apparently spread from cultivation and reproducing as early as 1939. [= *Armeniaca mume* Siebold]

*? ***Prunus munsoniana*** W. Wight & Hedrick, Munson Plum. Pd (GA, NC, VA), Mt (VA): roadsides; rare. OH, IL, MO, and KS, south to MS and TX; disjunct (introduced?) in GA, NC, VA, and NJ. [= C, F, G, K, S, Z]

Prunus nigra Aiton, Canada Plum. Mt (VA, WV), Pd (VA): old fields, hedgerows, forest edges; uncommon. May; June. NL (Newfoundland) west to MB, south to NY, OH, IN, IL, and IA; apparently disjunct in VA and WV. [= C, F, FNA, G, K, WV]

* ***Prunus padus*** Linnaeus, European Bird Cherry. Pd (DE): suburban woodlands; rare, native of Europe. Cultivated and rarely escaped at least as far south as se. PA (Rhoads & Klein 1993) and DE (Kartesz 1999). [= C, FNA, K]

Prunus pensylvanica Linnaeus f., Fire Cherry, Pin Cherry. Mt (GA, NC, VA, WV): high elevation forests, thickets at high elevations resulting from fire or logging; common (rare in GA). April-May; August-September. NL (Newfoundland) west to BC, south to w. NC, n. GA, e. TN, IN, IL, IA, SD, and CO. [= RAB, C, F, FNA, G, W, WV, Z; > *Prunus pensylvanica* var. *pensylvanica* – K; = *Prunus pennsylvanica* – S (an orthographic variant)]

* ***Prunus persica*** (Linnaeus) Batsch, Peach. Cp (FL, GA, NC, SC, VA), Pd (GA, NC, SC, VA), Mt (VA, WV): roadsides, trash-heaps, disturbed thickets; commonly cultivated, commonly escaped or persistent (rare in FL), native of China. March-April; June-July. [= RAB, C, F, FNA, G, K, W, WH, WV, Z; = *Amygdalus persica* Linnaeus – S]

Prunus pumila Linnaeus *var.* ***depressa*** (Pursh) Gleason, Prostrate Dwarf-cherry, Northern Sand Cherry. Mt (WV): sandy or gravelly shores and islands; rare. NL (Labrador) west to ON, south to NJ, s. PA (Rhoads & Klein 1993), c. WV, and TN. [= C, G, FNA, K, X; = *Prunus depressa* Pursh – F; < *Prunus pumila* – WV]

Prunus serotina Ehrhart *var.* ***serotina***, Black Cherry. Mt (GA, NC, SC, VA), Pd (DE, GA, NC, SC, VA), Cp (DE, FL, GA, NC, SC, VA): rich coves, bottomlands, northern hardwood forests, and in a wide variety of lower elevation habitats from dry to mesic, and weedy in fencerows; common. April-May; July-August. NS west to ND, south to c. peninsular FL and e. TX. Several other varieties occur in sc. and sw. North America, from c. TX westwards. In the Piedmont and Coastal Plain, *P. serotina* is generally a small, scrubby tree of fencerows and an understory tree in forests and woodlands, but in the Mountains reaching large sizes and full canopy stature. [= K, WH; < *Prunus serotina* var. *serotina* – RAB; < *Prunus serotina* – C, F, G, W; < *Padus virginiana* – S, misapplied; = *Prunus serotina* ssp. *serotina* – FNA, Y, Z]

* ***Prunus serrulata*** Lindley, Japanese Flowering Cherry. Pd (NC): suburban forests; rare, native of Japan. [= FNA, K; = *Cerasus serrulata* (Lindley) Loudon]

* ***Prunus subhirtella*** Miquel, Higan Cherry, Weeping Higan Cherry, Winter-flowering Cherry. Pd (VA), Mt (NC), Cp (FL): floodplain forests in suburban areas, other disturbed areas; rare, native of e. Asia, commonly planted, rarely escaped, but locally invasive. [= FNA, K; > *Prunus subhirtella* var. *pendula* (Maximowicz); = *Cerasus subhirtella* (Miquel) S.Y. Sokolov]

Prunus susquehanae Willdenow, Appalachian Dwarf-cherry, Appalachian Sand Cherry, Susquehanna Cherry. Pd (NC, VA), Mt (NC, VA): open rocky or sandy sites; rare. Sw. ME and sw. QC west to MB, south to nc. and sw. NC, sc. TN (the Barrens region of the Eastern Highland Rim), and IL. Catling (1997) supports species status, based on the greater distinctions of this entity from the other three in the complex. [= F, X; = *Prunus pumila* Linnaeus var. *susquehanae* (Willdenow) H. Jaeger – RAB, FNA, K; = *Prunus pumila* var. *cuneata* (Rafinesque) L.H. Bailey – C, G; = *Prunus cuneata* Rafinesque – S; < *Prunus pumila* – W, Z]

Prunus umbellata Elliott, Hog Plum, Flatwoods Plum. Cp (FL, GA, NC, SC), Pd (GA, NC, SC): upland, usually xeric, sandy or rocky forests and woodlands; common. March-April; August-September. S. NC, TN, and AR south to c. peninsular FL and TX. Fox, Godfrey, & Blomquist (1952) report *Prunus mitis* for s. NC (Cleveland County). It is presently unclear how best to treat variation in this complex. [> *Prunus umbellata* Elliott var. *umbellata* – K; > *Prunus umbellata* Elliott var. *injuncunda* (Small) Sargent – K; = *Prunus umbellata* – RAB, WH, Z; > *Prunus umbellata* – S; > *Prunus mitis* Beadle – S; > *Prunus injucunda* Small – S; = *Prunus umbellata* var. *umbellata* – FNA]

Prunus virginiana Linnaeus *var.* ***virginiana***, Choke Cherry. Mt (GA, NC, VA, WV): forming clonal thickets in oak and northern hardwood forests; common (uncommon in WV, rare in GA). Late April-June; July-August. NL (Newfoundland) and NL (Labrador) west to MB, south to w. NC, n. GA, AR, and OK. Other varieties occur in w. North America. [= FNA, K, Z; < *Prunus virginiana* – RAB, C, F, G, W, WV; = *Padus nana* (Du Roi) Roemer – S]

* *Prunus cerasifera* Ehrhart, Cherry Plum, Flowering Plum, Purpleleaf Plum. Introduced at scattered locations; reported for TN, PA, NJ (Kartesz 1999). [= F, FNA, K]

Prunus mexicana S. Watson, Big-tree Plum, Mexican Plum. {AL, KY, LA, MS}: streamsides, upland forests, fencerows; rare. IN, IL, and IA, south to AL, MS, LA, TX, and Mexico; reports from further east are apparently in error and based on pubescent material of *P. americana* .[= C, FNA, G, K, S, Z; = *Prunus americana* Marshall var. *lanata* – F]

* ***Prunus sargentii*** Rehder, Sargent Cherry, North Japanese Hill Cherry. Mt (WV): disturbed areas, rare, native of e. Asia. {not yet keyed}

* *Prunus tomentosa* Thunberg, Nanking Cherry, Korean Cherry. Disturbed areas, suburban forests and woodlands. Naturalized at least as far south as MD Piedmont and PA; native of Asia. April. [= FNA, K]

Pyracantha M.J. Roemer 1847 (Firethorn, Pyracantha)

A genus of about 10 species, shrubs, of s. Europe east to e. Asia. References: Lance in FNA (in press); Nesom (2010)=Y; Robertson (1974)=Z; Kalkman in Kubitzki (2004). Key based on FNA.

1 Leaf blades ovate to lanceolate or oblanceolate, margins finely crenulate-serrulate, apices acute; young twigs grayish pubescent ... ***P. coccinea***
1 Leaf blades obovate, oblong-obovate, oblong, or elliptic, margins remotely serrulate-crenulate or entire, apices obtuse, notched, or apiculate; young twigs brownish or rusty pubescent.
  2 Pedicels and hypanthia glabrate at flowering ... ***P. fortuneana***
  2 Pedicels and hypanthia pubescent.
    3 Leaf apices obtuse, apiculate, or aristate ... ***P. atalantioides***
    3 Leaf apices notched or truncate ... ***P. koidzumii***

* ***Pyracantha atalantioides*** (Hance) Stapf. {AL, GA}; rarely escaped or persistent, native of China. [= Y]

* ***Pyracantha coccinea*** M.J. Roemer, Scarlet Firethorn. Cp (AL, GA, LA, MS, NC, SC, VA), Mt (WV): planted, persistent around old homesites, and rarely escaped to woodlands; rare, native of se. Europe and Asia Minor. Reported for AL, LA, OK, SC, TN, and TX (Nesom 2010a). [= K, Y, Z; = *Cotoneaster pyracantha* (Linnaeus) Spach – F, S; = *Crataegus pyracantha* Linnaeus]

* ***Pyracantha fortuneana*** (Maximowicz) H.L. Li, Chinese Firethorn. Cp (AL, FL), Pd (AL), Mt (SC), {GA, NC}: planted, rarely escaped or persistent, native of China. May-July; October-December. Reported for AL, SC, and TX (Nesom (2010a). [= K, WH, Y; > *P. crenatiserrata* (Hance) Rehder]

* ***Pyracantha koidzumii*** (Hayata) Rehder, Formosan Firethorn. Cp (AL, FL), Pd (AL, GA, NC, SC), Mt (AL): planted, rarely escaped to woodlands, uncommon (rare in GA, NC, and SC), native of Taiwan. Reported for AL, AR, FL, GA, LA, MS, OK, SC, TX (Nesom 2010a). [= K, WH, Y, Z]

Pyrus Linnaeus 1753 (Pear)

A genus of 10-20 species, trees and shrubs, of Eurasia and n. Africa. References: Robertson (1974)=Z; Kalkman in Kubitzki (2004). [also see *Aronia*, *Malus*, and *Sorbus*]

1 Fruit pyriform; flowers 2.5-3 cm across; leaves crenate; styles 5 ... ***P. communis***
1 Fruit subglobose; flowers either 2-2.5 cm or 3-3.5 cm across; leaves serrate; styles 2 or 5 (rarely 3 or 4).
  2 Fruit ca. 1 cm in diameter; styles 2 (-3) ... ***P. calleryana***
  2 Fruit 3-10 cm in diameter; styles (4-) 5 ... ***P. pyrifolia***

* ***Pyrus calleryana*** Decaisne, Bradford Pear, Callery Pear. Cp (DE, FL, GA, NC, SC, VA), Pd (DE, GA, NC, SC, VA), Mt (GA, NC, SC, VA, WV): commonly planted and persistent, becoming an aggressive naturalizer in fields, roadsides, and disturbed areas from NC northward; common (uncommon in GA, SC, and WV, rare in FL), native of China. March-April. Its abundant naturalization in MD and n. VA suggests that this species has the potential to become a serious pest in much of eastern North America (see Nesom 2000c, Vincent 2005). [= K, WH]

* ***Pyrus communis*** Linnaeus, Common Pear. Mt (GA, NC, SC, VA, WV), Pd (DE, GA, NC, SC, VA), Cp (DE, FL, GA, NC, SC, VA): planted, persistent around old houses and in orchards; uncommon (rare in FL), native of Europe. April; August-October. [= RAB, C, F, G, K, S, WH, WV, Z]

* ***Pyrus pyrifolia*** (Burmann f.) Nakai, Oriental Pear, Japanese Pear, Chinese Pear. Cp (VA), Pd (VA), Mt (WV): planted, persistent around old houses and in orchards; uncommon, native of Asia. April; August-October. [= F, K, Z]

Rhaphiolepis Lindley 1820 (Asian-hawthorn)

A genus of about 15 species, shrubs, of e. Asia.

* *Rhaphiolepis umbellata* (Thunberg) Makino, Japanese-hawthorn, Yedda-hawthorn. Widely planted, not yet demonstrated to naturalize, but seems very likely to.

Rhodotypos Siebold & Zuccarini 1841 (Jetbead)

A monotypic genus, a shrub, of Japan and China. References: Kalkman in Kubitzki (2004).

Identification notes: Distinguished by its opposite leaves and black, beadlke fruits.

* ***Rhodotypos scandens*** (Thunberg) Makino, Jetbead. Pd (DE, NC, SC, VA), Mt (WV), Cp (DE, VA): suburban woodlands, disturbed areas, roadsides, old house sites, well established locally; uncommon (rare in NC, SC, VA, and WV, rare in DE Coastal Plain), native of e. Asia. Late March-May. [= C, F, G, K, WV; ? *R. tetrapetalus* (Siebold) Makino]

Rosa Linnaeus 1753 (Rose)

A genus of more than 100 species, shrubs or woody vines; mainly of north temperate regions. Many cultivars cannot be readily identified to species. References: Joly & Bruneau (2007)=Y; Lewis (2008); Robertson (1974)=Z; Kalkman in Kubitzki (2004). Key adapted in part from FNA and Y.

1 Stipules adnate to the petiole only basally, for < ½ their length; vigorous climbing vines, 3-5 (-10) m tall; petals white.
  2 Stems brown-tomentose, stipitate-glandular; terminal leaflet petiolules 3-5 mm; pedicels tomentose, 3-6 mm; hypanthia subglobose, white tomentose; [section *Bracteatae*] ..... ***R. bracteata***
  2 Stems glabrous, eglandular; terminal leaflet petiolules 9-13 mm; pedicels glabrous, 12-30 mm; hypanthia cupulate, densely setose [section *Laevigatae*] ..... ***R. laevigata***
1 Stipules adnate to the petiole > ½ their length; vigorous climbing vines or shrubs, 0.3-4 m tall; petals white, pink, rose-purple, or yellow.
  3 Styles connate into a column which protrudes from the orifice by 3-6 mm (sometimes separating in fruit); stipule margins and auricles deeply laciniate (or entire to ciliate in *R. setigera*); vines, climbing and scrambling to 4 m tall; [section *Systylae*].
    4 Leaflets 3-5; stipule margins and auricles mostly entire or ciliate; inflorescences laxly corymbose; flowers 3-5 cm in diameter, petals single, rose-purple to pink; carpels 20-25, styles glabrous, exserted 5-6 mm beyond the orifice; [native] ..... ***R. setigera***
    4 Leaflets (5-) 7-9; stipule margins and auricles deeply laciniate; inflorescences paniculate; flowers 1.5-2.5 cm in diameter, petals single or double, white to shades of pink; carpels 6-20; styles glabrous or pubescent, exserted 3-5 mm beyond the orifice; [alien].
      5 Pedicels 18-25 mm, glabrous, eglandular; flowers 2-2.5 cm in diameter, hypanthium elongate-ovoid, 4-6.5 mm x 2-3 mm, eglandular; carpels 12-20, styles pubescent, exserted 3.5-5 mm beyond orifices (1.5-2 mm in diameter) of flat discs (3-4 mm in diameter) ..... ***R. luciae***
      5 Pedicels 5-12 mm, tomentose, stipitate glandular at least near the base; flowers 1.5-2.5 cm in diameter; hypanthium 2 mm × 1-1.5 mm, eglandular or stipitate-glandular; carpels 6-11, styles glabrous, exserted 3-4 mm beyond the orifice (0.5-1 mm in diameter) of conical discs (2-3 mm in diameter) ..... ***R. multifora***
  3 Styles distinct, usually only the stigmas protruding from the orifice, by 0-4 mm; stipule margins and auricles entire to serrate, not laciniate; shrubs, erect or arching, to 0.3-5 m tall.
    6 Sepals entire, tapering to apex, persistent on fruit and erect or nearly erect; flowers generally solitary, or with 1-3 laterals.
      7 Fruit dark red when ripe, 20-25 mm in diameter; petals 3-5 cm long; pedicel subtended by a clasping bract; [section *Cassiorhodon*] ..... ***R. rugosa***
      7 Fruit blackish when ripe, 8-16 mm in diameter; petals 1-2.5 cm long; pedicel lacking a clasping bract, though often with a modified 3-foliolate leaf; [section *Pimpinellifoliae*] ..... ***R. spinosissima***
    6 Sepals either lobed or with broadened apices, or if entire then spreading, reflexed, or deciduous from fruit; flowers solitary or corymbose.
      8 Inflorescence of a solitary flower (rarely with a few laterals), the paired bracts on the pedicel caducous; [section *Gallicae*].
        9 Leaves not glandular-ciliate (or only remotely so); leaves not rugose ..... ***R. ×damascena***
        9 Leaves glandular-ciliate; leaves rugose ..... ***R. gallica***
      8 Inflorescence either corymbose, or of a solitary flower and its pedicel subtended by persistent bracts.
        10 Sepals disparate in size and shape, the outer pinnatifid with leafy segments; orifice of the hypanthium ca. 1 mm in diameter, the styles slightly exserted; [aliens]; [section *Caninae*].
          11 Stems to 5 m tall, prickles all similar; leaflets abaxially glabrous or rarely pubescent on midveins, eglandular; bracts 6-18 mm × 4-5 mm, glabrous; sepals abaxially eglandular ..... ***R. canina***
          11 Stems to 3 m tall, prickles of varying sizes; leaflets abaxially pubescent or tomentose, rarely glabrous, glandular; bracts 13-15 mm × 5-7 mm, tomentose; sepals abaxially densely stipitate-glandular.
            12 Stipules 6-10 mm × 2-4 mm, margins mostly stipitate-glandular; leaflet blades 10-22 mm × 8-15 mm, abaxial surfaces glabrous or pubescent; glands of the leaves apple-scented; bracts caducous, glabrous, margins stipitate-glandular; pedicels 6-9 mm long, densely stipitate- or setose-glandular; flowers 2.5-4 cm in diameter; hips red, 10-25 mm × 10-22 mm, sepals subpersistent ..... ***R. rubiginosa***
            12 Stipules 10-16 (-20) mm × 3-4 mm, margins densely glandular-ciliate; leaflet blades 15-30 (-60) mm × 8-22 (-50) mm, abaxial surfaces tomentose; glands of the leaves resin-scented; bracts persistent, tomentose, margins ciliate-glandular; pedicels (11-) 20-35 mm long, densely stipitate-glandular; flowers 3.5-5 cm in diameter; hips dark red, 10-15 mm × 10-12 mm, sepals caducous before hips mature ..... ***R. tomentosa***
        10 Sepals alike, all entire or with a few scarcely leafy teeth near the base; orifice of the hypanthium ca. 2-4 mm in diameter, the opening blocked by the stigmas; [natives and aliens]; [section *Cinnamomeae*].
          13 Petals 10 or more (flowers 'doubled'); [alien] ..... ***R. cinnamomea***
          13 Petals 5; [native to North America (some populations may be locally introduced)].

14 Hypanthium glabrous.
15 Long and straight prickles present throughout the stems..... ***R. acicularis*** *ssp.* ***sayi***
15 Prickles absent from the stems, or present and short or curved.
16 Infrastipular prickles stout and broad-based..... ***R. virginiana***
16 Infrastipular prickles absent or not especially stout or broad-based.
17 Lower leaf surface with generally < 2 hairs per mm²; infrastipular prickles always absent on new stems; bristles always present on new stems; leaflets 7-9 ..... ***R. arkansana***
17 Lower leaf surface with generally >2 hairs per mm²; infrastipular prickles present or absent on new stems; bristles generally absent on new stems; leaflets 5-7..... ***R. blanda***
14 Hypanthium with glands.
18 Bristles present on new branches.
19 Infrastipular prickles absent..... ***R. arkansana***
19 Infrastipular prickles present..... ***R. carolina***
20 Fertile branches armed with straight, thin or rarely stout, circular or somewhat flattened infrastipular prickles, lacking internodal prickles or aciculi (or if these present , few and scattered); stems mostly thin, pendent or upright; hypanthia (later hips) and pedicels stipitate-glandular (rarely eglandular) ..... ***R. carolina*** *ssp.* ***carolina***
20 Fertile branches armed with straight, thin or often stout, circular or flattened infrastipular prickles, with internodal prickles of small prickles, aciculi, or stipitate glands, usually densely covering branches and adjacent stems; stems mostly thick, or upright; hypanthia (later hips) and pedicels stipitate-glandular or eglandular..... ***R. carolina*** *ssp.* ***subserrulata***
18 Bristles absent on new branches.
21 Leaflets 3.5-5× as long as wide; leaves with (5-) 7-9 (-11) leaflets; [c. MS westwards] ..... ***[R. foliolosa]***
21 Leaflets 1-3× as long as wide; leaves with (3-) 5-7 (-9) leaflets; [collectively widespread].
22 Hypanthium typically with > 86 glands; terminal leaflet oblong, generally with 20-30 small teeth per side..... ***R. palustris***
22 Hypanthium typically with < 86 glands; terminal leaflet ovate, elliptic, or obovate, with 10-18 (-23) small teeth per side.
23 Bristles absent on new stems; auricles > 3.8 mm long; stipules > 1.1 mm wide; infrastipular prickles stout, broad-based, and often curved ..... ***R. virginiana***
23 Bristles present or absent on new stems; auricles < 3.8 mm long; stipules < 1.1 mm wide; infrastipular prickles slender and not especially broad-based or curved.
23 Fertile branches armed with straight, thin or rarely stout, circular or somewhat flattened infrastipular prickles, lacking internodal prickles or aciculi (or if these present , few and scattered); stems mostly thin, pendent or upright; hypanthia (later hips) and pedicels stipitate-glandular (rarely eglandular) ..... ***R. carolina*** *ssp.* ***carolina***
23 Fertile branches armed with straight, thin or often stout, circular or flattened infrastipular prickles, with internodal prickles of small prickles, aciculi, or stipitate glands, usually densely covering branches and adjacent stems; stems mostly thick, upright; hypanthia (later hips) and pedicels stipitate-glandular or eglandular ..... ***R. carolina*** *ssp.* ***subserrulata***

Rosa acicularis Lindley *ssp.* ***sayi*** (Schweinitz) W.H. Lewis, Prickly Rose. Mt (WV): rocky forests; rare. June. South and east to WV (Cronquist 1991, Harmon, Ford-Werntz, & Grafton 2006). [= FNA, K, WV; = *R. acicularis* var. *bourgeauiana* (Crépin) Crépin – C, F; < *R. acicularis* – G, Y]

*? ***Rosa arkansana*** Porter. Mt (NC): {habitat}; rare. Reported from North Carolina portion of the Great Smoky Mountains National Park. [= C, FNA, Y; > *R. arkansana* var. *suffulta* (Greene) Cockerell – F, K]

Rosa blanda Aiton, Smooth Rose, Meadow Rose. Mt (WV), Pd (VA): rocky forests; rare. QC west to MB, south to s. PA (Rhoads & Klein 1993), MD, VA, WV (Harmon, Ford-Werntz, & Grafton 2006), OH, IN, IL, MO, KS, and MT. [= C, F, FNA, G, Y; > *R. blanda* var. *blanda* – K]

* ***Rosa bracteata*** J.C. Wendland, McCartney Rose, Chickasaw Rose. Cp (FL, VA), Pd (GA, NC, SC, VA): disturbed areas, suburban borders; uncommon (rare in GA, NC, SC, VA), persistent after cultivation, introduced. May-November; July-November. [= RAB, C, F, FNA, G, K, S, WH, Z]

* ***Rosa canina*** Linnaeus, Dog Rose. Mt (NC, VA, WV), Pd (VA), Cp (VA): pastures; rare, introduced. May-June; September-October. [= RAB, C, F, FNA, G, K, S, W, WV, Z]

Rosa carolina Linnaeus *ssp.* ***carolina***, Carolina Rose. Mt (GA, NC, SC, VA, WV), Pd (GA, NC, SC, VA), Cp (FL, GA, NC, SC, VA): upland forests, woodlands, pastures, roadsides; common (rare in FL). May-June; August-October. NB and ON south to FL and TX. [= FNA; < *R. carolina* – RAB, C, G, W, Y, Z; > *R. carolina* var. *carolina* – F; > *R. carolina* var. *grandiflora* (Baker) Rehder – F; > *R. carolina* var. *villosa* (Best) Rehder – F; < *R. carolina* var. *carolina* – K; > *R. carolina* – S; > *R. lyoni* Pursh – S; > *R. serrulata* Rafinesque – S]

Rosa carolina Linnaeus *ssp.* ***subserrulata*** (Rydberg) W.H. Lewis, Carolina Rose. Mt (GA, NC, SC, VA, WV), Pd (GA, NC, SC, VA): glades and barrens; rare. May-June; August-October. PA, IN, ON, and MI, and MO, south to SC, AL, and TX. [= FNA; < *R. carolina* – RAB, C, G, W, Y, Z; > *R. carolina* var. *carolina* – F; ? *R. carolina* var. *grandiflora* (Baker) Rehder – F; ? *R. carolina* var. *villosa* (Best) Rehder – F; < *R. carolina* var. *carolina* – K; ? *R. carolina* – S; ? *R. lyoni* Pursh – S; ? *R. serrulata* Rafinesque – S]

* ***Rosa cinnamomea*** Linnaeus, Cinnamon Rose. Mt (VA): disturbed areas; rare, native of Eurasia. [= F, FNA, G, K, Z; ? *R. majalis* Herrmann – C]

* ***Rosa ×damascena*** P. Miller (pro sp.) [***R. gallica*** Linnaeus × ***moschata*** J. Herrmann], Damask Rose. Mt (NC): disturbed areas; rare, persistent after cultivation, native of Europe. May-June; September-October. [= K; = *R. damascena* P. Miller – RAB]

* ***Rosa gallica*** Linnaeus, French Rose. Cp (DE), Mt (NC, VA), Pd (SC, VA): disturbed areas; uncommon (rare in NC, SC, and VA), native of Europe. May-June; September-October. There is a question as to whether the name *R. gallica* can be used; if not, it would be replaced with *R. austriaca*. Represented by many cultivated forms, some involving complex hybridization with

other species. *R.* ×*damascena* P. Miller is apparently a hybrid of *R. gallica* and *R. moschata* J. Herrmann. [= RAB, C, F, FNA, G, K, Z; = ***R. austriaca*** Crantz]

* ***Rosa laevigata*** Michaux, Cherokee Rose. Cp (FL, GA, NC, SC), {VA}: roadsides, moist forests; common (rare in NC, rare [if present] in VA), native of China. Late March-April; September-October. [= RAB, FNA, K, S, WH, Z]

* ***Rosa luciae*** Franchet & Rochebrune ex Crépin, Memorial Rose, Dorothy Perkins Rose, Lucie Rose. Pd (GA, NC, SC, VA), Cp (FL, NC, SC, VA), Mt (VA, WV): roadbanks, railroad embankments, disturbed areas; uncommon (rare in WV), native of e. Asia. May-June; September-October. See Duncan (1985) for documentation for GA. [= FNA; > *Rosa wichuraiana* Crépin – C, F, G, K, W, WH, Z; > *R. wichuriana* – RAB, orthographic variant]

* ***Rosa multiflora*** Thunberg ex Murray, Multiflora Rose. Mt (GA, NC, SC, VA, WV), Pd (DE, GA, NC, SC, VA), Cp (DE, FL, GA, NC, SC, VA): pastures, thickets, bottomlands, upland forests, bogs; common (uncommon in FL), native of Asia, aggressively invasive. May-June; September-October. [= RAB, C, F, FNA, G, K, S, W, WH, WV, Z]

Rosa palustris Marshall, Swamp Rose. Cp (DE, FL, GA, NC, SC, VA), Pd (DE, GA, NC, SC, VA), Mt (GA, NC, SC, VA, WV): swamp forests, bogs, streamsides; common. May-July; September-October. NB and ON south to c. peninsular FL, MS, and AR. [= RAB, C, F, FNA, G, GW, K, W, WH, WV, Y, Z; > *R. palustris* – K, S; > *R. floridana* Rydberg – S; > *R. obtusiuscula* Rydberg – K, S]

* ***Rosa rubiginosa*** Linnaeus, Eglantine Rose, Sweetbriar Rose. Mt (GA, NC, SC, VA, WV), Cp (DE, NC, SC, VA), Pd (DE, GA, NC, SC, VA): pastures, disturbed areas; uncommon (rare in GA, NC, and SC), native of Europe. May-June; September-October. Brummitt (2005) rejected the name *R. eglanteria* for *R. rubiginosa* [= FNA; > *R. eglanteria* Linnaeus – RAB, C, F, G, K, W, WV, Z; > *Rosa micrantha* Borrer ex J.E. Smith – RAB, C, F, G, K, S, W, Z; > *R. rubiginosa* – S]

* ***Rosa rugosa*** Thunberg, Japanese Rose, Rugosa Rose. Cp (DE, VA), Pd (VA), Mt (WV): coastal dunes, disturbed areas, cultivated and sometimes escaped; common (rare in VA), native of Asia. [= C, F, FNA, G, K, WV, Z]

Rosa setigera Michaux, Climbing Prairie Rose. Mt (GA*, NC, VA, WV), Cp (DE, FL, NC*, SC*), Pd (GA): stream banks, pastures; rare, nativity uncertain in portions of our area. May-June; September-October. [= RAB, C, FNA, S, W; > *R. setigera* var. *setigera* – F, G, K, WV, Z; > *R. setigera* var. *tomentosa* Torrey & A. Gray – F, G, K, WV, Z]

* ***Rosa spinosissima*** Linnaeus, Scotch Rose. Mt (VA): cultivated and rarely escaped; rare, native of Eurasia. [= F, FNA, G, K; > *R. pimpinellifolia* Linnaeus – C]

* ***Rosa tomentosa*** J.E. Smith. {NC} [= C, F, FNA, K, S]

Rosa virginiana P. Miller, Virginia Rose. Pd (DE, VA), Cp (DE), Mt (WV), {GA, NC}: moist to dry forests and woodlands; uncommon (rare in DE, VA, and WV). May-June; August-October. NL (Newfoundland) and ON south to GA, AL, and MO. C. TN (Chester, Wofford, & Kral 1997), e. and c. KY (Clark et al. 2005). [= C, F, FNA, G, S, W, Y, Z; > *R. virginiana* var. *virginiana* – K]

* *Rosa chinensis* Thunberg, Chinese Rose. Cp (AL, MS), {VA}. Reported for AL, MS, and VA (BONAP 2010). [= K] {not yet keyed}

* *Rosa* ×*dumetorum* Thuillier (pro sp.). {KY} Introduced in KY. [= K] {not yet keyed}

Rosa foliolosa Nuttall in Torrey & Gray, White Prairie Rose. Cp (MS): prairies; rare. SE. KS and w. OK south to w. AR, and e. and c. TX; disjunct in c. MS. [= FNA, K]

* *Rosa moschata* J. Herrmann, Musk Rose. Allegedly introduced in AL. [= K, S] {not yet keyed; investigate}

* ***Rosa rubrifolia*** Villars, Red-leaf Rose. {SC} Reported for SC (Kartesz 1999). [= K]

* ***Rosa xanthina*** Lindley, Yellow Rose. Reported for SC (Kartesz 1999). [= K] {investigate}

Rubus Linnaeus 1753 (Blackberry, Raspberry, Dewberry, Wineberry, Bramble)

A genus of about 250 species (if treated conservatively) or 2000-3000 microspecies, shrubs (and a few herbs), almost cosmopolitan in temperate areas. References: Robertson (1974)=Z; Alice & Campbell (1999); Widrlechner (1998); Kalkman in Kubitzki (2004).

Identification Notes: All of our species of *Rubus* except *R. dalibarda, R. odoratus*, and *R. pubescens* have biennial stems. The first year the stems remain sterile and are termed **primocanes**. The second year, these stems produce lateral branches with flowers and are termed **floricanes**. Primocane and floricane leaves differ.

1 Leaves simple.
  2 Leaves unlobed, elliptic to ovate-orbiculate, finely toothed, 1.5-3 cm long; plant an herb, < 1 dm tall; petals white ..... ***R. dalibarda***
  2 Leaves palmately lobed, orbicular, coarsely toothed, 9-30 cm long; plant a shrub, 10-20 dm tall; petals deep pink; [subgenus *Anoplobatus* – **flowering raspberries**] ..... ***R. odoratus***
1 Leaves 3-9-foliolate (reduced simple leaves may also be present in the inflorescence).
  2 Upright stems herbaceous, annual, not differentiated into primocanes and floricanes, unarmed or with a few weak bristles; stipules oblanceolate; [e. WV northwards]; [subgenus *Cylactis* – **dwarf raspberries**] ..... ***R. pubescens***
  2 Upright stems woody, biennial, differentiated into primocanes and floricanes, these usually well-armed with bristles and/or curved prickles; stipules linear; [collectively widespread].
    3 Fruit separating from the receptacle, the receptacle remaining on the pedicel; stems either strongly white-glaucous (*R. occidentalis*), or densely beset with slender-based prickles and bristles (*R. idaeus*), or densely pubescent with 3-5 mm long glandular hairs (*R. phoenicolasius*), or if not as above then the leaves pinnately 5-9-foliolate (*R. illecebrosus*); [subgenus *Idaeobatus* – **raspberries**].
      4 Floricane leaves pinnately 5-9-foliolate ..... ***R. illecebrosus***
      4 Floricane leaves 1-3-foliolate.
        5 Inflorescence paniculiform, many-flowered; berries sticky, purplish-red, lacking a glaucous bloom ..... ***R. phoenicolasius***
        5 Inflorescence corymbiform, few-flowered; berries not sticky, black or red (rarely purplish or yellow), with a glaucous bloom.
          6 Fruit black (rarely yellow); pedicels with stout curved prickles; stems (at least the primocanes) strongly white-glaucous .....

.....***R. occidentalis***

6 Fruit red (rarely purple or yellow); pedicels with narrow straight bristles and sometimes also glandular hairs; stems green.

7 Inflorescence without glandular hairs or gland-tipped bristles; [alien, cultivated, sometimes escaped or persistent].....

.....***R. idaeus*** *var.* ***idaeus***

7 Inflorescence with glandular hairs and gland-tipped bristles; [native in Mountains of NC and VA].....***R. idaeus*** *var.* ***strigosus***

3 Fruit retaining the receptacle; stems or leaves not as described above, except if beset with slender-based prickles and bristles then also < 1 m tall; [subgenus *Rubus* – **blackberries and dewberries**].

8 Canes very coarse, scrambling, often 2-3 m long, heavily armed; inflorescence cymose-paniculate; branches and pedicels of the floricanes armed with strong, flattened prickles (or nearly straight in *R. bifrons*); [alien, generally in disturbed habitats]; [**alien blackberries**].

9 Leaves compound, the leaflets additionally laciniately divided; leaves green beneath.....***R. laciniatus***

9 Leaves compound, the leaflets toothed; leaves grayish-tomentose beneath.

10 Prickles nearly straight; stems glabrescent; petals pale pink to red.....***R. bifrons***

10 Prickles recurved; stems canescent above; petals white to pale pink.....***R. discolor***

8 Canes delicate to coarse, arching or trailing, 0-4 m long, unarmed to strongly armed; inflorescence racemiform; branches and pedicels of the floricanes generally unarmed; [native, though often in disturbed habitats].

11 Primocanes prostrate, creeping, or low-arching, rooting at the tip or also at the nodes; [**dewberries**].

12 Stems armed with stout-based, usually recurved prickles, bristles lacking.....***R. flagellaris***

12 Stems primarily armed with narrow-based prickles or even narrower bristles, with or without stout-based prickles as well.

13 Inflorescence racemiform; bristles of the stem nonglandular (very small glandular hairs may be present).....***R. hispidus***

13 Inflorescence reduced, normally to a single flower per branch of the floricane.....***R. trivialis***

11 Primocanes erect, ascending, or high-arching, not rooting; [**native blackberries**].

14 Canes armed primarily with bristles or slender-based prickles.....***R. setosus***

14 Canes armed with heavy, stout-based, often recurved, prickles (or the canes essentially unarmed, the broad-based prickles few or almost absent).

15 Leaflets oblanceolate to obovate, definitely wider beyond the middle, generally obtuse or rounded at the tip; leaves densely white- or gray-tomentose beneath; [primarily of the Coastal Plain].....***R. cuneifolius***

15 Leaflets lanceolate to ovate, widest below or near the middle, generally acute or acuminate at the tip; leaves glabrous to pubescent beneath, but the pubescence not notably tight and white or gray; [collectively widespread].

16 Pubescence of the inflorescence rachis and pedicels predominantly gland-tipped, glandular hairs often present also on the young primocanes and the branches of the floricanes, the glands flattened to cupulate.....***R. allegheniensis***

16 Pubescence of the inflorescence rachis and pedicels nonglandular or glandular, glandular hairs absent elsewhere, the glands rounded.

17 Leaves glabrous (or very nearly so) beneath; canes with at most few and weak prickles; leaflets of the primocanes with attenuate to caudate apices.....***R. canadensis***

17 Leaves softly pubescent beneath; canes with many and strong prickles; leaflets of the primocanes with acute to acuminate apices.....***R. pensilvanicus***

Rubus allegheniensis Porter, Allegheny Blackberry. Mt (GA, NC, VA, WV), Pd (DE, NC, VA): forests, woodlands, grassy balds; common. May-June; July. NS west to MN, south to w. NC, n. GA, and e. TN. [= RAB, C, G, W; > *R. allegheniensis* var. *allegheniensis* – F, K, WV; > *R. allegheniensis* var. *gravesii* Fernald – F, K, WV; > *R. alumnus* L.H. Bailey – F, K, WV; > R. *concameratus* H.A. Davis & T. Davis – WV; ? *R. nigrobaccus* L.H. Bailey – S; > *R. pugnax* L.H. Bailey – WV; > *R. reravus* L.H. Bailey – F; > *R. rosa* L.H. Bailey – WV]

* ***Rubus bifrons*** Vest ex Trattinick. Cp (GA, NC, SC, VA), Pd (GA, NC, SC, VA), Mt (GA, NC, SC, VA): disturbed areas, roadsides, thickets; common, native of Europe. May-June; late June-July. [= RAB, C, F, G, K, W]

Rubus canadensis Linnaeus, Smooth Blackberry, Thornless Blackberry. Mt (GA, NC, SC, VA, WV): forests, woodlands, grassy balds, especially common at high elevations; common. June-July; July-August. NL (Newfoundland) west to MN, south (primarily in the Appalachians) to w. NC, e. TN, and n. GA. [= RAB, C, F, G, K, S, W, WV]

Rubus cuneifolius Pursh, Sand Blackberry. Cp (DE, FL, GA, NC, SC), Pd (GA, NC, SC, VA), Mt (VA): woodlands, forests, disturbed areas; common (rare in Mountains). Late April-early June; June-July. CT and NY (Long Island) south to s. FL and AL, MS, and se. LA, primarily on the Coastal Plain. [= RAB, C, G, GW, S, W; > *R. cuneifolius* var. *cuneifolius* – F; > *R. cuneifolius* var. *subellipticus* Fernald – F; > *R. cuneifolius* – K; > *R. longii* Fernald – F, K; > *R. probabilis* L.H. Bailey – K; > *R. sejunctus* L.H. Bailey – F]

Rubus dalibarda Linnaeus, Dewdrop, Robin-runaway, Star-violet. Mt (NC, VA, WV): bog margins and mountain swamp forests, often along spring seeps, mostly in dense shade beneath *Rhododendron maximum*; rare. June-September. NL (Newfoundland) west to MI and MN, south to NJ and OH, and disjunct to WV, sw. VA, and w. NC. [= *Dalibarda repens* Linnaeus – RAB, C, G, GW, K, S, W, WV; = *R. repens* (Linnaeus) Kuntze]

* ***Rubus discolor*** Weihe & Nees, Himalaya-berry. Cp, Pd (NC?, SC?, VA): disturbed areas, thickets; uncommon, native of Europe. [= C, K; = *R. procerus* P.J. Mueller – F; *? R. linkianus* Seringe – S, misapplied?]

Rubus flagellaris Willdenow, Common Dewberry. Cp (DE, FL, GA, NC, SC, VA), Pd (DE, GA, NC, SC, VA), Mt (GA, NC, SC, VA, WV): old fields, woodlands, roadsides, disturbed areas; common. April-May; May-July. NS west to MN, south to GA and LA. [= RAB, W; > *R. flagellaris* – C, F, G, K, S, WV; > *R. akermani* Fernald – F; > *R. arundelanus* Blanchard – G; > *R. baileyanus* Britton – F, K, S, WV; > *R. boyntoni* W.W. Ashe – F, orthographic variant; > *R. boyntonii* W.W. Ashe – K; > *R. cacaponensis* H.A. Davis & T. Davis – WV; > *R. cathartium* Fernald – F; > *R. celer* L.H. Bailey – F, K, WV; > *R. clarus* L.H. Bailey – F, K; > *R. cordifrons* L.H. Bailey – F; > *R. deamii* – K, WV; > *R. decor* L.H. Bailey – F, WV; > *R. depavitus* L.H. Bailey – F, K; > *R. enslenii* – C, F, G, K, S, WV; > *R. exsularis* L.H. Bailey – WV; > *R. fecundus* L.H. Bailey – WV; > *R. felix* L.H. Bailey – F, WV; > *R. grimesii* L.H. Bailey – F, K; > *R. hypolasius* Fernald – F; > *R. imperiorum* Fernald – F; > *R. iniens* L.H. Bailey – F, K; > *R. injunctus* L.H. Bailey – F, WV; > *R. invisus* (L.H. Bailey) Britton – F, K, S, WV; > *R. jaysmithii* – F, K; > *R. kentuckiensis* L.H. Bailey – F, WV; > *R. leviculus* L.H. Bailey – F, K; > *R. longipes* Fernald – F; > *R. michiganensis* (Card ex L.H. Bailey) L.H. Bailey – WV; > *R. montensis* L.H. Bailey – WV; > *R. multifer* L.H. Bailey – WV; > *R. nefrens* L.H. Bailey – F, K; > *R. obvius* L.H. Bailey – F, K; > *R. particularis* L.H. Bailey – F, K, WV; > *R. pernagaeus* Fernald – F, K; > *R. plexus* Fernald –

F, K; > *R. profusiflorus* L.H. Bailey – WV; > *R. pronus* L.H. Bailey – WV; > *R. recurvicaulis* Blanchard – C, F; > *R. redundans* L.H. Bailey – F; > *R. roribaccus* (L.H. Bailey) Rydberg – F, K, WV; > *R. rosagnetis* L.H. Bailey – F; > *R. russeus* L.H. Bailey – WV; > *R. sailori* – L.H. Bailey – WV; > *R. scambens* L.H. Bailey – F, K; > *R. sewardianus* – F, K; > *R. steelei* L.H. Bailey – WV; > *R. subinnoxius* Fernald – F; > *R. temerarius* L.H. Bailey – F, K; > *R. terraltanus* L.H. Bailey – WV; > *R. tetricus* L.H. Bailey – F; > *R. vixalacer* L.H. Bailey – WV; > *R. whartoniae* L.H. Bailey – F, K]

Rubus hispidus Linnaeus, Swamp Dewberry. Cp (DE, GA, NC, SC, VA), Mt (GA, NC, VA, WV), Pd (GA, NC, VA): bogs, moist woodlands and forests, disturbed moist areas; common. May-June; June-July. NS and QC west to WI, south to n. SC, n. and wc. GA (Carter, Baker, & Morris 2009), and MO. [= RAB, C, G, GW, S, W; > *R. ambigens* Fernald – F; > *R. davisiorum* L.H. Bailey – F, WV; > *R. hispidus* – K, WV; > *R. hispidus* var. *hispidus* – F; > *R. hispidus* var. *obovalis* (Michaux) Fernald – F; > *R. huttonii* L.H. Bailey – F, WV; > *R. paganus* L.H. Bailey – K, WV; > *R. porteri* L.H. Bailey – F, K; > *R. provincialis* L.H. Bailey – K, WV; > *R. tardatus* Blanchard – F, K; > *R. vagulus* L.H. Bailey – F; > *R. vegrandis* L.H. Bailey – F; > *R. vigil* L.H. Bailey – F; > *R. zaplutus* L.H. Bailey – F]

* ***Rubus idaeus*** Linnaeus *var.* ***idaeus***, Cultivated Red Raspberry. Mt (NC, VA): disturbed areas; rare (commonly cultivated in the cooler portions of our area, rarely escaped or persistent), native of Eurasia. June-August; July-September. [= C, F; = *R. idaeus* – G; = *R. idaeus* ssp. *idaeus* – K]

Rubus idaeus Linnaeus *var.* ***strigosus*** (Michaux) Maximowicz, Red Raspberry. Mt (NC, VA, WV): high elevation forests and thickets, adelgid-killed spruce-fir forests; uncommon (rare in NC and VA). June-August; July-September. The species is circumboreal; var. *strigosus* ranges from NL (Newfoundland) west to AK, south to PA, IN, IA, and AZ; disjunct further south in nw. VA and ne. WV, and in w. NC and e. TN. [= C; > *R. idaeus* Linnaeus var. *canadensis* (Richardson) House – RAB, F; > *R. idaeus* var. *strigosus* – F; = *R. strigosus* Michaux – G, WV; = *R. idaeus* ssp. *strigosus* (Michaux) Focke – K; > *R. carolinianus* Rydberg – S; > *R. idaeus* ssp. *sachalinensis* (Levl.) Focke – W; > *R. idaeus* ssp. *melanolasius* Focke var. *canadensis* – Z]

* ***Rubus illecebrosus*** Focke, Strawberry-raspberry. Mt (NC, VA, WV): disturbed areas; rare, native of Japan. [= RAB, C, F, G, K, WV]

* ***Rubus laciniatus*** Willdenow, Cut-leaved Blackberry, Evergreen Blackberry. Mt (NC, SC, VA, WV), Pd (NC, SC, VA), Cp (DE): disturbed areas, thickets; rare, native of Europe. May-June; June-July. [= RAB, C, F, K, W, WV]

Rubus occidentalis Linnaeus, Black Raspberry, Blackcap. Mt (NC, SC, VA, WV), Pd (DE, NC, SC, VA), Cp (NC, SC, VA), {GA}: roadsides, woodlands, thickets, disturbed areas; common (increasingly rare southward in our area; much more common in VA and WV than in NC, and rare in n. SC). Late April-early June; June-July. QC to ND and e. CO, south to n. GA, c. AL, n. MS, AR, and c. OK. [= RAB, C, F, G, K, S, W, WV, Z]

Rubus odoratus Linnaeus, Flowering Raspberry. Mt (GA, NC, VA, WV), Pd (DE): moist roadsides, thickets, and forests; common (rare in DE). June-August; July-October. NS west to MI, south to w. NC, n. GA, and e. TN. [= RAB, C, G, W, Z; > *Rubus odoratus* var. *odoratus* – F, K, WV; > *Rubus odoratus* var. *columbianus* Millspaugh – F, K, WV; = *Rubacer odoratum* (Linnaeus) Rydberg – S]

Rubus pensilvanicus Poiret, Pennsylvania Blackberry. Cp (DE, GA, NC, SC, VA), Pd (DE, GA, NC, SC, VA), Mt (GA, NC, SC, VA, WV): roadsides, thickets, woodlands; common. April-May; late May-July. ME west to MN, south to FL and TX. The most common "highbush" blackberry in most of our area. [= *R. argutus* – W; > *R. argutus* Link – RAB, C, F, G, GW, K, S; > *R. abactus* L.H. Bailey – WV; > *R. andrewsianus* Blanchard – WV; > *R. barbarus* L.H. Bailey – F; > *R. bellobatus* L.H. Bailey – WV; > *R. betulifolius* Small – RAB, S; > *R. blakei* L.H. Bailey – F; > *R. condensiflorus* L.H. Bailey – F; > *R. congruus* Bailey – F; > *R. cupressorum* Fernald – F; > *R. defectionis* Fernald – F, K; > *R. densissimus* H.A. Davis & T. Davis – WV; > *R. dissitiflorus* Fernald – F; > *R. fatuus* Bailey – F; > *R. floricomus* Blanchard – F, K; > *R. floridus* Tratt. – F, S; > *R. frondosus* Bigelow – F, K, WV; > *R. immanis* L.H. Bailey – K; > *R. jennisonii* L.H. Bailey – WV; > *R. jugosus* L.H. Bailey – F; > *R. laudatus* Berger – K, WV; > *R. leggii* H.A. Davis & T. Davis – WV; > *R. libratus* L.H. Bailey – F; > *R. louisianus* Berger – F; > *R. orarius* Blanchard – C; > *R. ostryifolius* Rydberg – G; > *R. pauxillus* L.H. Bailey – F, K; > *R. pensilvanicus* – C, F, G, K, WV; > *R. pergratus* Blanchard – K; > *R. philadelphicus* Blanchard – WV; > *R. praepes* L.H. Bailey – F; > *R. prestonensis* H.A. Davis & T. Davis – WV; > *R. recurvans* Blanchard – F, K; > *R. rosarius* L.H. Bailey – K; > *R. subsolanus* L.H. Bailey – F, WV; > *R. tygartensis* H.A. Davis & T. Davis – WV]

* ***Rubus phoenicolasius*** Maximowicz, Wineberry. Mt (GA, NC, SC, VA, WV), Pd (DE, NC, SC, VA), Cp (DE, VA): roadsides, thickets; common, native of e. Asia. May-June; June-July. [= RAB, C, F, G, K, S, W, WV]

Rubus pubescens Rafinesque, Dwarf Blackberry. Mt (WV): bogs; rare. May-June. NL (Labrador) to YT, south to e. WV and s. PA (Rhoads & Klein 1993), IN, CO, and WA. [= C, G, WV; > *R. pubescens* var. *pubescens* – F, K]

Rubus setosus Bigelow, Bristly Blackberry. Mt (VA, WV): thickets; rare. June-July. QC west to MN, south to VA and IL. [= C, G; > *R. angustifoliatus* L.H. Bailey – F; > *R. benneri* L.H. Bailey – F; > *R. elegantulus* Blanchard – K; > *R. groutianus* Blanchard – WV; > *R. nocivus* L.H. Bailey – F; > *R. notatus* L.H. Bailey – WV; > *R. racemiger* L.H. Bailey – F, K, WV; > *R. semisetosus* Blanchard – F, K; > *R. setosus* – F, K, WV]

Rubus trivialis Michaux, Southern Dewberry, Coastal Plain Dewberry. Cp (FL, GA, NC, SC, VA), Pd (GA, NC, SC, VA), Mt (GA, NC, SC): roadsides, old fields, thickets, disturbed areas; common (rare in Mountains). March-April; late April-May. E. MD south to s. FL, west to TX, north in the interior to MO. [= RAB, C, F, G, GW, K, W; > *R. trivialis* – S; > *R. lucidus* Rydberg – S]

* ***Rubus triphyllus*** Thunberg. Pd (DE): disturbed areas; uncommon, native of Japan. [= F, K] {not yet keyed}

Sanguisorba Linnaeus 1753 (Burnet)

A genus of 15 or more species, herbs, of Eurasia, n. Africa, and North America. References: Weakley in FNA (in press); Robertson (1974)=Z; Nordborg (1966, 1967)=Y; Kalkman in Kubitzki (2004). [also see *Poteridium* and *Poterium*]

1 Leaflets pinnatifid (each leaflet incised nearly to the midvein).....***[Poteridium annuum]***
1 Leaflets toothed (the incisions not nearly to the midvein).

2 Leaflets 3-10 cm long; inflorescence 6-30 cm long, spike-like; stamens 4 per flower, the filaments 8-10 mm long; sepals white (sometimes fading greenish); [native].....***Sanguisorba canadensis***
2 Leaflets 0.8-2 cm long; inflorescence 1-2 cm long, globose; stamens 15-20 per flower, the filaments 3-4 mm long; sepals green to pinkish-purple; [cultivated, occasionally escaped].....***[Poterium minor** ssp. **muricata]***

Sanguisorba canadensis Linnaeus, Canada Burnet, American Burnet, White Burnet. Mt (GA, NC, SC, VA, WV), Cp (DE): fens, seepage over mafic or ultramafic rocks (such as amphibolite, greenstone, serpentinite), spray zones around waterfalls, other seepage wetlands, wet meadows; rare. Late July-September. NL (Newfoundland) and NL (Labrador) west to MB, south to NJ, PA, OH, and IN; disjunct southward in KY, nc. VA, and from sw. VA south to sw. NC, ne. TN, and ne. GA. First reported for SC by Hill & Horn (1997) and Hill (1999). [= RAB, C, F, FNA, G, GW, K, S, W, WV, Z]

Sibbaldia Linnaeus 1753 (Sibbaldia, Mountain-cinquefoil)

A genus of 5-7 species, subshrubs, circumboreal, of n. Eurasia and n. North America. Our single species, has been variously also treated in *Potentilla* and *Sibbaldiopsis*. Many recent studies (see references) have shown that it is not closely related to *Potentilla*, and falls into a group of genera including *Sibbaldia*, *Comarum*, *Alchemilla*, *Aphanes*, *Drymocallis*, *Dasiphora*, and *Fragaria* (Lundberg et al. 2009; Potter et al. 2007; Eriksson et al. 2003). I here follow Lundberg et al. (2009) and Paule & Soják (2009), who further demonstrate that *Sibbaldiopsis* is embedded in *Sibbaldia* and is best transferred there. References: Paule & Soják (2009)=Z; Lundberg et al. (2009); Potter et al. (2006); Eriksson, Donoghue, & Hibbs (1998); Eriksson et al. (2003); Kalkman in Kubitzki (2004).

Sibbaldia tridentata (Aiton) Paule & Soják, Mountain-cinquefoil, Three-toothed Cinquefoil, Mountain White Potentilla, Wine-leaf Cinquefoil, White Sibbaldia. Mt (GA, NC, TN, VA, WV): grassy balds, crevices of rock outcrops at high (rarely moderate) elevations, high elevation glades; rare (though sometimes very locally abundant). June-August; July-September. Greenland and NL (Newfoundland) west to NT, south to ND, IA, WI, MI, s. ON, and NS, and in the mountains to w. VA, ne. TN, and ne. GA (at progressively higher elevations southward). Showy in flower, and also in leaf from late summer on, when the leaves tend to turn a rich burgundy red. Though appearing herbaceous, *S. tridentata* is really an evergreen sub-shrub. [= Z; = *Sibbaldiopsis tridentata* (Aiton) Rydberg – K, S; = *Potentilla tridentata* Aiton – RAB, C, F, G, W, WV]

Sorbaria (Seringe) A. Braun 1860

A genus of 4 species, shrubs, of c. and e. Asia. References: Kalkman in Kubitzki (2004)

* ***Sorbaria sorbifolia*** (Linnaeus) A. Braun, False Spiraea. Mt (WV): disturbed areas; rare, native of Asia. Cultivated and naturalized at least as far south as s. PA (Rhoads & Klein 1993), MD, and WV. Reports of it in VA (Massey 1961, repeated in Kartesz 1999) are apparently based only on cultivated plants. [= C, F, G, K]

Sorbus Linnaeus 1753 (Mountain-ash, Rowan)

A genus of about 250 species, trees and shrubs, of mainly temperate Northern Hemisphere. References: McAllister (2005)=Y; Jones (1939)=Z; Aldasoro et al. (2004). [also see *Aronia*]

1 Branches and lower leaf surfaces glabrous (or inconspicuously and sparsely pubescent); winter buds glutinous; [native tree] .....***S. americana***
1 Branches and lower leaf surfaces densely white-villous; winter buds white-villous; [introduced tree].....***S. aucuparia** ssp. **aucuparia***

Sorbus americana Marshall, Mountain-ash, American Rowan. Mt (GA, NC, VA, WV), Pd (NC): high elevation forests, balds, and high elevation rock outcrops, often with *Picea, Abies*, and/or *Betula alleghaniensis*; common (rare in NC Piedmont, rare in GA). June-July; September-October (persisting well into winter). NL (Newfoundland) west to MN, south to PA, w. NC, e. TN, ne. GA, and n. IL. This small-to-medium tree is showy in most seasons; in the summer its creamy-white corymbs are attractive, the leaves turn a bright orange-red in fall, and the red berries persist well into winter. [= RAB, C, G, K, S, W, Y, Z; = *Pyrus americana* (Marshall) A.P. de Candolle – F, WV]

* ***Sorbus aucuparia*** Linnaeus *ssp.* ***aucuparia***, Rowan, European Mountain-ash. Mt (WV): disturbed areas; rarely cultivated; rare, native of n. Europe. A planted tree and escape (sometimes appearing naturalized), south to s. PA (Rhoads & Klein 1993), MD, DE, WV (Kartesz 1999), and DC (Jones 1939). Also reported for SC by Kartesz (1999), supposedly based on Jones (1939), but Jones (1939) does not mention SC in his account of *S. aucuparia*. [= Y; < *S. aucuparia* – C, G, K, Z; < *Pyrus aucuparia* (Linnaeus) Gaertner – F, WV]

Spiraea Linnaeus 1753 (Spiraea, Meadowsweet, Hardhack)

A genus of about 80-120 species, shrubs, of north temperate areas (especially Asia). Many species and hybrids are cultivated, and additional taxa to those treated below may be encountered as persistent or escaped. References: Lis in FNA (in press); Robertson (1974)=Z; Rehder (1940); Uttal (1974); Kalkman in Kubitzki (2004).

1 Inflorescence a simple umbel; flowers white; [section *Chamaedryon*]; [alien].
2 Flowers 10-15 mm in diameter.
3 Leaves 2-7 cm long, coarsely serrate and sometimes also slightly 3-lobed; inflorescences with > 6 flowers ..... ***S. cantoniensis***
3 Leaves 1-4 (-5) cm long, finely serrulate, not lobed; inflorescences with 3-6 flowers ..... ***S. prunifolia***
2 Flowers 6-10 mm in diameter.
4 Leaf blades linear to lanceolate, 2.5-4 cm × 0.3-1 cm, > 4× as long as wide; flowers 6-8 mm in diameter ..... ***S. thunbergii***
4 Leaf blades ovate to obovate, 3-5 cm × 2-3 cm, < 2× as long as wide; flowers 7-10 mm in diameter ..... ***S. ×vanhouttei***
1 Inflorescence a compound corymb or panicle; flowers white, pink, or red; [native or alien].
5 Inflorescence a corymb, flat-topped or rounded, broader than long; [section *Calospyra*].
6 Leaves rounded, obtuse, or acute at the apex; petals white (rarely pink); [native].
7 Follicle 2-3 mm long; leaves 1-2× as long as wide, rounded or obtuse at apex, rounded at base; plants 3-8 (-10) dm tall; [of dry or moist forested slopes, or thin soil on rock outcrops, rarely of streambanks] ..... ***S. corymbosa***
7 Follicle 1-2 mm long; leaves 2-4× as long as wide, acute at apex, cuneate at base; plants 4-25 dm tall; [of rocky riverbanks] ..... ***S. virginiana***
6 Leaves long-acuminate at the apex; petals pink (rarely white or red); [alien].
8 Leaves glabrous; flowers usually white (rarely pink); shrub to 8 dm tall ..... ***S. ×bumalda***
8 Leaves pubescent on the veins beneath; flowers usually pink (rarely white); shrub to 15 dm tall ..... ***S. japonica***
3 Inflorescence a panicle, longer than broad; [section *Spiraea*].
9 Lower leaf surface densely tomentose with white, tawny, or rusty tomentum which obscures the surface.
10 Follicles glabrous; [alien, rare] ..... ***S. ×billiardii***
10 Follicles pubescent; [native, common in boggy wetlands] ..... ***S. tomentosa***
9 Lower leaf surface glabrous or with a few scattered hairs that do not obscure the surface.
11 Leaves lanceolate to oblong-lanceolate, widest at or below the middle; flowers pink; [alien, rarely escaped or persisting] ..... ***S. salicifolia***
11 Leaves oblanceolate to obovate or oblong, widest above or at the middle; flowers white (rarely slightly pink); [native, of bogs, stream-banks, swampy areas, or moist to dry rocky areas].
12 Leaves 3-5 (-8)× as long as wide, finely and sharply toothed; inflorescence, hypanthium, and sepals pubescent; sepals usually obtuse; twigs yellow-brown to brown ..... ***S. alba***
12 Leaves 2-3× as long as wide, coarsely and bluntly toothed; inflorescence, hypanthium, and sepals usually glabrous or nearly so; sepals usually acute; twigs red-brown to purple-brown ..... ***S. latifolia***

Spiraea alba Du Roi, Narrowleaf Meadowsweet, Pipestem. Mt (NC, VA, WV), Pd (DE, VA): bogs, boggy streambanks, seepages; uncommon (rare in DE and NC). June-September; August-October. QC west to AB, south to NC, IN, and MO. There is considerable disagreement over whether *S. alba* and *S. latifolia* represent two species with some introgression in areas of overlap, two varieties, or a variable or clinal species. [= F, FNA, G, S, W, WV, Z; = *S. alba* var. *alba* – RAB, C, GW, K]

* ***Spiraea ×billiardii*** Herincq [*S. douglassii* × *salicifolia*]. Mt (NC, VA, WV): cultivated, escaped or persisting; rare, introduced from cultivation, one parent from w. North America, one from Eurasia. Also present in KY and TN (D. Estes, pers. comm..). [= K]

* ***Spiraea ×bumalda*** Burven [*S. albiflora* × *japonica*]. Pd (VA): cultivated, escaped or persisting; rare, native of cultivation, both parents from Asia. [= FNA, K]

* ***Spiraea cantoniensis*** Loureiro. Cp (AL, GA, LA, NC): roadsides; rare, native of Asia. *S. cantoniensis* has been collected twice on Fort Bragg, NC, by Phil Crutchfield (specimen at Fort Bragg) (Sorrie, pers. comm.). Also reported for other scattered states in e. North America (AL, AR, LA, NY (Kartesz 1999, FNA). [= FNA, K]

Spiraea corymbosa Rafinesque, Dwarf Spiraea, Rock Spiraea. Mt (NC, VA, WV), Pd (NC, VA), {GA?}: rocky forests and woodlands, granitic domes, dry slopes of Piedmont monadnocks, rocky slopes in partial sun; common (rare in NC and WV). June-August; August-October. A Southern and Central Appalachian endemic: sc. PA and w. MD south through w. VA, e. WV, to nw. NC, and perhaps also to e. TN (?), to n. AL(?), apparently fairly common only in w. VA. The species is limited to only a few counties each of NC and WV (Franklin 2004, Strausbaugh & Core 1978), and is not listed for TN in Chester, Wofford, & Kral (1997). Although Mohr (1901) listed the species for AL, it is not listed as a part of the state's woody flora by Clark (1971). *S. corymbosa* is related to *S. lucida* Douglas ex Greene [= *S. betulifolia* var. *lucida* (Douglas ex Greene) C.L. Hitchcock] of the Rocky Mountains, *S. betulifolia* [= *S. betulifolia* var. *betulifolia*] of ne. Asia (Japan, e. Siberia, ne. China, Sakhalin, and the Kurile Islands, and *S. aemiliana* Schneider [= *S. betulifolia* var. *aemiliana* (Schneider) Koidz.]. The group is often treated as 4 varieties or subspecies of *S. betulifolia*, but the morphological differences and strongly disjunct distribution seem to warrant treatment as a relictual complex of related species. See Uttal (1974), Greene (1892), and others listed in Robertson (1974) for additional discussion and a range of conclusions. [= F, FNA, S, WV; < *S. betulifolia* – RAB; = *S. betulifolia* Pallas var. *corymbosa* (Rafinesque) Maximowicz – C, G, K, W, Z; = *S. betulifolia* ssp. *corymbosa* (Rafinesque) Taylor & MacBryde]

* ***Spiraea japonica*** Linnaeus f., Japanese Spiraea. Mt (AL, GA, NC, SC, VA, WV), Pd (DE, NC, SC, VA), Cp (DE): roadsides, woodland borders, old home-sites; common (uncommon in DE, GA, NC, SC, and VA), native of Japan and China. June-July; July-August. [= RAB, C, F, FNA, G, W, WV, Z; > *S. japonica* var. *fortunei* (Planchon) Rehder – K]

Spiraea latifolia (Aiton) Burkhart, Broadleaf Meadowsweet. Mt (NC, VA, WV), Pd (DE, VA), Cp (DE, VA): bogs, seeps, and rock outcrops (glades) over amphibolite, greenstone, olivine, and granite; uncommon (rare in DE, GA, and NC, rare in Piedmont and Coastal Plain). June-September; August-October. NL (Newfoundland) west to MI, south to e. VA and w. NC. [= FNA, G, S, W, WV, Z; = *S. alba* var. *latifolia* (Aiton) Dippel – RAB, C, GW, K; = *S. latifolia* var. *latifolia* – F]

* ***Spiraea prunifolia*** Siebold & Zuccarini, Bridal-wreath Spiraea. Mt (VA, WV), Pd (DE, VA), Cp (AL, MS, LA, NC, VA): cultivated, escaped or persisting; uncommon (rare in AL, DE, LA, MS, and WV), native of China, Korea, and Taiwan. [= C, FNA, G, K]

* ***Spiraea salicifolia*** Linnaeus, Willowleaf Spiraea. Mt (GA, NC, VA), Pd (VA), Cp (MS, VA): cultivated, escaped or persisting; rare, native of Eurasia. [= C, FNA, K]

* ***Spiraea thunbergii*** Siebold ex Blume. Mt (GA), Cp (AL, LA, MS, NC): roadsides; rare, native of Asia. *S. thunbergii* has been collected from roadside at Fort Bragg, NC, by Phil Crutchfield (specimen at Fort Bragg) (Sorrie, pers. comm.). Also GA, MS, and MD (FNA). [= C, FNA, K]

Spiraea tomentosa Linnaeus, Hardhack, Steeplebush. Mt (GA, NC, SC, VA, WV), Pd (NC, SC, VA), Cp (DE, NC, SC, VA): bogs, wet meadows; common (rare in Piedmont, rare in GA). July-September; September-October. NS west to MN, south to SC, ne. GA, c. TN, and AR. [= RAB, GW, K, S, W, WV; > *S. tomentosa* var. *rosea* (Rafinesque) Fernald – C, F, FNA, G, Z; > *S. tomentosa* var. *tomentosa* – C, F, FNA, G, Z; *? S. subcanescens* Rydberg]

Spiraea trilobata Linnaeus var. *trilobata*, Asian Meadowsweet, Three-lobed Spiraea. Disturbed areas; native of e. Asia. Reported by Will Cook from Wake County, NC (Cook, pers. comm. 2011). [] {not yet keyed}

* ***Spiraea ×vanhouttei*** (C. Briot) Carrière [*S. cantoniensis* × *trilobata*], Bridal-wreath Spiraea. Pd (NC), Mt (WV): cultivated, escaped or persisting; rare, introduced from cultivation, the two parents both from Asia. [= FNA, K, Z; = *C. vanhouttei* – C, G]

Spiraea virginiana Britton, Virginia Spiraea, Appalachian Spiraea. Mt (GA, NC, VA, WV): riverbanks, riverside shrub thickets, where occasionally flood-scoured; rare. June-July; August-September. A Southern Appalachian endemic: sw. PA, WV, and sw. VA south through w. NC and e. TN to nw. GA. Ogle (1991a, 1991b) presents an excellent discussion of the taxonomy, history, and biology of this interesting species. [= RAB, C, F, FNA, G, K, S, W, WV, Z; > *S. virginiana* var. *serrulata* Rehder]

150. ELAEAGNACEAE A.L. de Jussieu 1789 (Oleaster Family) [in ROSALES]

A family of 3 genera and 30-50 species, shrubs, small trees, and lianas, of temperate Eurasia and North America, and tropical Asia and Australia. References: Bartish & Swenson in Kubitzki (2004).

Elaeagnus Linnaeus 1753 (Silverberry, Oleaster, Russian-olive)

A genus of 20-45 species, shrubs and small trees, of Asia (mostly) and North America. References: Bartish & Swenson in Kubitzki (2004).

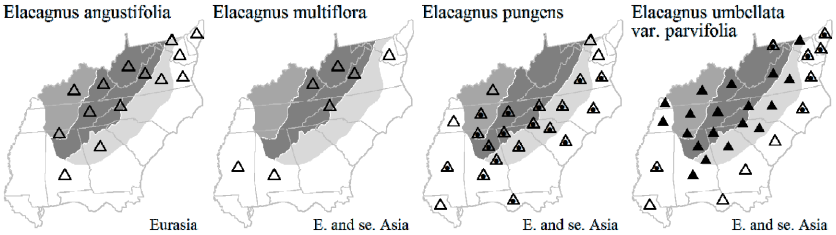
1 Flowering in the fall (October-November) and fruiting in the spring (March-April); leaves evergreen; branches usually spiny..... ***E. pungens***
1 Flowering in the spring and fruiting in the fall; leaves deciduous (somewhat coriaceous in texture and semi-persistent); branches spiny or not.
  2 Fruit yellow, lepidote with silver scales; leaves with silver scales beneath .....***E. angustifolia***
  2 Fruit reddish-brown or pinkish, lepidote with silver and brown scales; leaves with a mixture of silver and bronze scales beneath.
    3 Fruit 10-15 mm long, bright red; fruiting pedicel 15-25 mm long; hypanthium tube about as long as the separate calyx lobes..... .....***E. multiflora***
    3 Fruit 6-8 mm long, silvery red; fruiting pedicel 8-12 mm long; hypanthium tube about 2× as long as the separate calyx lobes .... ***E. umbellata*** *var.* ***parvifolia***

* ***Elaeagnus angustifolia*** Linnaeus, Russian Olive, Oleaster. Disturbed areas; native of Eurasia. June-July. [= C, F, G, K]

* ***Elaeagnus multiflora*** Thunberg, Cherry Elaeagnus, Cherry Silverberry. Disturbed areas; native of Japan and China. April. First reported for NC by Leonard (1971b). [= C, F, G, K; = *E. multiflorus* – S, orthographic variant]

* ***Elaeagnus pungens*** Thunberg, Thorny-olive, Autumn Silverberry. Forests and woodlands in suburban areas, spread by birds; native of Japan. October-November; March-April. [= RAB, K]

* ***Elaeagnus umbellata*** Thunberg *var.* ***parvifolia*** (Royle) Schneider, Autumn-olive, Spring Silverberry. Forests and woodlands, spread by birds; native of Japan and China. April-May; August-September. This species has rapidly become a noxious weed shrub, still unfortunately sometimes promoted for "wildlife plantings." The rapidity of its increase may be judged by its treatment in Strausbaugh & Core (1978) as not definitely naturalized in WV; Harmon, Ford-Werntz, & Grafton (2006) map it for every county of WV. [= K; < *E. umbellata* – RAB, C, F, G, W, WV; < *E. umbellatus* – S, orthographic variant]



151. RHAMNACEAE A.L. de Jussieu 1789 (Buckthorn Family) [in ROSALES]

A family of about 50-52 genera and 900-925 species, mostly trees, shrubs, and lianas, cosmopolitan in distribution. References: Nesom in FNA (in prep.); Brizicky (1964a)=Z; Richardson et al. (2000a, 2000b); Medan & Schirarend in Kubitzki (2004).

1 Plant a woody vine.
2 Leaf margins entire; tendrils absent; [widespread in our area]; [tribe *Rhamneae*] ..... ***Berchemia***
2 Leaf margins serrate to crenate; tendrils present; [of ne. FL southwards]; [tribe *Gouanieae*] ..... ***Gouania***
1 Plant a shrub or small tree.
3 Leaves with 3 prominent veins from near the base.
4 Plants not spiny; fruit dry, capsular; [native]; [tribal placement uncertain] ..... ***Ceanothus***
4 Plants armed with stipular spines; fruit pulpy; [alien, cultivated and escaped]; [tribe *Paliureae*] ..... ***Ziziphus***
3 Leaves with prominently pinnate venation, the lowermost lateral veins no more prominent than others.
5 Leaves opposite, 2-4 cm long; [of shell middens and shell hammocks in the outer Coastal Plain of NC and SC]; [tribe *Rhamneae*] ..... ***Sageretia***
5 Leaves alternate (or opposite in *Frangula* and some *Rhamnus*), 3-15 cm long; [of various habitats in the Piedmont and Mountains (rarely Coastal Plain) of VA, NC, and SC].
6 Inflorescence repeatedly branched dichotomously; peduncles fleshy and reddish in fruit; nectariferous disc pubescent; [tribe *Paliureae*] ..... ***Hovenia***
6 Inflorescence not repeatedly branched dichotomously; peduncles not fleshy; nectariferous disc glabrous; [tribe *Rhamneae*].
7 Winter buds naked, pubescent; flowers perfect, sepals, stamens, and petals 5; style undivided; leaves with 8-10 lateral veins on either side of the midvein ..... ***Frangula***
7 Winter buds with bud scales; flowers functionally unisexual, sepals and stamens 4 or 5 (the stamens rudimentary in the pistillate flowers), petals 0 or 4 (never 5); style divided 1/3 to 2/3 its length into 2, 4 or 5 segments; leaves with (2-) 3-9 lateral veins on either side of the midvein ..... ***Rhamnus***

Berchemia Necker 1825 (Supplejack)

A genus of about 12 species, vines, of tropical to warm temperate Asia, Africa and se. North America. *B. scandens* is the only New World species. References: Nesom in FNA (in prep.); Brizicky (1964a)=Z; Medan & Schirarend in Kubitzki (2004).

Identification notes: The young stems are shining and reddish; older stems can reach 10 cm in diameter, with bark medium gray and smooth (though often marred by sap wells drilled by Yellow-bellied Sapsuckers). The smooth bark and neatly pinnately-veined leaves are distinctive.

Berchemia scandens (Hill) K. Koch, Supplejack, American Rattan. Cp (FL, GA, NC, SC, VA), Pd (GA, NC), Mt (GA): swamp forests, bottomlands, streambanks, in mesic to even xeric uplands over calcareous rock or sediment; common (rare in Piedmont). April-May; August-October. Se. VA south to s. FL, west to TX, north in the interior to nc. TN, w. TN, s. IL, and s. MO. *Berchemia* climbs high into the crowns of swamp trees. [= C, F, FNA, G, GW, K, RAB, S, WH, Z]

Ceanothus Linnaeus 1753 (Redroot, New Jersey Tea)

A genus of ca. 55 species, shrubs, mostly in California. References: Nesom in FNA (in prep.); Fross & Wilken (2006)=X; Coile (1988)=Y; Brizicky (1964a)=Z; Medan & Schirarend in Kubitzki (2004).

1 Leaves 0.2-1.0 cm long, obovate ..... ***C. microphyllus***
1 Leaves 2-10 cm long, elliptic to ovate.
2 Inflorescences terminating leafy terminal shoots; leaves mostly obtuse to acute ..... ***C. herbaceus***
2 Inflorescences terminating leafless axillary shoots (these sometimes with leafy bracts distinctly smaller than normal leaves); leaves mostly acute to acuminate.
3 Leaves (3-) 4-10 cm long, mostly 2.5-6 cm wide; [of various habitats of the Piedmont, Mountains, and rarely Coastal Plain] ..... ***C. americanus* *var.* *americanus***
3 Leaves 2-4 (-6) cm long, mostly 1-2 cm wide; [primarily of sandy habitats of the Coastal Plain and rarely Piedmont] ..... ***C. americanus* *var.* *intermedius***

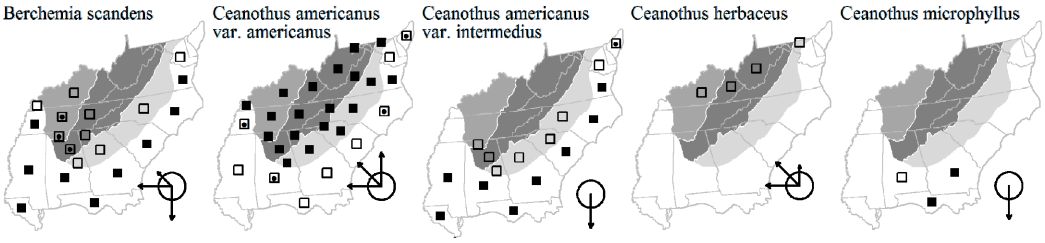
Ceanothus americanus Linnaeus *var.* ***americanus***, Common New Jersey Tea. Woodland borders, dry woodlands, glady openings, dry ridge forests and woodlands (pine or oak) in the Mountains. May-June; June-July. ME west to s. MB, south to FL Panhandle and TX. [= C, F, G, X, Y, Z; < *C. americanus* – FNA, K, RAB, W, WH; = *C. americanus* – S]

Ceanothus americanus Linnaeus *var.* ***intermedius*** (Pursh) Torrey & A. Gray, Southern New Jersey Tea. Sandhills, dry sandy woodlands and forests, rocky openings around granitic or quartzitic rocks in the Piedmont. May-June; June-July. NJ (or possibly MA) south to c. peninsular FL, west to LA, mostly on the Coastal Plain, but disjunct inland to sandy soils around outcrops of siliceous rocks. The recognition of infraspecific taxa in the variable *C. americanus* is uncertain; var. *intermedius* may either represent ecological forms, or the variation may be too clinal to make taxonomic recognition rewarding. However, material from our area (and beyond) sorts relatively easily, with some intermediates from the Piedmont; varietal status seems provisionally appropriate. [= C, F, G, X, Y, Z; < *C. americanus* – FNA, K, RAB, W, WH; = *C. intermedius* Pursh – S]

Ceanothus herbaceus Rafinesque, Prairie Redroot. Flood-scoured rocky riverbanks. April-May. Primarily midwestern: MI west to MT, south to nw. IN, AR, TX, and Mexico; disjunct eastward in QC, NH, VT, NY, DC, and n. VA (? - Arlington County). Rafinesque described *C. herbaceus* from "near the falls of the Potowmack, between the rocks." The holotype not extant, Coile (1988) chose a neotype, collected by Sheldon in 1881 from "Arlington County, Virginia, Chain Bridge, rocky river bottoms, Potomac River." However, Bartgis, Fleming, & Wiegand (1997) indicate that *C. herbaceus* in the Washington, D.C.

area can only be ascribed with certainty to DC. [= FNA, K, X, Y, Z; = *C. ovatus* Desfontaines – F, S, misapplied; = *C. pubescens* (Torrey & A. Gray ex S. Watson) Rydberg ex Small – S]

Ceanothus microphyllus Michaux. Sandhills. E. GA south to c. peninsular FL, west to s. AL, approaching to within a few kilometers of SC (in Screven and Chatham counties, GA), and should be sought in se. SC (except that its outlandish appearance makes it difficult to overlook!). *C.* ×*serpyllifolius* Nuttall (pro sp.) is apparently a hybrid of *C. americanus* var. *intermedius* and *C. microphyllus* (Coile 1988); it is known from scattered sites in FL and GA. [= FNA, K, S, X, Y, Z]



Frangula P. Miller 1754 (Buckthorn)

A genus of ca. 50 species, shrunbs and small trees, of the northern hemisphere. The distinctions between *Frangula* and *Rhamnus* are many and meaningful; their separation at the generic level seems warranted based on morphological and molecular analyses (Richardson et al. 2000a; Bolmgren & Oxelman 2004). References: Nesom in FNA (in prep.); Brizicky (1964a)=Z; Medan & Schirarend in Kubitzki (2004).

1 Leaves entire; leaves ca. 2× as long as wide ..... ***F. alnus***
1 Leaves serrulate; leaves ca. 3× as long as wide ..... ***F. caroliniana***

* ***Frangula alnus*** P. Miller, European Alder-Buckthorn, Glossy Buckthorn. Forested areas, other disturbed areas; native of Europe. This species is a seriously invasive weed in ne. United States, south to (at least) NJ, s. PA (Rhoads & Klein 1993), KY, and se. TN (Marion County) (Chester, Wofford, & Kral 1997, Kral 1981), and w. NC (where recently found in a forested area along the Blue Ridge Parkway). [= FNA, K; = *Rhamnus frangula* Linnaeus – C, F, G]

Frangula caroliniana (Walter) A. Gray, Carolina Buckthorn. Dry to moist barrens, woodlands, and forests, Coastal Plain limestone bluffs and shell middens, especially over mafic or calcareous rocks. May-June. Sw. VA west to s. OH and s. MO, south to c. peninsular FL and TX. [= K; = *Rhamnus caroliniana* Walter – FNA, RAB, S, W, WH; > *Rhamnus caroliniana* Walter var. *caroliniana* – C, F, G, Z]

Gouania Jacquin 1763 (Chewstick)

A genus of ca. 50 species, shrubs, of tropical America. References: Nesom in FNA (in prep.).

Gouania lupuloides (Linnaeus) Urban, Whiteroot, Chewstick. Hammocks. August-March. [= FNA, WH] {add to synonymy; not yet keyed}

Hovenia Thunberg 1781 (Raisin-tree)

A genus of 7 species, trees, of e. Asia. References: Nesom in FNA (in prep.); Brizicky (1964a)=Z; Medan & Schirarend in Kubitzki (2004).

* ***Hovenia dulcis*** Thunberg, Japanese Raisin-tree. Suburban woodlands, escaped form cultivation; native of China. Goldman (1998) presents a discussion of this species' introduction into North America, with a color photograph. [= FNA, K, RAB, Z]

Rhamnus Linnaeus 1753 (Buckthorn)

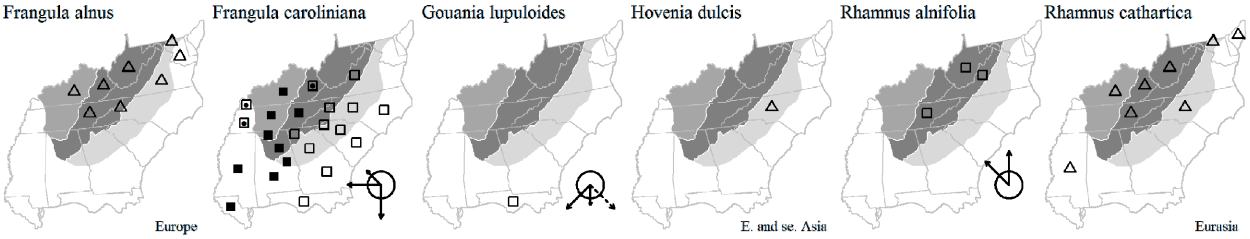
A genus of ca. 150 species, trees and shrubs, of the northern hemisphere. The recognition of *Frangula* as separate from *Rhamnus* is supported by molecular phylogeny (Bolmgren & Oxelman 2004). References: Nesom in FNA (in prep.); Brizicky (1964a)=Z; Bolmgren & Oxelman (2004); Medan & Schirarend in Kubitzki (2004). [also see *Frangula*]

1 Leaves mostly opposite or subopposite (or some alternate), mostly with (2-) 3-6 lateral veins on either side of the midrib; plant a large shrub or small tree, to 10 m tall; fruit with 4 stones; [aliens, mostly of moist (but not boggy) soils].
2 Leaves mostly 1-2× as long as wide, with (2-) 3 (-4) lateral veins on either side of the midrib; style divided ½ its length into 4 segments..... ..... ***R. cathartica***
2 Leaves mostly 2-3× as long as wide, with 4-6 lateral veins on either side of the midrib; style divided ⅔ its length into 2 segments .... ***R. davurica***

1 Leaves alternate, mostly with (4-) 6-9 lateral veins on either side of the midrib; plant a shrub to 2 m tall; fruit with 2-3 stones; [natives of various, calcareous habitats].
3 Sepals and stamens 5; petals 0; fruit with 3 stones; [of mafic or calcareous peaty wetlands and seeps]..... ***R. alnifolia***
3 Sepals and stamens 4; petals 4; fruit with 2 stones; [of dry to moist calcareous woodlands and thickets].
4 Young leaves and young branches glabrous or with scattered hairs; mature leaves glabrous below..... ***R. lanceolata*** *var.* ***glabrata***
4 Young leaves and young branches pubescent; mature leaves soft pubescent below ..... ***R. lanceolata*** *var.* ***lanceolata***

Rhamnus alnifolia L'Héritier, Alder-leaved Buckthorn, American Alder-Buckthorn. Mafic or calcareous (dolomitic) seeps, usually with *Parnassia grandifolia*. May-July. NL (Newfoundland) west to BC, south to NJ, PA, sw. VA, ne. TN (Chester, Wofford, & Kral 1997), OH, n. IN, n. IL, IA, and CA. [= C, F, FNA, G, K, W, WV, Z]

* ***Rhamnus cathartica*** Linnaeus, Common Buckthorn. Disturbed areas; native of Eurasia. April-June. Reported for VA by Harvill et al. (1991), but the report is actually based on specimens of *R. davurica* (Virginia Botanical Associates 2005); now bonafide specimens have been found in Giles and Wythe counties (T.F. Wieboldt, pers. comm. 2009). [= C, F, FNA, G, K, Z]



* ***Rhamnus davurica*** Pallas, Dahurian Buckthorn. Suburban woodlands, rarely naturalized; native of e. Asia. April-June. Also reported from suburban areas near Louisville, KY, and Knoxville, TN (D. Estes, pers. comm.). [> *Rhamnus davurica* ssp. *davurica* – FNA, K; = *R. citrifolia* (Weston) W. Hess & Stearn – C]

Rhamnus lanceolata Pursh *var.* ***glabrata*** Gleason, Western Lance-leaved Buckthorn. Dry habitats over calcareous rocks. April-May. Var. *glabrata* Gleason ranges from OH west to SD, south to w. VA (Ludwig 1999), KY, c. TN, AR, and KS. [= C, F, G, Z; = *R. lanceolata* ssp. *glabrata* (Gleason) Kartesz & Gandhi – FNA, K; < *R. lanceolata* – S, W]

Rhamnus lanceolata Pursh *var.* ***lanceolata***, Eastern Lance-leaved Buckthorn. Dry to moist thickets over calcareous rocks. April-May. Var. *lanceolata* ranges from PA south to AL, mostly in the Appalachians. [= C, F, G, Z; = *R. lanceolata* ssp. *lanceolata* – FNA, K; < *R. lanceolata* – S, W, WV]

Sageretia Brongniart 1827 (Small-flowered Buckthorn)

A genus of about 35 species, shrubs and trees, of tropical to warm temperate areas of Africa, Asia, and America. References: Nesom in FNA (in prep.); Nesom (1993c)=Y; Brizicky (1964a)=Z; Medan & Schirarend in Kubitzki (2004).

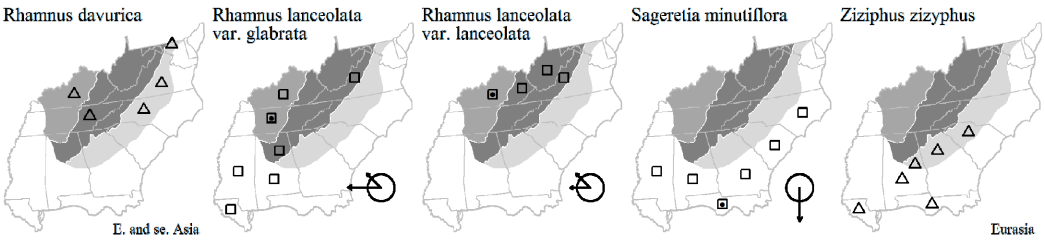
Identification notes: *S. minutiflora* can appear superficially a bit like *Ilex vomitoria*, with which it typically grows; it can be distinguished from *Ilex vomitoria* by its opposite leaves.

Sageretia minutiflora (Michaux) C. Mohr, Small-flowered Buckthorn. Shell middens and shell hammocks, dry calcareous hammocks and maritime forests. August-September; October-November. Se. NC south to s. FL, west to s. MS. *S. minutiflora* is apparently most closely related to *S. elegans* (Kunth) Brongniart, which ranges from s. Mexico south to s. South America. [= FNA, K, RAB, S, WH, Y, Z]

Ziziphus P. Miller 1754 (Jujube)

A genus of 85-100 species, shrubs and trees, of tropical and warm temperate areas. References: Nesom in FNA (in prep.); Brizicky (1964a)=Z; Medan & Schirarend in Kubitzki (2004).

* ***Ziziphus zizyphus*** (Linnaeus) Karsten, Chinese Jujube, Common Jujube, Chinese Date. Disturbed areas; native of Eurasia. Reported from ec. GA (Jones & Coile 1988). Cultivated at least as far north as NC. As of 2010, *Z. jujuba* is proposed for conservation over the nearly tautonymic *Z. zizyphus*. [= K, WH; = *Zizyphus zizyphus* (Linnaeus) Karsten – S, orthographic variant; = *Z. jujuba* P. Miller – FNA, Z]



152. ULMACEAE de Mirbel 1815 (Elm Family) [in ROSALES]

As here circumscribed (excluding *Celtis* and relatives), a family of 6-7 genera and about 35 species, of temperate, subtropical, and boreal Northern Hemisphere, rarely extending into the Southern Hemisphere). Zavada & Kim (1996) discuss compelling reasons to recognize the *Celtis* from the Ulmaceae. The distinctiveness of the Celtidaceae from the Cannabaceae and Moraceae is more questionable. References: Sherman-Broyles, Barker, & Schulz in FNA (1997); Zavada & Kim (1996); Todzia in Kubitzki, Rohwer, & Bittrich (1993). [also see *CANNABACEAE*]

1 Leaves strongly 3-veined from the base, the venation otherwise pinnate; fruit a drupe with thin flesh.....***[Celtis** – see CANNABACEAE**]***
1 Leaf venation pinnate throughout, the venation strictly pinnate; fruit dry, a samara (flat and winged) or nutlike (with numerous fleshy protuberances).
2 Fruit nutlike (with numerous fleshy protuberances); primary lateral veins mostly forking before reaching the margin; [small trees of swamp forests of the Coastal Plain from se. NC and SC southward].....***Planera***
2 Fruit a samara (flat and winged); primary lateral veins mostly parallel and unforked to the leaf margin; [small to large trees, widespread in our area] ..... ***Ulmus***

Planera J.F. Gmelin 1791 (Planer-tree, Water-elm)

A monotypic genus, a tree, of temperate se. North America. References: Barker in FNA (1997); Todzia in Kubitzki, Rohwer, & Bittrich (1993).

Planera aquatica (Walter) J.F. Gmelin, Planer-tree, Water-elm. River swamps where flooded (often to depths of 1-2 m) in the winter. Se. NC (limited to the Waccamaw and Lumber rivers) south to n. FL, west to e. TX, and north in the Mississippi Embayment to w. TN, w. KY, s. IL, and se. MO. [= RAB, C, F, FNA, G, GW, K, S]

Ulmus Linnaeus 1753 (Elm)

A genus of about 25-30 species, trees (rarely shrubs), of temperate and boreal regions of the Northern Hemisphere (most diverse in c. and n. Asia). References: Sherman-Broyles in FNA (1997); Wiegrefe, Sytsma, & Guries (1994); Kurz & Godfrey (1962)=Z; Todzia in Kubitzki, Rohwer, & Bittrich (1993). Key adapted in part from FNA.

1 Leaf blades mostly < 7 cm long, the base symmetrical to somewhat oblique.
2 Samaras ciliate-margined; twigs often cork-winged; upper surfaces of leaves glabrous to scabrous; [native trees, sometimes weedy].
3 Leaf apex acute; flowers appearing in the late winter to late spring; calyx lobes 5; upper surfaces of leaves glabrous to somewhat scabrous; [widespread in our area; [subgenus *Oreoptelea*, section *Chaetoptelea*].....***U. alata***
3 Leaf apex obtuse; flowers appearing in the late summer to fall; calyx lobes 6-9; upper surfaces of leaves harshly scabrous; [of w. TN, w. MS westward; also disjunct in FL]; [subgenus *Oreoptelea*, section *Trichoptelea*].....***U. crassifolia***
2 Samaras with glabrous margins; twigs never cork-winged; upper surfaces of leaves glabrous; [introduced trees, planted and sometimes naturalized or persistent]; [subgenus *Ulmus*, section *Microptelea*].
4 Flowers appearing in the late summer to fall; leaf base generally oblique; leaves 1.5-2.5 cm wide, 5 or more of the lateral veins forked per side.....***U. parvifolia***
4 Flowers appearing in the late winter to late spring; leaf base generally symmetrical; leaves 2-3.5 cm wide, 3 or fewer of the lateral veins forked per side.....***U. pumila***
1 Leaf blades mostly > 7 cm long, the base moderately to strongly oblique (rarely nearly symmetrical).
5 Leaf uppersurface slightly to very strongly scabrous; leaf undersurface tomentose or villous, with tufts of hairs in the vein axils; flowers and fruits sessile or subsessile (on pedicels 0-2 mm long), not pendulous, in dense fascicles; [subgenus *Ulmus*, section *Ulmus*].
6 Leaves with ciliate margins; samara pubescent on the body with reddish hairs; bud scales red, the margins red-tomentose; [native tree].....***U. rubra***
6 Leaves without ciliate margins; samara glabrous except along the margin of the notched apex **or** on the central vein of the wing; bud scales brown, margins pale-cilate; [introduced tree, planted and sometimes naturalized or persistent]
7 Leaf base strongly oblique, the lower side overlapping the petiole; branchlets not corky; samara glabrous except on the central vein of the wing .....***U. glabra***
7 Leaf base oblique but not overlapping the petiole; branchlets with corky wings; samara glabrous except along the margin of the notched apex .....***U. procera***
5 Leaf uppersurface glabrous (or slightly to moderately scabrous on stump sprouts or seedlings); leaf undersurface glabrous to tomentose, with or without tufts of hairs in the vein axils; flowers and fruits pedicellate (on pedicels 5-20 mm long), pendulous, in fascicles or racemes.
8 Leaf undersurfaces glabrous or slightly pubescent, but always with tufts of hairs in the vein axils; branches never with corky wings; inflorescence a fascicle; [trees widespread in our area]; [subgenus *Oreoptelea*, section *Blepharocarpus*].
9 Leaf bases strongly oblique; larger leaves 10-15 cm long; primary leaf teeth acuminate, often curved inward; [tree widespread in our area].....***U. americana** var. **americana***
9 Leaf bases moderately oblique (rarely nearly symmetrical); larger leaves 7-10 cm long; primary leaf teeth acute, not curved; [tree restricted to moist calcareous sites in the Coastal Plain of se. NC southward].....***U. americana** var. **floridana***
8 Leaf undersurfaces moderately white or yellowish soft-pubescent, lacking prominant tufts of hairs in the vein axils (differing from the general pubescence of the surface); branches often developing corky wings; inflorescence a raceme or racemose cyme; [trees of calcareous areas in the western portion of our area]; [subgenus *Oreoptelea*, section *Trichoptelea*].

10 Leaves 7-8 (-14) cm long, lanceolate to ovate, the undersurface with yellowish-gold pubescence; buds and young twigs glabrous; calyx lobes 5-6; seeds thickened ..... ***U. serotina***
10 Leaves 9-11 (-16) cm long, obovate, the undersurface with whitish pubescence; buds and young twigs pubescent; calyx lobes 7-8; seeds inflated..... ***U. thomasii***

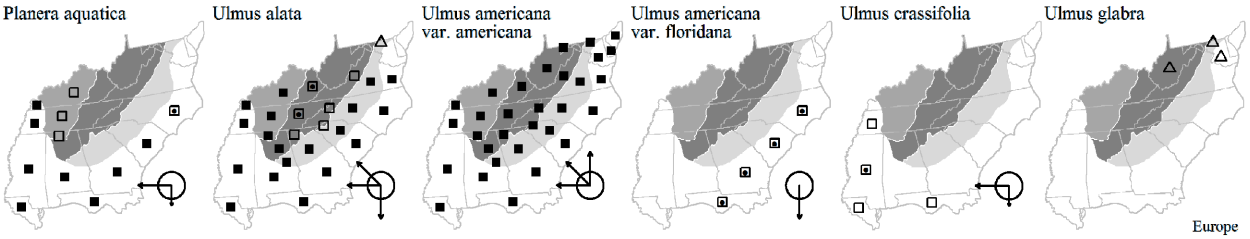
Ulmus alata Michaux, Winged Elm. Rock outcrops, dry and mesic forests and woodlands, bottomlands, old fields, disturbed areas. February-March; March-April. N. VA west to MO, south to c. peninsular FL and c. TX. [= RAB, C, F, FNA, G, GW, K, S, W, WH, Z]

Ulmus americana Linnaeus *var.* ***americana***, American Elm, White Elm. Swamps, bottomland forests, moist slopes, especially on relatively or strongly nutrient-rich substrates. February-March; March-April. NS, NB, and QC west to se. SK, south to n. FL and c. TX. An ascomycetous fungus, *Ceratocystis ulmi*, is the cause of the Dutch Elm disease. In our area, the effects of the disease appear to have been mild or nonexistent, especially in natural areas. [= Z; < *U. americana* – RAB, C, F, FNA, G, GW, K, W, WV; = *U. americana* – S]

Ulmus americana Linnaeus *var.* ***floridana***, Florida Elm. Shell middens, other calcareous forests. January-March; February-April. Se. NC (north at least to Carteret County) south to c. peninsular FL, west to Panhandle FL. [= Z; < *U. americana* – RAB, C, F, FNA, G, GW, K, W; = *U. floridana* Chapman – S]

Ulmus crassifolia Nuttall, Cedar Elm. Bottomlands, mesic forests. W. TN, s. MO, and OK south to MS, LA, and TX; disjunct in e. Panhandle FL. [= FNA, K, S, Z]

* ***Ulmus glabra*** Hudson, Wych Elm, Scotch Elm. Suburban woodlands; native of Europe. Naturalized in ne. United States; reported from VA and DC (Sherman-Broyles in FNA 1997), but may only be cultivated. [= FNA, C, F, K]



* ***Ulmus parvifolia*** Jacquin, Chinese Elm, Lacebark Elm. Disturbed areas; native of China and Japan. August-October; September-November. [= FNA, K]

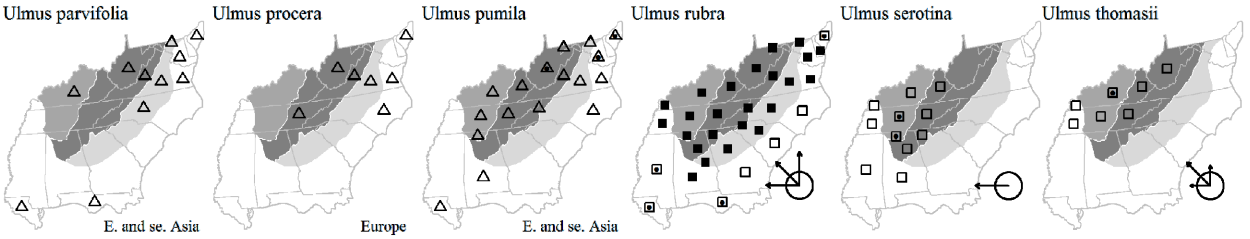
* ***Ulmus procera*** Salisbury, English Elm, English Cork Elm. Disturbed areas; native of Europe. [= C, FNA, K; *U. minor* P. Miller, misapplied]

* ***Ulmus pumila*** Linnaeus, Siberian Elm, Dwarf Elm. Disturbed areas; native of Asia. [= C, F, FNA, K]

Ulmus rubra Muhlenberg, Slippery Elm, Red Elm. Moist to fairly dry calcareous forests, rich bottomlands, rich cove forests in the low Mountains. February-March; March-April. ME, QC, and ON west to MN and ND, south to Panhandle FL and c. TX. [= RAB, C, FNA, G, K, W, WV, Z; = *U. fulva* Michaux – S]

Ulmus serotina Sargent, September Elm. Mesic limestone forests. KY, s. IL, and e. OK south to e. TN, nw. GA, AL, and MS. It was collected on the French Broad River by Rugel in 1842, and has been attributed to NC by Mohr. [= C, FNA, F, G, K, S]

Ulmus thomasii Sargent, Cork Elm, Rock Elm. Rocky or rich slopes, especially over limestone. April. QC to MN and NE, south to NJ, MD, PA, WV, KY, TN, AR, and KS. [= C, FNA, K; = *U. thomasi* – F, G, WV, orthographic variant]



153. CANNABACEAE Endlicher 1827 (Hops Family) [in ROSALES]

As circumscribed to include the Celtidaceae, a family of 14 genera and about 120 species, trees, shrubs, woody vines, herbs, and herbaceous vines, of cosmopolitan distribution. Zavada & Kim (1996) discuss compelling reasons to recognize the Celtidaceae as a family distinct from the Ulmaceae. The distinctiveness of the Celtidaceae from the Cannabaceae and Moraceae is more questionable; and Sytsma et al. (2002) conclude that Celtidaceae should be considered a part of Cannabaceae. References: Small in FNA (1997); Kubitzki in Kubitzki, Rohwer, & Bittrich (1993); Sherman-Broyles, Barker, & Schulz in FNA (1997); Zavada & Kim (1996); Todzia in Kubitzki, Rohwer, & Bittrich (1993); Sytsma et al. (2002).

1 Tree or shrub; leaves simple and unlobed..... ***Celtis***
1 Herb or vine; leaves either compound or lobed.
2 Erect herb; leaves with 3-7 leaflets..... ***Cannabis***
2 Climbing or sprawling vine; leaves simple, with 1-9 lobes ..... ***Humulus***

Cannabis Linnaeus 1753 (Hemp, Marijuana)

A genus of 1-3 species, herbs, originally native to c. Asia. *Cannabis* was formerly widely cultivated nearly worldwide for the fiber hemp; it is now better known as the source of the drug marijuana. References: Small in FNA (1997); Hillig & Mahlberg (2004); Kubitzki in Kubitzki, Rohwer, & Bittrich (1993).

* ***Cannabis sativa*** Linnaeus, Hemp, Marijuana. Disturbed areas and clandestinely cultivated plots; native of Asia. June-October. Though perhaps not truly naturalized or persistent, *Cannabis* is treated here since clandestine cultivated plots are encountered by the field biologist, especially in fairly remote areas in the mountainous parts of our area. [= F, FNA, G, WH, WV; > *C. sativa* Linnaeus ssp. *sativa* var. *sativa* – C, K]

Celtis Linnaeus 1753 (Hackberry)

A genus of about 100 species, trees, shrubs, and woody vines, widespread in tropical, subtropical, and temperate regions worldwide. References: Todzia in Kubitzki, Rohwer, & Bittrich (1993).

1 Branches armed with short spines ..... ***C. iguanaea***
1 Branches unarmed.
  2 Leaves thick, very glossy above; bark remaining smoothish, lacking protuberances; [rare alien] ..... ***C. sinensis***
  2 Leaves thin, dull or glossy above (glossy normally only in sun leaves, especially of *C. laevigata*); bark developing wartlike corky protuberances on larger individuals; [collectively common natives]
    3 Leaf blades mostly > 2× as long as wide, the tip attenuate and long-acute to long-acuminate, the base cuneate to rounded; leaf margins entire or with a few teeth on each margin; leaves glabrous or nearly so (except the margins often ciliate); [large trees, mostly of floodplains, but also in upland situations over calcareous substrates such as limestone, dolostone, and shell middens] ..... ***C. laevigata***
    3 Leaf blades mostly < 2× as long as wide, the tip obtuse to short-acuminate, the base slightly to strongly cordate at least on one side; leaf margins entire or with a few teeth on each margin (the plant then a shrub or small tree of rocky places) or distinctly serrate with 10-35 teeth on each margin; leaves scabrous above, at least toward the tip; [shrubs to medium trees, of floodplains, moist slopes, and dry rocky woodlands, barrens, and glades].
      4 Leaves 5-12 cm long, toothed well below the middle; fruit 7-14 mm long, ellipsoid or subglobose, dark orange, purple, or black, on a pedicel 7-25 mm long; [small to medium trees of dry to moist habitats] ..... ***C. occidentalis***
      4 Leaves 2-8 cm long, toothed only near the tip if at all; fruit 5-9 mm long, subglobose or essentially spherical, orange, red, or brown, on a pedicel 3-13 mm long; [shrubs or small twisted trees of dry, rocky habitats] ..... ***C. tenuifolia***

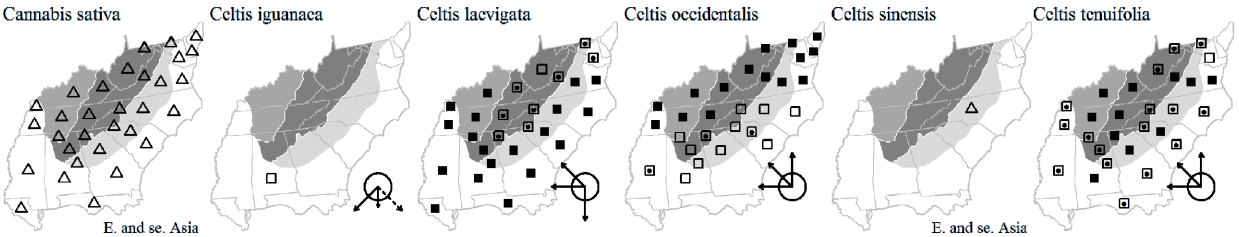
Celtis iguanaea (Jacquin) Sargent, Iguana Hackberry. Shell-middens and calcareous coastal sites. AL, sw. peninsular FL, West Indies, American tropics. [= K, WH; = *Momisia iguanaea* (Jacquin) Rose & Standley – S]

Celtis laevigata Willdenow, Southern Hackberry, Sugarberry. Bottomland forests, especially on natural levees, upland calcareous forests and woodlands, shell middens. April-May; August-October. MD, WV, IN, IL, MO and KS south to s. FL and TX. [= RAB, C, FNA, G, GW, W; > *C. laevigata* var. *laevigata* – F; > *C. laevigata* var. *smallii* (Beadle) Sargent – F; = *C. laevigata* var. *laevigata* – K; > *C. mississippiensis* Bosc – S; > *C. smallii* Beadle – S]

Celtis occidentalis Linnaeus, Northern Hackberry. Xeric to mesic glades, outcrops, barrens, woodlands, and bottomland forests, usually over calcareous substrate. April-May; August-October. NH, QC, MB, and MT south to Panhandle FL, TX, and NM. [= C, FNA, G, K, S, W, WV; = *C. occidentalis* var. *occidentalis* – RAB; > *C. occidentalis* var. *canina* (Rafinesque) Sargent – F; > *C. occidentalis* var. *occidentalis* – F; > *C. occidentalis* var. *pumila* (Pursh) A. Gray – F; < *C. occidentalis* – WH]

* ***Celtis sinensis*** Willdenow, Chinese Hackberry. Suburban woodlands; native of China, Korea, and Japan. Found naturalizing in Guilford County, NC (W. Cook, pers. comm., 2010). {not yet keyed}

Celtis tenuifolia Nuttall, Dwarf Hackberry, Georgia Hackberry. Xeric to mesic glades, outcrops, barrens, woodlands, often over calcareous substrate. April-May; August-October. NJ, PA, IN, IL, and KS south to Panhandle FL and TX. [= C, FNA, G, K, W, WV; = *C. occidentalis* var. *georgiana* (Small) Ahles – RAB; > *C. tenuifolia* var. *georgiana* (Small) Fernald & Schubert – F; > *C. tenuifolia* var. *tenuifolia* – F; = *C. georgiana* Small – S; < *C. occidentalis* – WH]



Humulus Linnaeus 1753 (Hops)

A genus of 2 species, herbaceous vines, of temperate regions of the Northern Hemisphere. References: Small (1978)=Z; Small in FNA (1997); Kubitzki in Kubitzki, Rohwer, & Bittrich (1993). Key adapted from Z.

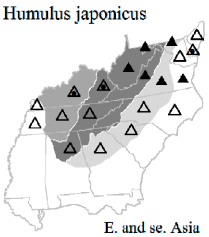
1 Veins on lower surface of leaves armed with rigid, spinulose hairs; bracts of pistillate flowers spinulose-ciliate; most leaves 5-9 lobed ..... ***H. japonicus***
1 Veins on lower surface of leaves more or less pubescent with lax, weak hairs, but lacking rigid, spinulose hairs; bracts of pistillate flowers smooth-margined; most leaves 1-3 lobed.
2 Lower surfaces of leaves (measured on middle lobe of 4-6 cm long leaves of flowering or fruiting branches) usually with < 20 hairs per cm of length of midrib; glands (measured on leaves as above) < 25 per 10 square mm of intervein lower leaf surface; [introduced variety, sometimes showing introgression with native varieties]..... ***H. lupulus*** *var.* ***lupulus***
2 Lower surfaces of leaves (measured on middle lobe of 4-6 cm long leaves of flowering or fruiting branches) usually with > 20 hairs per cm of length of midrib; glands (measured on leaves as above) > 25 per 10 square mm of intervein lower leaf surface; [native varieties, though often weedy and sometimes showing introgression with var. *lupulus*].
3 Lower surfaces of leaves (measured on middle lobe of 4-6 cm long leaves of flowering or fruiting branches) conspicuously pubescent between the veins and on the veins, with > 100 hairs per cm of length of midrib; smaller leaves unlobed (less commonly 3-lobed) ..... ***H. lupulus*** *var.* ***pubescens***
3 Lower surfaces of leaves (measured on middle lobe of 4-6 cm long leaves of flowering or fruiting branches) not conspicuously pubescent, the pubescence usually limited to the veins, usually with < 100 hairs per cm of length of midrib; smaller leaves generally 3-lobed ..... ***H. lupulus*** *var.* ***lupuloides***

* ***Humulus japonicus*** Siebold & Zuccarini, Japanese Hops. Disturbed areas, particularly in rich, alluvial soils, where it has become a serious weed along major VA rivers; native of Japan, Taiwan, and China. June-October; July-October. [= RAB, C, F, FNA, G, K, W, WV, Z]

Humulus lupulus Linnaeus *var.* ***lupuloides*** E. Small, Northeastern Hops. Pd (VA), Mt (VA, WV), Cp (NC, VA): disturbed areas, particularly in rich, alluvial soils; uncommon (rare in NC and WV, rare in VA Coastal Plain). July-August; September-October. NS and NL (Newfoundland) south to VA and NC, west to NE, MT, and AB. It is not clear whether its occurrence in NC is native or native of further north. The 3 varieties (two native and one introduced) in our area are subtly different, the differences apparently sometimes further obscured by introgressive hybridization. [= C, FNA, K, Z; < *H. lupulus* – RAB, F, G, S, W, WV]

* ***Humulus lupulus*** Linnaeus *var.* ***lupulus***, Brewer's Hops, European Hops. Pd (VA), Mt (WV): disturbed areas; rare, native of Europe. July-August; September-October. The European var. *lupulus* is (of course) one of the key ingredients of beer. [= C, FNA, K, Z; < *H. lupulus* – RAB, F, G, S, W, WV]

Humulus lupulus Linnaeus *var.* ***pubescens*** E. Small, Midwestern Hops. Mt (GA, NC, VA), Pd (NC, VA), Cp (VA): disturbed areas, particularly in rich, alluvial soils; rare. July-August; September-October. NY and PA south to NC and ne. GA and west to MN, NE, KA, and AR. It is not clear whether the few occurrences east of the Blue Ridge (including those in NC and VA) are native or adventive from further west. [= C, FNA, K, Z; < *H. lupulus* – RAB, F, G, S, W]



154. MORACEAE Lindley 1847 (Mulberry Family) [in ROSALES]

A family of about 38 genera and 1100 species, trees, shrubs, vines, and herbs, of tropical, subtropical, and (few) warm temperate areas. References: Wunderlin in FNA (1997); Rohwer & Berg in Kubitzki, Rohwer, & Bittrich (1993).

1 Herb, 0.3-1.0 m tall; stem without latex; [tribe *Moreae*]..... ***Fatoua***
1 Shrub or tree, at maturity over 1 m tall, or woody vine growing appressed to masonry; stem bearing translucent to milky-white latex.
2 Stipules connate, the stipule scar encircling the twig; inflorescence a syconium (the flowers borne on the inner walls of the fleshy receptacle); [tribe *Ficeae*]..... ***Ficus***
2 Stipules free, the stipule scar not encircling the twig; inflorescence a spike, head, or catkin (the flowers borne exposed on a contracted or elongated axis or receptacle).
3 Leaves entire, unlobed or shallowly 3-lobed; stems usually thorny; [tribe *Maclureae*.
4 Fruit 2-3 cm in diameter; petioles 5-20 mm long; leaves 3-7 (-10) cm long..... ***Cudrania***
4 Fruit 10-15 cm in diameter; petioles 30-50 mm long; leaves 6-20 cm long..... ***Maclura***
3 Leaves serrate, often also 3-15-lobed (the lobes sometimes deep); stems not thorny; [tribe *Moreae*].
5 Stems and leaves hirsute; leaves alternate, opposite, and whorled..... ***Broussonetia***
5 Stems and leaves glabrous to pubescent; leaves alternate..... ***Morus***

Broussonetia L'Héritier ex Ventenat 1799 (Paper Mulberry)

A genus of about 8 species, trees, shrubs, and vines, of tropical and subtropical Asia and Madagascar. References: Endress & Bittrich in Kubitzki, Rohwer, & Bittrich (1993).

* ***Broussonetia papyrifera*** (Linnaeus) L'Héritier ex Ventenat, Paper Mulberry. Pd (DE, GA, NC, SC, VA), Cp (DE, GA, NC, SC, VA), Mt (GA, NC, SC, VA, WV): urban lots, disturbed areas, roadsides; common (uncommon in VA and WV Mountains, rare in DE), native of e. Asia. April. [= RAB, C, F, FNA, G, K, W; = *Papyrius papyriferus* (Linnaeus) Kuntze – S]

Cudrania Trécul 1847 (Cudrania)

A genus of 1-several species, shrubs, of Asia. References: Endress & Bittrich in Kubitzki, Rohwer, & Bittrich (1993).

* ***Cudrania tricuspidata*** (Carrière) Bureau ex Lavallée, Cudrania. Pd (NC), Cp (GA): escaped and naturalized from plantings; rare, native of China and Korea, where cultivated as a food for silkworms. July. Naturalized in Orange County, NC, in McIntosh Co. GA (Jones & Coile 1988), and perhaps elsewhere in our area, where recommended as a hedge plant since at least 1940 (Rehder 1940). [= FNA, K; = *Maclura tricuspidata* Carrière]

Fatoua Gaudichaud-Beaupré 1830 (Crabweed)

A genus of 2-3 species, herbs or weak shrubs, of Asia, Madagascar, and Australia. References: Vincent (2004)=Y; Massey (1975)=Z; Miller & Wood (2003); Kral (1981b); Endress & Bittrich in Kubitzki, Rohwer, & Bittrich (1993).

* ***Fatoua villosa*** (Thunberg) Nakai, Crabweed, Mulberry-weed, Foolish-weed. Pd (GA, NC, SC, VA), Cp (GA, SC), Mt (NC): disturbed areas, vegetable and flower gardens; rare, native of Asia (apparently se. Asian islands). July-November. As reported by Massey (1975) and Vincent (2004), *Fatoua* was first reported in the United States (Louisiana) in the early 1960's. As of 2004, its distribution in North America had spread to include 28 states and the District of Columbia, including most states except the Great Plains and Rocky Mountains had spread (Vincent 2004, Sundell et al. 1999, Miller & Wood 2003. Since all early collections seem to be in and around greenhouses and nurseries, it is likely that it has been introduced in horticultural material, perhaps repeatedly (Kral 1981b). *Fatoua* appears to have become a fairly aggressive weed in eastern North America. It can be expected to continue to spread, and has the potential to become noxious. It has alternate, ovate leaves with cordate bases, borne on long petioles (about as long as the leaf blade), the inflorescences are dense cymes borne on peduncles in the axils of leaves. Pubescence of the stem and foliage is uncinulate, giving the plant a "tacky" feel. An excellent illustration appears in Correll & Correll (1982). [= FNA, K, Y, Z]

Ficus Linnaeus 1753 (Fig)

A genus of about 750 species, trees, shrubs, and vines, of tropical, subtropical, and warm temperate areas. References: Endress & Bittrich in Kubitzki, Rohwer, & Bittrich (1993).

1 Leaves lobed, 7-30 cm long; [shrub to small tree]..... ***F. carica***
1 Leaves unlobed, 1-5 cm long; [vine, climbing appressed to walls]..... ***F. pumila***

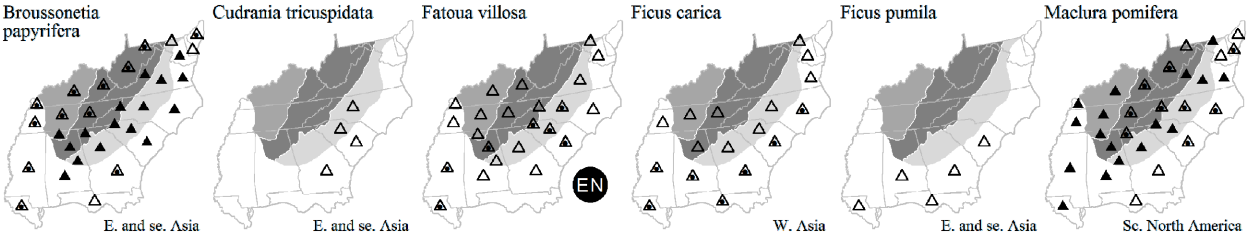
* ***Ficus carica*** Linnaeus, Edible Fig, Garden Fig. Cp (FL, GA, NC, SC, VA), Pd (GA, NC, SC): grown for its fruits, persistent from plantings, persisting and naturalizing particularly on barrier islands, where it sometimes forms thickets on dunes, or otherwise in the outer Coastal Plain, where proximity to the ocean ameliorates cold winter temperatures; rare, native of w. Asia. May-August; July-October. This is the common cultivated fig, grown for its fruit in the Mid-east for millenia. [= RAB, F, FNA, K, S, WH]

* ***Ficus pumila*** Linnaeus, Climbing Fig. Cp (AL, FL, GA, LA, SC): walls, disturbed urban areas; rare, native of s. Asia. Locally common in Charleston, Savannah, Pensacola, Mobile, New Orleans, and other old seaports, where grown on walls as an ornamental and certainly persisting. [= FNA, K, WH]

Maclura Nuttall 1818 (Osage-orange)

A monotypic genus (or sometimes broadened to include *Cudrania* and other genera), a tree, of sc. North America. References: Endress & Bittrich in Kubitzki, Rohwer, & Bittrich (1993).

* ***Maclura pomifera*** (Rafinesque) C.K. Schneider, Osage-orange, Bow-wood, Bois-d'arc, Hedge-apple. Fields, hedgerows, forests; common (uncommon in DE Coastal Plain, rare in FL), naturalized from extensive planting in the eighteenth and nineteenth centuries, native of TX, OK, AR, and LA. April-May; October. The large fruits are unmistakable: yellowish-green, grapefruit-sized, and wrinkled, reminiscent of a giant, spherical mulberry fruit. The wood is extremely heavy, fine-grained, a bright yellow-orange when fresh, but darkening with age, famous for making bows and also used in cabinetry. [= RAB, C, F, FNA, G, K, W, WH, WV; = *Toxylon pomiferum* Rafinesque ex Sargent – S]



Morus Linnaeus 1753 (Mulberry)

A genus of about 10-15 species, trees, of warm temperate, subtropical, and tropical areas. References: Galla et al. (2009)=Z; Endress & Bittrich in Kubitzki, Rohwer, & Bittrich (1993).

1 Upper leaf surface glossy, glabrous or slightly scabrous; lower leaf surface glabrous, or slightly pubescent on the veins and in the vein axils only; ripe fruits black, purple, red, pink, or white ..... ***M. alba***
1 Upper leaf surface dull, scabrous; lower leaf surface pubescent on the veins, veinlets, and the surface between the veins; ripe fruits black or purple ..... ***M. rubra***

* ***Morus alba*** Linnaeus, White Mulberry, Silkworm Mulberry, Russian Mulberry. Disturbed areas, vacant lots, roadsides, moist forests; native of e. Asia. March-May; May-June. [= RAB, C, F, FNA, G, GW, K, S, W, WV, Z; > *M. alba* – S; > *M. nigra* Linnaeus – S, misapplied as to our material; > *M. alba* var. *tatarica* (Linnaeus) Seringe]

* *Morus nigra* Linnaeus, Black Mulberry. Reported. {add to synonymy; add to key; add to Access}

Morus rubra Linnaeus, Red Mulberry. Bottomland forests, mesic slopes, disturbed areas, suburban woodlands. April-May; May-June. MA, VT, NY, MI, WI, and se. SD south to s. FL and w. TX, and into Mexico. The fruits are very variable in quality from tree to tree. *M. rubra* is the only member of the Moraceae native to our area. *M. murrayana* D.E Saar & S.J. Galla has recently been described as distinct from *M. rubra* and occurring widely in eastern North America (KY, TN, MO, IL, IN, MS, LA, VA, NC, and AL) (Galla et al. 2009). It is alleged to differ from *M. rubra* by its leaves to 38 cm long (vs. to 15 cm long), the outer three leaves on branchlets almost always > 15 cm long (vs. < 15 cm long), leaves with caudate apex (vs. acute to acuminate apex), lateral veins curving before reaching margins, only the tiniest veins ending in a tooth (vs. lateral veins above lowest lateral fairly straight and ending in a tooth); mature fruit to 4 cm long and 1.5 cm wide but often thinner, with much size variation on a single individual (vs. mature fruit to 3 cm long). All the alleged characters appear to be highly variable and correlated with vigor. [= RAB, C, F, G, GW, K, S, W, WV; > *M. rubra* var. *rubra* – K; > *M. rubra* – Z; > *M. murrayana* D.E. Saar & S.J. Galla – Z]

155. URTICACEAE A.L. de Jussieu 1789 (Nettle Family) [in ROSALES]

A family of about 45 genera and 1000 species, herbs, shrubs, vines, and trees, of cosmopolitan distribution in tropical, subtropical, and temperate regions. References: Boufford in FNA (1997); Friis in Kubitzki, Rohwer, & Bittrich (1993); Miller (1971a).

1 Leaves alternate.
  2 Flowers in axillary spikes; woody herb to 4 m tall; [tribe *Boehmerieae*] ..... ***Boehmeria nivea***
  2 Flowers in terminal panicles, axillary panicles, or axillary fascicles; herb to 1.5 m tall.
    3 Leaves 4-13 cm wide, with stinging trichomes; [tribe *Urticeae*] ..... ***Laportea***
    3 Leaves 0.8-2 cm wide, lacking stinging trichomes; [tribe *Parietarieae*] ..... ***Parietaria***
1 Leaves opposite.
  4 Plant with stinging trichomes, these having a distinct bulbous or cylindrical base, and a stiff, translucent apex; [tribe *Urticeae*] ..... ***Urtica***
  4 Plant without stinging trichomes (or these minute and not apparent), the non-stinging hairs (if present) soft and flexible, lacking a bulbous or cylindrical base.
    5 Flowers in axillary spikes; foliage dull, yellow-green; [tribe *Boehmerieae*] ..... ***Boehmeria cylindrica***
    5 Flowers in axillary panicles or fascicles; foliage shiny, bright green; [tribe *Lecantheae*] ..... ***Pilea***

Boehmeria Jacquin 1760 (False-nettle)

A genus of about 80 species, trees, shrubs, and perennial herbs, of warm temperate, subtropical, and tropical regions of the Old World and New World. References: Friis in Kubitzki, Rohwer, & Bittrich (1993).

1 Leaves opposite; monoecious herb to 1.5 m tall; [subgenus *Duretia*] ..... ***B. cylindrica***
1 Leaves alternate; dioecious herb to 4 m tall; [subgenus *Tilocnide*] ..... ***B. nivea***

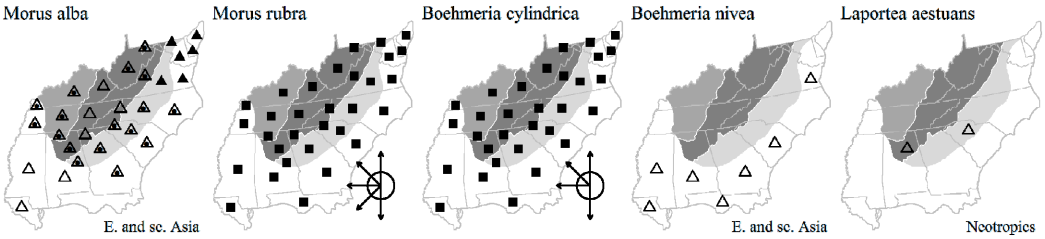
Boehmeria cylindrica (Linnaeus) Swartz, False-nettle. Swamp forests, bottomlands, bogs, marshes, other wetlands. July-August; September-October. QC and MN south to FL and NM. [= RAB, C, FNA, G, GW, K, W, WH; > *B. cylindrica* var. *cylindrica* – F; > *B. cylindrica* var. *drummondiana* (Weddell) Weddell – F; > *B. cylindrica* – S; > *B. drummondiana* Weddell – S]

* ***Boehmeria nivea*** (Linnaeus) Gaudichaud-Beaupré, Ramie. Disturbed suburban areas, waste ground; native of Asia. This plant is cultivated for the fiber of its stems, which is extracted and used for fabric in a manner reminiscent of linen (which is made from *Linum usitatissimum*). Reported for Lowndes County, GA (Carter, Baker, & Morris 2009). [= RAB, FNA, K; = *Ramium niveum* (Linnaeus) Small – S]

Laportea Gaudichaud-Beaupré 1830 (Wood-nettle)

A genus of about 21 species, shrubs, perennial herbs, and annual herbs, of tropical and warm temperate e. Asia and temperate e. North America. References: Friis in Kubitzki, Rohwer, & Bittrich (1993).

* *Laportea aestuans* (Linnaeus) Chew, West Indian Wood-nettle. Reported for scattered sites in the se. US (Kartesz 2010). [= K2]



Laportea canadensis (Linnaeus) Weddell, Wood-nettle. Moist, nutrient-rich forests, especially abundant in cove forests in the Mountains and bottomlands in the Piedmont. Late June-August; late July-October. NS and se. MB south to Panhandle FL and OK. By mid-summer, *Laportea* often becomes the aspect dominant in rich, moist cove forests of the mountains (especially those with extensive seepage), visually replacing the diverse spring flora. The stinging hairs can penetrate pants made of light-weight or loosely woven fabrics. [= RAB, C, F, FNA, G, GW, K, W, WV; *? Urticastrum divaricatum* (Linnaeus) Kuntze – S]

Parietaria Linnaeus 1753 (Pellitory)

A genus of about 20 species, annual and perennial herbs, of nearly cosmpolitan distribution. References: Hinton (1968)=Z; Friis in Kubitzki, Rohwer, & Bittrich (1993).

1 Leaves softly pubescent; [alien weed]; [subgenus *Parietaria*]..... ***P. judaica***
1 Leaves glabrescent; [native, sometimes weedy in calcareous or coastal areas]; [subgenus *Freirea*].
2 Main lateral veins diverging from the midvein above the usually narrowly cuneate leaf base; larger leaves 2-5× as long as wide ..... ***P. pensylvanica*** *var.* ***pensylvanica***
2 Main lateral veins diverging from the midvein at the usually truncate, rounded, or broadly cuneate leaf base; larger leaves 1-2× as long as wide.
3 Achene with a flanged stipe, the minute apiculate tip located symmetrically at the pole of the achene, the achene 0.8-1.0 mm long..... ***P. floridana***
3 Achene without a flanged stipe, the minute apiculate tip located asymmetrically, the achene usually 1.2 (-1.4) mm long..... ***P. praetermissa***

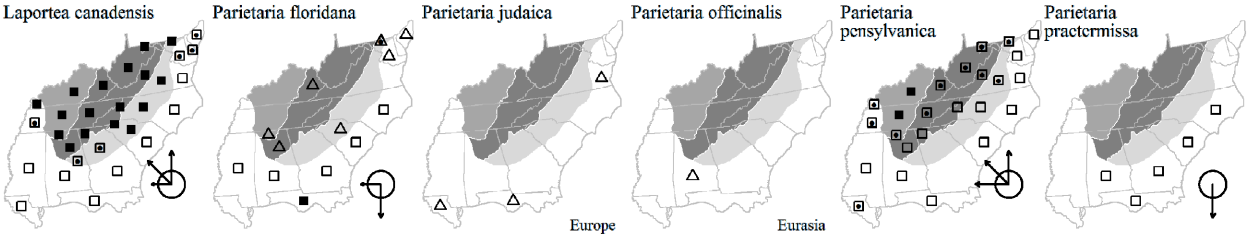
Parietaria floridana Nuttall, Florida Pellitory. Coastal shores, sometimes weedy in calcareous situations. March-frost; April-frost. DE south to FL and west to TX, on the outer Coastal Plain. This species has smaller leaves than *P. praetermissa*. [= FNA, GW, K, WH, Z; = *P. nummularia* Small – C, F, S]

* ***Parietaria judaica*** Linnaeus, Pellitory-of-the-wall. Disturbed urban areas; native of Europe. [= FNA, K, WH; ? *P. diffusa* Mertens & Koch]

* *Parietaria officinalis* Linnaeus, Pellitory. Reported as introduced in Mobile County, AL (Kartesz 2010). {investigate} [= K2] {not keyed; add to synonymy}

Parietaria pensylvanica Muhlenberg ex Willdenow, Pennsylvania Pellitory, Rock Pellitory. In circumneutral soils, such as in thin soils at the bases of calcareous or subcalcareous cliffs or on calcareous shale barrens, rich floodplain soils. April-October; May-October. ME west to BC, south to e. NC, w. NC, AL, Panhandle FL, TX, NV, and Mexico. Two varieties are sometimes delimited, var. *pensylvanica* eastern and northern and var. *obtusa* (Rydberg ex Small) Shinners southwestern. [= C, FNA, G, GW, K, K2, RAB, S, W, WH; > *P. pensylvanica* – F, WV (sensu stricto)]

Parietaria praetermissa Hinton, Coastal Pellitory. Shell middens, coastal hammocks. March-frost; April-frost. E. NC south to s. FL and west to w. LA. [= FNA, GW, K, WH, Z; = *P. floridana* Nuttall – RAB, C, F, S, misapplied]



Pilea Lindley 1821 (Clearweed)

A genus of about 250 species, annual and perennial herbs, nearly cosmpolitan in tropical and warm temperate regions of the Old World and the New World. References: Friis in Kubitzki, Rohwer, & Bittrich (1993).

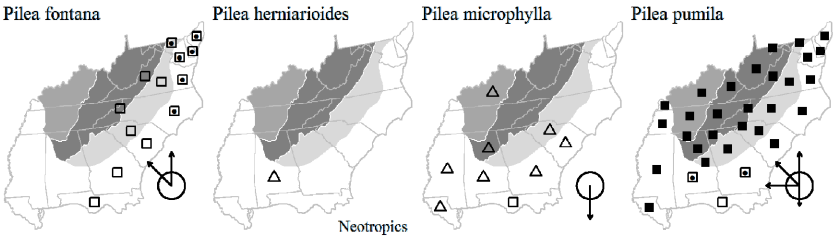
1 Leaves 0.5-1.0 (-1.8) cm long ..... ***P. microphylla***
1 Leaves 4-10 cm long.
  2 Achene 1-1.5× as long as broad, tuberculate, dark brown or black, the margins slightly paler ..... ***P. fontana***
  2 Achene 1.5-2× as long as broad, smooth, green or light brown, with slightly raised dark to black lines and mottlings ..... ***P. pumila***

Pilea fontana (Lunell) Rydberg, Blackfruit Clearweed, Lesser Clearweed. Swamp forests, freshwater marshes, calcareous wetlands. August-September; September-November. E. Canada west to MN and ND, south to FL, IN, and NE. Only reliably distinguishable from *P. pumila* using fruits, *P. fontana* is, however, somewhat less shiny and transparent-translucent. [= RAB, C, F, FNA, G, GW, K, W, WH; < *Adicea pumila* (Linnaeus) Rafinesque – S]

* *Pilea herniarioides* (Swartz) Lindley, Caribbean Clearweed. Reported for Mobile County, AL and scattered sites in the FL peninsula (Kartesz 2010). [= K2] {not keyed; add to synonymy}

* ***Pilea microphylla*** (Linnaeus) Liebmann, Rockweed, Artillery Weed. Old rock and brick walls, urban areas. January-December. Although listed by RAB for the Carolinas as "a weed in and around greenhouses, not established as part of our flora," this species is well-established and weedy in Charleston, SC and Savannah, GA. It is presumably adventive from further south. [= RAB, FNA, K, S, WH]

Pilea pumila (Linnaeus) A. Gray, Greenfruit Clearweed, Coolwort, Richweed. Swamp forests, bottomlands, freshwater marshes. August-September; September-November. QC west to MN, south to FL, LA, and OK. [= RAB, C, FNA, G, GW, W, WH, WV; > *P. pumila* var. *pumila* – F, K; > *P. pumila* var. *deamii* (Lunell) Fernald – F, K; < *Adicea pumila* (Linnaeus) Rafinesque – S (including in concept *P. fontana*)]



Urtica Linnaeus 1753 (Stinging Nettle)

A genus of about 80 species, annual and perennial herbs, nearly cosmpolitan, but primarily in temperate regions of the Northern Hemisphere. References: Woodland (1982)=Z; Woodland, Bassett, Crompton, & Forget (1982); Friis in Kubitzki, Rohwer, & Bittrich (1993).

1 Tap-rooted annual; stipules 1-3 mm long, spreading or deflexed; inflorescences usually shorter than the subtending leaf petiole, each panicle consisting of a mixture of pistillate and staminate flowers.
  2 Flower clusters subglobose; mature achenes ovate, 1-1.5 mm long, < 1 mm wide; leaf teeth generally blunt, the sides of the tooth convex ..... ***U. chamaedryoides***
  2 Flower clusters elongate; mature achenes triangular, 1.5-2.5 mm long, 1-1.5 mm wide; leaf teeth generally sharp, the sides of the tooth straight ..... ***U. urens***
1 Rhizomatous perennial; stipules 5-15 mm long, erect; inflorescences usually surpassing the subtending leaf petiole, each panicle of either pistillate or staminate flowers.
  3 Plants dioecious (male and female flowers always on separate plants); stems usually weak, sprawling, branching; stems strongly hispid with stinging hairs; leaf blades strongly hispid with stinging hairs on both surfaces; leaf teeth commonly 5-6 mm long ..... ***U. dioica***
  3 Plants mostly monoecious (with male and female flowers in separate inflorescences on the same plant), rarely an entire plant male or female; stems upright, erect, less branched; stems glabrous to puberulent or strigose, lacking (or nearly so) stinging hairs; leaf blades glabrous or glabrescent above (lacking stinging hairs), glabrous to puberulent below (with some stinging hairs); leaf teeth commonly 2-3.5 mm long ..... ***U. gracilis***

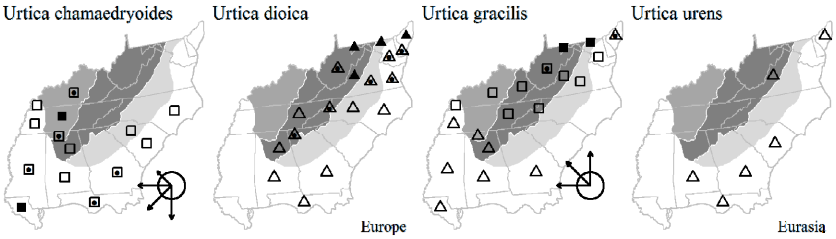
Urtica chamaedryoides Pursh, Dwarf Stinging Nettle. Rich moist soil, usually on floodplains. November-May; May-July. WV, KY, se. MO and OK south to FL, TX, and Mexico; very rare east of the Blue Ridge. Notable locations in our area include

Stevens Creek (McCormick County, SC), Congaree Swamp (Richland County, SC), and various sites on very rich levees of the Roanoke River (NC). Gaddy & Rayner (1980) report the common winter flowering of this species in our area. [= RAB, C, F, FNA, G, K, S, WH, Z]

* ***Urtica dioica*** Linnaeus, European Stinging Nettle, Great Nettle. Disturbed areas, primarily in calcareous soils; native of Europe. May-July; July-September. See *U. gracilis* for discussion of the two taxa. [= F, S, WV; < *U. dioica* – RAB, W (also see *U. gracilis*); = *U. dioica* var. *dioica* – C, G; = *U. dioica* ssp. *dioica* – FNA, K, Z]

Urtica gracilis Aiton, American Stinging Nettle. Bottomland forests and edges, particularly over limestone. May-July; July-September. NL (Labrador) and NS west to AK, south to sw. VA, w. NC (?), s. OH, s. IL, s. MO, n. TX, s. NM, and se. AZ. The native stinging nettle of e. and c. North America is best treated as specifically distinct from *U. dioica* of Europe. Woodland (1982) and Woodland, Bassett, Crompton, & Forget (1982) showed that *U. gracilis* differs from *U. dioica* in a variety of morphologic characters (see key), chromosome number (2n = 26 for *U. gracilis*, 2n = 52 for *U. dioica*), breeding system (monoecy vs. dioecy), and distribution (North American vs. Eurasian); furthermore, the two taxa could not be crossed. Woodland (1982) chose subspecific status, apparently to emphasize the close relationship of the two (and a third taxa in w. North America). The combination of morphological distinctiveness, allopatry, major differences in species biology, and incompatability seem adequate to warrant separation as species, however. Until herbaria can be checked, it is uncertain whether *U. gracilis* occurs in NC. F (as *U. procera*), G (as *U. dioica* var. *procera* and S include NC in the range; Woodland (1982), however, showed the range as extending only south to VA. [= S, WV; < *U. dioica* – RAB, W; = *U. dioica* Linnaeus var. *procera* (Muhlenberg ex Willdenow) Weddell – C, G; > *U. gracilis* Aiton – F; > *U. procera* Muhlenberg – F; = *U. dioica* Linnaeus ssp. *gracilis* (Aiton) Selander – FNA, K, Z]

* ***Urtica urens*** Linnaeus, Burning Nettle, Dog-nettle, Small Nettle. Disturbed areas; native of Eurasia. April-May; May-July. [= RAB, C, F, FNA, G, K, S, WH, WV, Z]



157. FAGACEAE Dumortier 1829 (Beech Family) [in FAGALES]

A family of about 8 genera and 620-1050 species, trees and shrubs, mostly of the Northern Hemisphere, but extending into se. Asia and Australia. References: Nixon in FNA (1997); Govaerts & Frodin (1998); Kubitzki in Kubitzki, Rohwer, & Bittrich (1993); Elias (1971a).

1 Fruits partially enclosed in a scaly cup; leaves lobed, toothed, crenate, or entire..... ***Quercus***
1 Fruits enclosed in a spiny or prickly bur; leaves toothed.
  2 Nuts rounded or flattened on one or two sides; bur with long, straight spines; winter buds < 1 cm long; leaves elliptic or oblanceolate, some of them usually > 12 cm long..... ***Castanea***
  2 Nuts sharply triangular; bur with short, recurved prickles; winter buds 1.5-2.5 cm long; leaves ovate, 6-12 cm long..... ***Fagus***

Castanea P. Miller 1754 (Chestnut, Chinquapin)

A genus of 8-10 species, trees and shrubs, of temperate regions of the Northern Hemisphere. References: Johnson (1988)=Z; Nixon in FNA (1997); Kubitzki in Kubitzki, Rohwer, & Bittrich (1993); Stanford (1998). Key adapted from Z, in part.

1 Leaves elliptic, oblanceolate or lanceolate, 8-30 cm long, the apices acuminate, sometimes only shortly so; spine-covered husk of fruit splitting into 4 sections, enclosing (2-) 3 (-5) nuts; nut flattened on at least one side, 18-25 mm in diameter; pistillate dichasia of 3 flowers; leaves usually without stellate trichomes; twigs puberulent or glabrous.
  2 Undersurface of leaves densely covered with bulbous-based trichomes when young, essentially glabrous in age; leaves mostly > 15 cm long, generally long-acuminate; twigs glabrous; trees single-trunked; spines of fruit husk weak, easily bent ..... ***C. dentata***
  2 Undersurface of leaves persistently and densely tomentose beneath; leaves mostly < 15 cm long, generally short-acuminate; twigs puberulent; trees multi-trunked from base; spines of fruit husk stiff; nut ..... ***C. mollissima***
1 Leaves elliptic to oblanceolate, mostly < 15 cm long, the apices acute to obtuse; twigs puberulent; spine-covered husk of fruit splitting into 2 sections, enclosing 1 nut; nut circular in cross-section, 7-19 mm in diameter; pistillate dichasia of 1 flower; leaves with stellate trichomes, with few bulbous-based trichomes when young, puberulent, pilose, tomentulose, or tomentose in age (usually rather densely so).
  3 Longest spines of the fruit husk usually >10 mm long; young twigs glabrous; petiole 8-10 (-15) mm long; [plants of n. AL and westward].. ..... ***C. ozarkensis***
  3 Longest spines of the fruit husk usually <10 mm long; young twigs puberulent; petiole 3-7 (-10) mm long; [plants widespread in our area]. ..... ***C. pumila***

Castanea dentata (Marshall) Borkhausen, American Chestnut. Mesic and xeric forests. June-July; September-October. S. ME, s. ON, MI, c. IN, s. IL, south to c. NC, c. GA, Panhandle FL, and sc. MS. Formerly one of the most important, largest, and

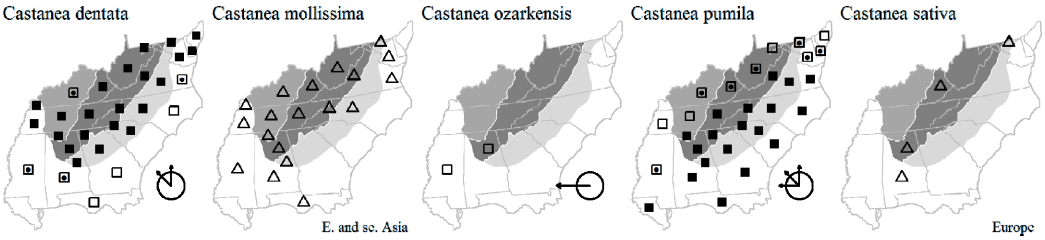
most abundant forest trees in the Mountains of our area, *C. dentata* was severely affected by chestnut blight, *Cryphonectria parasitica* (Murrill) Barr, introduced at New York City in 1904 on nursery stock of *C. mollissima*. Blight spread steadily southward, reaching our area in the 1920's and 1930's. *C. dentata* remains rather abundant, but now occurs only as stump sprouts and small trees, usually reinfected by blight persisting on oaks and killed at about the size of first fruit production. The accidental introduction of chestnut blight and the subsequent profound alteration of the role of chestnut is one of the most tragic ecological disasters to have affected our area. *Castanea ×neglecta* Dode (pro sp.) [*C. dentata* × *pumila*], occurs in our area; "the leaves of the hybrid resemble those of *C. dentata* in size and shape but have the vestiture and stellate trichomes of *C. pumila*" (Johnson 1988). [= RAB, C, F, FNA, G, K, S, W, WH, Z]

* ***Castanea mollissima*** Blume, Chinese Chestnut. Forests; native of China. June; September. This species is relatively resistant to chestnut blight and has been planted widely as an ornamental and nut tree; it sometimes naturalizes and appears nearly native. Reported for NC (Macon County) by Pittillo & Brown (1988). [= C, FNA, K, WH]

Castanea ozarkensis W.W. Ashe, Ozark Chinquapin. Dry forests. May-July; September-October. S. MO, e. OK, and w. AR; disjunct in c. AL, where now apparently extirpated by blight. *C. ozarkensis* is related to *C. pumila*, though showing some relation as well to *C. dentata*. *C. ozarkensis* is more susceptible to blight than *C. pumila*. [= FNA, S; = *C. pumila* P. Miller var. *ozarkensis* (W.W. Ashe) G.E. Tucker – K, Z]

Castanea pumila (Linnaeus) P. Miller, Common Chinquapin. Xeric forests and woodlands, generally in fire-maintained habitats. May-July; September-October. NJ, s. PA, s. OH, n. KY, and s. MO, south to c. peninsular FL and se. TX. It is relatively resistant to chestnut blight. [= FNA, WH; = *C. pumila* var. *pumila* – C, K, Z; > *C. pumila* var. *pumila* – RAB, F; > *C. pumila* var. *ashei* Sudworth – RAB, F; > *C. alnifolia* Nuttall var. *alnifolia* – RAB; > *C. alnifolia* var. *floridana* Sargent – RAB; > *C. pumila* – G, S, W; > *C. ashei* (Sudworth) Sudworth – S; > *C. floridana* (Sargent) Ashe – S; > *C. alnifolia* – S]

* ***Castanea sativa*** P. Miller, Spanish Chestnut. Reported as naturalized in KY, AL, PA, and elsewhere in e. North America (Clark et al. 2005). [= K] {not yet keyed; synonymy incomplete}



Fagus Linnaeus 1753 (Beech)

A genus of about 10 species, trees, of temperate regions of the Northern Hemisphere. Our native trees belong to subgenus *Fagus*, section *Grandifolia* (Shen 1992). References: Cooper & Mercer (1977)=Z; Nixon in FNA (1997); Shen (1992)=X; Kubitzki in Kubitzki, Rohwer, & Bittrich (1993); Elias (1971a)=Y; Stanford (1998); Govaerts & Frodin (1998)=V.

1 Leaves denticulate; cupule prickles 1-2.5 (-4) mm long, slightly to strongly recurved; cupule valves generally ovate, the apex obtuse, reddish in color; leaves with fairly dense white acicular trichomes on the lower leaf surface at maturity; leaf base sometimes clearly cordate; [plants of the Coastal Plain, Piedmont, and low to moderate elevations (mostly below 1050 m or 3500 feet) in the Mountains] ..... ***F. grandifolia* var. *caroliniana***

1 Leaves sharply serrate; cupule prickles (3-) 4-10 mm long, projecting forward; cupule valves generally narrowly triangular, the apex acute, grayish-yellow in color; leaves usually lacking white acicular trichomes on the lower surface at maturity, instead with yellowish glandular hairs (acicular trichomes often present on the veins); leaf base not clearly cordate; [plants of moderate to high elevations (mostly above 1050 m or 3500 feet) in the Mountains]..... ***F. grandifolia* var. *grandifolia***

Fagus grandifolia Ehrhart *var.* ***caroliniana*** (Loudon) Fernald & Rehder, White Beech, American Beech. Moist forests, from near sea level to low elevations in the Mountains, mostly below 1050 meters (3500 feet). March-May; September-October. Se. MA, OH, IN, s. IL, s. MI (?), and MO south to Panhandle FL and e. TX. Several subspecies, varieties, or phases of *Fagus grandifolia* have been described, and their taxonomic recognition is controversial. The most recent monographer, Shen (1992), recognizes three subspecies, one of which is limited to Mexico, the other two as treated here but at the subspecific level. I have here chosen to recognize 2 intergradient varieties in our area. A third variety, var. *mexicana* (Martínez) Little, of the mountains of México, is apparently most closely related to var. *grandifolia*. Cooper & Mercer (1977) studied variation in NC, concluding that two genetic races or varieties were present, the montane var. *grandifolia* and the Piedmont and Coastal Plain var. *caroliniana*, but that patterns of variation were complicated. Hardin & Johnson (1985) and Hardin (1992, 1985) note that variation is "more-or-less" clinal, variation within populations is great, and they do not favor recognition of infraspecific taxa. Depending on one's tolerance or intolerance for intergradational varieties, one may choose to recognize one or two taxa in our area. [= C, F, G, Y; < *F. grandifolia* – RAB, FNA, K, S, W, WV, Z; < *F. grandifolia* ssp. *grandifolia* – V; = *F. grandifolia* ssp. *caroliniana* (Loudon) Camp ex Shen – X, nomen nudum; = *F. ferruginea* Aiton]

Fagus grandifolia Ehrhart *var.* ***grandifolia***, Gray Beech, Red Beech, American Beech. Moderate to high elevation forests, especially on high elevation ridges, gaps, and open slopes, often forming clonal dwarfed thickets in the most exposed situations. April-May; September-October. NS, NB, and s. QC west to s. ON and n. MI, south to VA, w. NC, n. GA, e. TN, and n. OH. "Red beech" is alleged to differ from "gray beech" in having the involucral segments not covering the nutlets at maturity. Hardin

& Johnson (1985), Hardin (1985), and Shen (1992) point out that var. *mexicana* (Martínez) Little, of the mountains of México, is more closely related to our montane variety or phase than to the lower elevation variety or phase. [= C, F, G, Y; < *F. grandifolia* – RAB, FNA, K, S, W, WV, Z; < *F. grandifolia* ssp. *grandifolia* – V; = *F. grandifolia* ssp. *grandifolia* – X]

* *Fagus sylvatica* Linnaeus, European Beech, Copper Beech, of subgenus *Fagus*, section *Fagus*, is sometimes cultivated, but is not known to escape in our area. It has only 5-10 (-12) lateral veins, as opposed to (12-) 15-18 (-20) in *F. grandifolia*. {not keyed} [= V; ? *F. sylvatica* ssp. *sylvatica* – X] {not keyed}

Quercus Linnaeus 1753 (Oak)

A genus of about 350-530 species, trees and shrubs, of temperate, subtropical, and rarely tropical regions of the Northern Hemisphere. Oaks are the predominant tree of our area, with a variety of species dominating much of the landscape in nearly every ecological situation. Only in a few specialized (and usually in some sense edaphically extreme) communities are oaks generally entirely absent: deepest Coastal Plain swamps, some Coastal Plain depression ponds, wettest pine savannas, pocosins, spruce-fir forests, highest elevation northern hardwood forests, and mountain bogs.

Our oaks are divided into two well-marked sections; other sections occur outside our area. Red oaks (section *Lobatae*, sometimes treated as subgenus *Erythrobalanus*) are characterized by acorns maturing in two years (in one year in *Q. elliottii*), styles elongate, abortive ovules are at the top of the seed, leaves and leaf lobes bristle-tipped, inner surface of the acorn shell velvety-pubescent, and acorns rooting in spring. White oaks (section *Quercus*, sometimes treated as subgenus *Quercus*) are characterized by acorns maturing in a single year, styles short or absent, abortive ovules at the base of the seed, leaves and leaf lobes not bristle-tipped, inner surface of the acorn shell smooth, and acorns rooting in autumn. Twenty of our *Quercus* species are in this group: *Q. alba*, *Q. austrina*, *Q. bicolor*, *Q. boyntonii, Q. chapmanii, Q. geminata*, *Q. lyrata*, *Q. macrocarpa, Q. margarettae*, *Q. michauxii*, *Q. minima, Q. montana*, *Q. muehlenbergii*, *Q. oglethorpensis*, *Q. prinoides*, *Q. robur, Q. similis, Q. sinuata* var. *sinuata*, *Q. stellata*, and *Q. virginiana*. Hybrids within each section are frequent and diverse; hybrids do not naturally occur between the two sections. The live oaks of the southeastern Coastal Plain and Central America are subsection *Virentes*; other white oaks are subsection *Quercus*. References: Nixon in FNA (1997) (overall treatment); Jensen in FNA (1997) (red oaks); Nixon & Muller in FNA (1997) (white oaks); Godfrey (1988); Stein, Binion, & Acciavatti (2003); Cronquist (1991); Duncan & Duncan (1988); Hunt (1990)=Z; Hunt (1994); Kubitzki in Kubitzki, Rohwer, & Bittrich (1993).

Identification notes: Many oak species are well-adapted to ecological situations in which fires frequently burn the ground layer. Fire-maintained communities of the Piedmont and Mountains typically have oaks such as *Q. stellata*, *Q. marilandica* var. *marilandica*, *Q. ilicifolia*, and *Q. prinoides*. The two latter species are normally shrubby, and have become rarer because of fire suppression (they require fire to prevent larger trees from outcompeting them). In contrast, *Q. stellata* and *Q. marilandica* var. *marilandica* become larger and more frequent in fire-suppressed conditions.

Fifteen oak species in our area are typical of upland Coastal Plain communities with at least occasional fire: *Q. arkansana, Q. chapmanii, Q. geminata, Q. hemisphaerica, Q. incana, Q. laevis, Q. margerettae, Q. marilandica* var. *marilandica, Q. minima, Q. myrtifolia, Q. stellata*, and less typically *Q. falcata, Q. nigra, Q. velutina,* and *Q. virginiana*. Fire suppression of Coastal Plain communities, especially of sandhills, leads to an unnatural increase in the stature and abundance of oaks present. In frequent fire conditions, most oaks will persist as short, shrubby fire sprouts. Additional suggestions of how to recognize fire sprouts of hese species are given below. In general, leaves of fire sprouts are larger and more deeply lobed than normal leaves. In species of the red oak group, the bristle tips are larger and more pronounced. Increased size in leaves is particularly noticeable when an area previously long fire-suppressed is burned (the large underground root system and nutritional resources of a small tree destroyed by fire being devoted to a few very vigorous sprouts). Fire sprouts are often in sunny conditions, which tend to make oak leaves more deeply lobed and more coriaceous than shaded leaves.

White oaks with lobed leaves:
Q. margarettae – Often forms dense clonal, stoloniferous patches in frequent fire conditions. Tends to retain standard leaf characteristics.
Q. stellata – Less prone to formal clonal patches. Sprout leaves often very large, with exaggerated lobing.

Red oaks normally with deeply lobed leaves:
Q. laevis – Not clonal. Vigorous sprouter, leaves more deeply lobed than any other fire red oak. Small sprouts often have vertical leaf orientation characteristic of adults, though vigorous fire sprouts sometimes have more normally disposed leaves. Sprout leaves sometimes very large, with very long, curving lobes.
Q. falcata – Not clonal. Sprout leaves generally less lobed than typical adult leaves, more like forma *triloba*, but larger and coarser in texture, difficult to distinguish in shape from *Q. marilandica* var. *marilandica* and *Q. velutina*. See pubescence differences in main key.
Q. velutina – Not clonal. Leaves variable, sometimes minimally lobed and closely resembling *Q. marilandica* var. *marilandica* and *Q. falcata*. See pubescence differences in main key.

Red oaks normally with unlobed leaves:
Q. marilandica var. *marilandica* – Sprout leaves sometimes coarsely (though never deeply) lobed. Texture often very coriaceous, shiny, and very stiff. See pubescence characters in main key.
Q. nigra – Not very typically in fire-prone situations, but sometimes so. Young saplings, as well as fire sprouts, often with wildly different leaves than the typical adult form, frequently deeply lobed (for excellent illustrations showing variability in leaf shapes, see p. 329 of Godfrey, 1988 and pp. 51-52 of Godfrey & Wooten, 1981). Leaves always smaller and more glabrous than those of other fire oaks (except *Q. hemisphaerica*).
Q. incana – Generally not strongly clonal and stoloniferous even in frequently burned situations. Fire sprouts and vigorous shoots more prone to lobing than adult trees. Even fire shoots, though, usually with only one to several lobes, and the characteristic bluish-green characteristic holds. See comments above on *Q. elliottii*.

Q. elliottii – Strongly clonal via a stoloniferous "runner", never tree-like. Leaves never lobed, even on fire sprouts, though fire sprout leaves can be larger (to 15 cm long and 5 cm wide). Very difficult to tell from fire sprouts or seedlings of *Q. incana*, best separated by leaf pubescence (white in *Q. elliottii*, gray in *Q. incana*), margin (slightly revolute in *Q. elliottii*, flat in *Q. incana*), leaf vernation (planate in *Q. incana*, rolled in *Q. elliottii*), and acorn maturation (1 year in *Q. elliottii*, with acorns often on small plants, 2 years in *Q. incana*, with small plants rarely produing acorns).
Q. hemisphaerica – Not clonal. Leaves of vigorous shoots and fire sprouts often shallowly lobed, the lobing usually fairly neat and regular, triangular-ascending, and with bristle tips.

Live oaks:
Q. geminata – Sometimes clonal. Leaves, even of sprouts, not normally with lobes or teeth.
Q. virginiana – Sometimes clonal. Leaves of vigorous summer shoots (but apparently not spring shoots) often coarsely toothed, very similar to similar leaves of *Q. hemisphaerica*, but lacking bristle tips (instead the translucent margin with a darker, thickened callus at the tip of the tooth).
Q. minima – Always clonal. Leaves often with teeth or lobes.

Some oaks with ambiguous leaves are keyed in both Key A and Key D or in both Key B and Key C. The leaves of juvenile (seedling or sapling) branches, fire-sprout shoots, or other vigorous shoots (resulting from similar stimuli such as insect damage) are often much different than typical leaves and are not accounted for in these keys (see discussion at end of generic treatment). Hybrids are frequently encountered; they, too, are not keyed here, but can usually be identified (with difficulty) by their intermediate morphology and by parental context. Trichome types are useful in making and confirming identifications of oaks, since certain types are restricted to various groups of species. Hand lenses of 10× or 20× can be useful, but a dissecting scope with 20× to 40× dissecting microscope is far preferable. See Hardin (1992, 1976, 1979), and Thomson & Mohlenbrock (1979).

1 Most of the leaves on a relatively mature tree entire and unlobed (some species frequently with some leaves on a tree, especially those on young or vigorous growth, that are toothed or shallowly lobed, the teeth or lobes generally few and irregular in size or location); [primarily either "laurel oaks" of section *Lobatae* or "live oaks"'of section *Quercus*] ..... **Key A**
1 Most of the leaves on a relatively mature tree lobed or toothed.
  2 Venation of the leaves neatly and evenly pinnate, the 3-17 (or more) main lateral veins on each side distinctly parallel to each other, each ending in a tooth or shallow, crenate lobe extending < ¼ of the way to the midrib; ["chestnut oaks" of sections *Quercus* and *Cerris*] ..... **Key B**
  2 Venation of the leaves pinnate, but more branched and irregular, the 1-7 main lateral veins on each side rebranching into prominent side veins, the leaf usually distinctly lobed, at least some of the lobes of some of the leaves of a tree extending > ¼ of the way to the midrib.
    3 Apices of the lobes or teeth obtuse (rarely acute), lacking bristle tips; ["white oaks" of section *Quercus*] ..... **Key C**
    3 Apices of the lobes or teeth acuminate (rarely acute), and with bristle tips; ["red oaks" of section *Lobatae*] ..... **Key D**

Key A – Leaves (most of them) entire and unlobed (Laurel Oaks and Live Oaks)

1 Leaves broadly obovate or spatulate, 1-2.5 (-3)× as long as wide.
  2 Leaves 10-30 cm long, with rounded, subcordate, truncate, or oblique bases; lower leaf surfaces thinly to densely pubescent with tawny to orange glandlike hairs; [section *Lobatae*] ..... ***Q. marilandica*** *var.* ***marilandica***
  2 Leaves 2-10 (-15) cm long, mostly with cuneate or rounded bases (in some species sometimes subcordate, truncate, or oblique); lower leaf surfaces glabrous, glabrescent, or pubescent, but the pubescence not orange and glandlike.
    3 Twigs of the current year densely and finely hairy, obscuring the surface; [scrubby trees of sandhills from se. SC southward]; [section *Quercus*] ..... ***Q. chapmanii***
    3 Twigs of the year glabrous or sparsely pubescent; [shrubs, scrubby small trees, or large trees of various habitats].
      4 Leaves grayish beneath; [section *Quercus*] ..... ***Q. sinuata*** *var.* ***sinuata***
      4 Leaves bright green or orange-scurfy beneath; [section *Lobatae*].
        5 Leaf blade strongly convex; lower leaf surface orange-scurfy; [of sandhills and scrub from n. FL southward] ..... ***Q. inopina***
        5 Leaf blade planar (the margins sometimes revolute); lower leaf surface glabrous or pubescent and also with tufts of hairs in the vein axils; [collectively more widespread in habitat and distribution].
          6 Leaves evergreen, (including the petiole) usually < 4 cm long (sometimes to 9 cm long) and < 2 cm wide (to 6 cm wide); lower leaf surface usually entirely glabrous at maturity (rarely with pubescence in the vein axils); leaf blades rarely lobed; [shrub to scrubby tree of sandhills in se. SC and southward] ..... ***Q. myrtifolia***
          6 Leaves deciduous, (including the petiole) usually > 5.5 cm long (rarely smaller) and usually 3-5 cm wide; lower leaf surface usually with tufts of hairs in the main vein axils beneath; leaf blades often lobed.
            7 Leaves with broadly cuneate to rounded leaf bases, the blades 5-15 cm long; lower leaf surfaces generally pubescent across the surface, and also with tufts in the axils; [of sw. GA westward] ..... ***Q. arkansana***
            7 Leaves with cuneate bases, the blades 5-10 (-15) cm long; lower leaf surfaces glabrous, except for tufts of hairs in the vein axils; [widespread in our area] ..... ***Q. nigra***
1 Leaves linear, elliptic, or narrowly obovate, 2-10× as long as wide.
  8 Leaves (at maturity) glabrous or at most sparsely pubescent on the surface below, though often with tufts of hairs in the main vein axils.
    9 Twigs of the year densely and finely hairy, obscuring the surface; leaves (at maturity) sparsely pubescent beneath; [scrubby trees of sandhills from se. SC south]; [section *Quercus*] ..... ***Q. chapmanii***
    9 Twigs of the year glabrous or sparsely pubescent; leaves (at maturity) bright green and glabrous beneath, though often with tufts of hairs in the main vein axils; [medium to large trees, more widespread, mostly of moist habitats, except *Q. hemisphaerica*]; [section *Lobatae*].
      10 Leaves predominantly lanceolate, mostly 6-12 cm long and 0.7-2 cm wide, most of them 5-8× as long as wide, the apex acute; mature leaves with tufts of hairs in the vein axils below, and sometimes also some pubescence on the blade surface near the midrib; blades never with lobes or teeth; leaves deciduous in autumn; young leaves bronze red, emerging tightly rolled lengthwise and appearing linear; [trees of bottomlands and upland depression swamps, mesic uplands, and also weedy and frequent in disturbed successional habitats] ..... ***Q. phellos***

10 Leaves predominantly oblanceolate, obovate, or rhombic, mostly 2.5-10 cm long and 1.5-4 cm wide, most of them 2-5× as long as wide, the apex acute, obtuse, or rounded; mature leaves with or without tufts of hairs in the vein axils below, lacking pubescence on the blade surface; blades sometimes with 1-5 lateral lobes or teeth; leaves persisting until spring, or tardily and irregularly deciduous in winter; young leaves red, yellow, or green, not emerging tightly rolled lengthwise; [trees primarily either of swamp forests, maritime forests, or sandhills, not typically weedy].

11 Mature leaves entirely glabrous below; leaves mostly with acute apices and bristle tips (rarely a few rounded), mostly 2.5-8 cm long and 1-2 (-3) cm wide, the upper surface shiny, the vein network not readily visible when backlit; leaves evergreen (persisting until spring); petiole 0.5-2 mm long; leaves of vigorous growth often with dentate lobes; [trees of dry sandy habitats, such as sandhills and maritime forests] ..... ***Q. hemisphaerica***

11 Mature leaves with tufts of stellate trichomes in the vein axils; leaves mostly with rounded apices (rarely a few acute and then bristle-tipped), mostly 5-10 cm long and (1.8-) 2-4 cm wide, the upper surface dull, the vein network readily visible when backlit; leaves tardily deciduous; petiole 2-6 mm long; leaves of vigorous growth rarely lobed, and then not dentate; [trees of moist habitats, such as floodplain forests] ..... ***Q. laurifolia***

8 Leaves (at maturity) persistently and densely pubescent on the surface below, the pubescence in some species so dense and tight as to be difficult to perceive without at least 10× magnification.

12 Leaves bristle-tipped (sometimes the bristle fallen or broken off, but leaving a truncate scar), deciduous in autumn; multi-armed trichomes of the rosulate or multiradiate types, many of the arms ascending or erect (never with the stellate or fused-stellate trichomes characteristic of the live oaks); acorns maturing in 2 years (immature acorns present through the winter on fruiting trees); [section *Lobatae*].

13 Leaves (including petiole) mostly 10-17 cm long, 3.5-7 cm wide; lower leaf surface (at maturity) sparsely to moderately densely pubescent with soft hairs; leaves lustrous dark-green above; [trees of the Mountains, Piedmont, and rarely Coastal Plain] ..... ***Q. imbricaria***

13 Leaves (including petiole) mostly 4-11 cm long, 0.5-3.0 cm wide; lower leaf surface densely covered with soft hairs; leaves lustrous dark-green or bluish-green above; [stoloniferous shrubs and small to medium trees of the Coastal Plain].

14 Leaves 0.5-1.5 cm wide, mostly 4-8× as long as wide, lustrous dark-green above; acorns 8-12 mm long; petioles 1-3 mm long; [plant a stoloniferous shrub, to 1 m tall (or to 2 m in fire-suppressed pinelands)] ..... ***Q. elliottii***

14 Leaves 1.5-3.0 cm wide, mostly 2-4× as long as wide, dull bluish-green above; acorns 10-15 mm long; petioles 4-15 mm long; [plant a small to medium tree] ..... ***Q. incana***

12 Leaves not bristle-tipped, evergreen (overwintering, falling with the expansion of new leaves in the spring) or deciduous (in *Q. oglethorpensis*); multi-armed trichomes of the fused-stellate and stellate types, the arms parallel to the leaf surface, radiating from a well developed disc that appears as a white eye or dot at 20-40× magnification (or rosulate or multiradiate in *Q. oglethorpensis*); acorns maturing in 1 year (immature acorns not present through the winter, unless aborted); [section *Quercus*].

15 Leaves deciduous in autumn; bark gray, resembling *Q. alba*; [trees of bottomlands and upland clay flats of GA and SC] ..... ***Q. oglethorpensis***

15 Leaves evergreen (overwintering, falling with the expansion of new leaves in the spring); bark (on the tree species) brownish, deeply furrowed; [trees and stoloniferous shrubs of sandy habitats of the Coastal Plain of GA, NC, SC, and VA].

16 Plant a stoloniferous shrub, to 1 m tall (or to 2 m in fire-suppressed pinelands) and producing acorns at that size ..... ***Q. minima***

16 Plant a small to large tree, not producing acorns until >2m tall.

17 Leaf blades with the margins strongly revolute, and also the sides of the blades generally rolled downward and obscuring part of the lower surface, the leaf appearing boatlike (the depth of the "boat" often approaching the width of the leaf); midvein and major lateral veins impressed on the upper surface and raised on the lower surface (the lower surface therefore appearing rugose); buds dark brown; cup scales gray-tipped; pubescence of the lower surface stellate, both appressed and erect, the individual stellae readily visible at 20× magnification (sometimes at 10× magnification); acorns (1-) 2 (-6) per stalk; [typically a small tree of dry sands] ..... ***Q. geminata***

17 Leaf blades flat, or the margins slightly to strongly revolute, the sides of the blade sometimes rolled downward, usually not obscuring part of the lower surface, the leaf not boatlike (the leaf much wider than deep); midvein and major lateral veins not impressed (or very slightly so) on the upper surface and only very slightly, if at all, raised on the lower surface (the lower surface therefore not appearing notably rugose); buds red-brown; cup scales red-tipped; pubescence of the lower surface stellate, all of it tightly appressed, the individual stellae readily visible only at 30× magnification (sometimes barely distinguishable at 20× magnification); acorns 1-2 per stalk; [typically a salt-pruned shrub to large tree of dunes, estuarine shorelines, and southward of upland flats and slopes] ..... ***Q. virginiana***

Key B – Leaves with even crenations or teeth (Chestnut Oaks)

1 Scales of the acorn cup prolonged and long tapered; lateral veins terminating in a well-developed bristle; [species planted, rarely escaped]; [section *Cerris*] ..... ***Q. acutissima***

1 Scales of the acorn cup acute to obtuse; lateral veins terminating in a minute mucro or hardened projection; [species native]; [section *Quercus*].

2 Acorns on peduncles (2-) 4-7 cm long; acorns 1.5-2.5 cm long; veins ending in crenations usually 6-10 on each side of leaf ..... ***Q. bicolor***

2 Acorns sessile or on peduncles 0-1 cm long; acorns 1-2 cm or 2.5-3.5 cm long; veins ending in crenations usually 8-15 or 3-7 (if 3-7, then a stoloniferous shrub).

3 Leaves mostly obovate, with rounded teeth (crenations), the teeth sometimes with a minute mucro; hairs of the leaf undersurface clustered in sessile, stellate-appearing clusters of 2-8 hairs; acorns 2.5-3.5 cm long; large trees.

4 Hairs of the leaf undersurface in clusters with a diameter of 0.15-0.5 mm, dense to sparse; bark of mature trees light gray, loose, breaking into plates or scales ..... ***Q. michauxii***

4 Hairs of the leaf undersurface asymmetric, appressed-stellate, with a diameter of 0.1-0.25 mm, sparse; bark of mature trees dark gray, tight, deeply furrowed ..... ***Q. montana***

3 Leaves mostly narrowly elliptic, narrowly ovate, or narrowly obovate, with sharp ascending, often incurved teeth, the teeth ending in a hardened projection; hairs of the leaf undersurface tiny and stellate, with 6-10 rays parallel to the leaf surface; acorns 1-2 cm long; medium to large trees or stoloniferous shrubs.

5 Medium to large tree; veins ending in teeth usually 7-13 on each side of the leaf; leaves 8-20 cm long and 4-10 cm wide; [of dry to moist calcareous woodlands and forests] ..... ***Q. muehlenbergii***

5 Stoloniferous shrub to 5 m tall; veins ending in teeth usually 3-8 (-9)on each side of the leaf; leaves 4-10 (-14) cm long and 2-6 (-8) cm wide; [of dry, often sandy and acid woodlands] ..... ***Q. prinoides***

Key C – Leaves with lobes not bristle-tipped (White Oaks)

1 Lower surfaces of mature leaves glabrous.

2 Leaf lobes with acute apices; sinuses often both broad and "flat-bottomed" (with portions parallel to the midrib); acorn cup covering 2/3 to 3/4 of acorn ..... ***Q. lyrata***

2 Leaf lobes with obtuse apices; sinuses narrow (often notch-like), narrowly to broadly rounded or triangular (lacking portions parallel to the midrib); acorn cup covering 1/4 to 1/2 of acorn.

3 Leaves mostly 4-10 (-17) cm long, 2-5 (-9) cm wide, with 1-5 shallow lobes or undulations, extending 1/8 to 1/2 of the way to the midrib; acorn cup flat at the base, covering < ¼ of the acorn ..... ***Q. sinuata** var. **sinuata***

3 Leaves mostly 7-20 cm long, 3-10 cm wide, with 3-11 lobes, extending 1/4 to 5/6 of the way to the midrib (if the lobing < ½ of the way to the midrib, then the acorn cup rounded at the base and covering 1/4 to 1/2 of the acorn).

4 Leaf base deeply cordate; [alien, sometimes planted and persistent] ..... ***[Q. robur]***

4 Leaf base cuneate; [native]

5 Leaves with 7-11 lobes (the sinuses usually deep, those of the larger leaves usually about 2/3 to 5/6 of the way to the midrib), 10-20 cm long, 5-10 cm wide; terminal bud rounded or globose; basal scales of acorn cup thickened, the thickening giving the cup a knobby texture ..... ***Q. alba***

5 Leaves with 3-7 lobes (the sinuses usually shallow, those of the larger leaves usually ranging from 1/4 to 1/2 of the way to the midrib), 7-15 cm long, 3-8 cm wide; basal scales of the acorn cup thin, appressed, the cup having a rough but not knobby texture ..... ***Q. austrina***

1 Lower surfaces of mature leaves pubescent, the pubescence varying from dense to sparse (sometimes minute and requiring 10× magnification to be readily visible).

6 Lower surfaces of mature leaves whitish to pale green, with a mixture of minute, sessile, stellate hairs with horizontal tips and longer stellate hairs with erect ascending tips; leaves shallowly lobed (if so, the lobes 9-19) to deeply lobed (if so, the lobes with acute apices), the sinuses extending 1/4 to 4/5 of the way to the midrib.

7 Leaves mostly shallowly lobed at the base, the sinuses extending 1/4 to 1/2 of the way to midrib, grading into mere crenations toward the tip of the leaf, the total number of lobes/crenations usually 9-19; acorns borne on peduncles 2-10 cm long; acorn cup covering 1/3 to 1/2 of acorn, the upper scales with long-acuminate apices ..... ***Q. bicolor***

7 Leaves mostly relatively deeply lobed throughout the length of the leaf, the sinuses extending 1/2 to 4/5 of the way to the midrib, the total number of lobes 3-13; acorns sessile or borne on peduncles up to 1 cm long; acorn cup covering 1/3 to 3/4 of acorn, the upper scales with acute, long-acuminate, to long-awned apices.

8 Upper scales of the acorn cups thin and acute; acorn cup covering ½ to 3/4 of the acorn; [swamps in the Coastal Plain and lower Piedmont of GA, NC, SC, and VA] ..... ***Q. lyrata***

8 Upper scales of the acorn cups long-attenuate into nearly terete awns; acorn cup covering 1/3 to 1/2 of the acorn; [Mountains of VA] ..... ***Q. macrocarpa** var. **macrocarpa***

6 Lower surfaces of mature leaves gray, green, pale green, or yellowish, glabrescent or densely pubescent, the hairs few-branched and erect; leaves mostly relatively deeply and obtusely lobed, rarely shallowly lobed (if so, the lobes 3-7), the sinuses extending 1/2 to 4/5 of the way to the midrib, the total number of lobes 3-7; acorns sessile or nearly so.

9 Leaf lobes with acute apices; acorn cup covering 2/3 to 3/4 of acorn ..... ***Q. lyrata***

9 Leaf lobes with obtuse to rounded apices; acorn cup covering 1/3 to 1/2 of acorn.

10 Woody twigs of the season glabrous or with scattered, deciduous 2-forked hairs; petioles of mature leaves 3-10 (-15) mm long; leaf blades (2.5-) 4-8 (-13.5) cm long, irregularly and often rather shallowly 3-5 (-7) lobed, the overall form of the leaf only rarely cruciform; largest lateral lobes usually at the midpoint of the blade (or even below it), the lobes usually not sublobed, tapering from base to tip; [xeric sandy sites in the Coastal Plain from se. VA southward] ..... ***Q. margarettae***

10 Woody twigs of the season densely and persistently stellate-pubescent, especially toward the tip of the twig; petioles of mature leaves 15-20 mm long (*Q. stellata*) or 3-10 (-15) mm long (*Q. boyntonii* and *Q. similis*); leaf blades (5-) 7.5-15 (-20) cm long, usually 5-lobed, the overall form of the leaf typically cruciform (*Q. stellata*) or not (*Q. boyntonii* and *Q. similis*); largest lateral lobes of the leaves usually above the midpoint of the blade, these lobes often sublobed or squarish in shape, usually wider near their tips than at their bases (*Q. stellata*) or not sublobed, tapering from base to tip (*Q. boyntonii* and *Q. similis*); [collectively widespread in our area].

11 Leaves usually cruciform, the largest lateral lobes often sublobed or squarish in shape, usually wider near their tips than at their bases, and borne at right angles to the midrib; [usually of dry to dry-mesic upland situations, widespread in our area] ..... ***Q. stellata***

11 Leaves not cruciform, the largest lateral lobes usually not sublobed, tapering from base to tip, and borne at ascending angles relative to the midrib; [of temporarily flooded calcareous swamps of the Coastal Plain, from SC (NC?) southward in our area (*Q. similis*) or localized on sandstone in nc. AL (*Q. boyntonii*)].

12 Rhizomatous shrubs to small trees, generally < 2 m tall; [of sandstone outcrops in nc. AL] ..... ***Q. boyntonii***

12 Single-trunked large trees; [usually of temporarily flooded calcareous swamps of the Coastal Plain, from SC (NC?) southward in our area] ..... ***Q. similis***

Key D – Leaves with lobes or teeth bristle-tipped (Red Oaks)

1 Leaves shallowly 3-lobed near the broad apex (some leaves of sprout or juvenile shoots may be more lobed).

2 Leaf blades 5-15 cm long; lower leaf surfaces glabrous, except for tufts of hairs in the vein axils (or pubescent across the surface in *Q. arkansana*].

3 Leaves with broadly cuneate to rounded leaf bases, the blades 5-15 cm long; lower leaf surfaces generally pubescent across the surface, and also with tufts in the axils; [of sw. GA westward] ..... ***Q. arkansana***
3 Leaves with cuneate bases, the blades 5-10 (-15) cm long; lower leaf surfaces glabrous, except for tufts of hairs in the vein axils; [widespread in our area] ..... ***Q.nigra***
2 Leaf blades 10-30 cm long; lower leaf surfaces pubescent across the surface (and often also with denser tufts of hairs in the vein axils).
4 Petioles short and stout, 5-15 mm long; lower leaf surfaces thinly to densely pubescent with a mixture of tawny or orange glandlike hairs and stellate hairs whose structure is easily visible at 10× magnification ..... ***Q. marilandica* *var.* *marilandica***
4 Petioles long and slender, (14-) 20-50 mm long; lower leaf surfaces densely puberulent with tawny stellate hairs whose structure is barely visible at 10× magnification..... ***Q. falcata***
1 Leaves shallowly to deeply 5-12-lobed (some of the leaves of *Q. georgiana* only 3-lobed), the lobes primarily lateral.
5 Mature leaves pubescent beneath on the surface with stellate hairs.
6 Leaves 5-10 (-12) cm long, 5-lobed; shrub or small tree; [w. NC northward] ..... ***Q. ilicifolia***
6 Leaves (8-) 10-20 cm long, 5-12-lobed; small to large trees[collectively widespread in our area].
7 Petioles 0.5-1.0 (-1.8) cm long, generally twisted such that the blade is oriented in a vertical plane; leaves all deeply lobed, some of the sinuses extending > 4/5 of the way to the midrib; pubescence of the lower leaf surface greenish yellow, matted, and glandlike, usually sloughing off by late in the year ..... ***Q. laevis***
7 Petioles 2-5 cm long, not twisted so that the blade is oriented in a vertical plane; leaves shallowly to deeply lobed, some of the leaves on a tree generally shallowly lobed, none of the sinuses extending > 2/3 of the way to the midrib; pubescence of the lower leaf surface tawny or gray, stellate, not glandlike, persistent or sloughing off by late in the year.
8 Acorns 12-20 mm long, in a cup 15-25 mm across and 10-12 mm deep; mature leaves loosely and rather coarsely pubescent (the stellate hairs conspicuous and readily distinguishable at 10× magnification), often becoming nearly or entirely glabrous by late in the year (except for tufts of hairs in the vein axils); terminal bud 4-angled, 7-10 mm long, densely gray-tomentose..... ***Q. velutina***
8 Acorns 10-15 mm long, in a cup 12-14 mm across and 4-5 mm deep; mature leaves densely and finely pubescent (the stellate hairs minute and scarcely distinguishable at 10× magnification), the pubescence permanent; terminal bud only obscurely angled (if at all), 5-8 mm long, brown-puberulent.
9 Base of blades of sun-leaves typically rounded, thus forming a U-shape (some leaves cuneate, angled, or oblique); terminal lobe of leaves generally long-attenuated, narrow (its sides nearly parallel for much of its length), and curved to one side (falcate) (note that trees with the trilobed leaf form will key out above); leaves with 3-7 well-developed lobes, these often very irregular in size, shape, spacing, and orientation; pubescence of lower leaf surface normally tawny (when fresh) ..... ***Q. falcata***
9 Base of blades of sun-leaves typically cuneate or angled, thus forming a V-shape (some leaves somewhat U-shaped or oblique); terminal lobe of leaves generally short, broadly triangular (its sides normally tapering toward the tip for most of their length), not strongly curved to one side; leaves with 5-9 well-developed lobes, these generally rather uniform in size, shape, spacing, and orientation; pubescence of leaf surface gray ..... ***Q. pagoda***
5 Mature leaves glabrous beneath on the surface, with tufts of hairs in the main vein axils beneath.
10 Petioles 0.5-1.0 (-1.8) cm long, generally twisted such that the blade is oriented in a vertical plane; inner cup-scales of the acorn cup inflexed, thus the cup appearing to have a broadly rounded rim..... ***Q. laevis***
10 Petioles 2.5-7 cm long, not twisted so that the blade is oriented in a vertical plane; inner cup-scales of the acorn cup not inflexed, thus the cup appearing to have a sharp rim appressed against the acorn.
11 Terminal buds 4-angled, 7-10 mm long, the bud scales densely gray-tomentose..... ***Q. velutina***
11 Terminal buds not 4-angled, 3-5 (-7) mm long, the bud scales glabrous or with ciliate margins.
12 Leaves relatively shallowly lobed, the sinuses extending up to 2/3 of the way to the midrib; upper leaf surface dull, not lustrous.
13 Acorn cup covering about 1/4 of acorn; leaf sinuses extending about ¼ of the way to the midrib; bark of mature trees dark gray to black; [widespread in our area, at low to medium elevations] ..... ***Q. rubra* *var.* *rubra***
13 Acorn cup covering about 1/3 of acorn; leaf sinuses extending about 1/3 of the way to the midrib; bark of mature trees medium gray; [of the Mountains, mostly at 1000 m and above] ..... ***Q. rubra* *var.* *ambigua***
12 Leaves relatively deeply lobed, the sinuses extending 2/3 to 9/10 of the way to the midrib; upper leaf surface lustrous.
14 Larger lateral lobes of most leaves with 1 bristle per lobe (-2 on some lobes); total bristle tips < 10/leaf ..... ***Q. georgiana***
14 Larger lateral lobes of most leaves with 2 or more bristles; total bristle tips 9-50/leaf.
15 Mature leaves mostly 7-12 cm long, 5-11 cm wide (averaging about 9 cm long and 8 cm wide), with 5-7 lobes; acorns (8-) 10-13 (-15) mm long; acorn cup nearly flat at base, covering about ¼ of the acorn ..... ***Q. palustris***
15 Mature leaves mostly 10-20 cm long, 8-15 cm wide (averaging about 12-15 cm long and 10-12 cm wide), with (5-) 7-11 lobes; acorns (12-) 15-25 (-37) mm long; acorn cup nearly flat, turbinate, or rounded, covering ¼-½ of the acorn.
16 Acorn cup nearly flat at base, covering about ¼-1/3 of the acorn; acorn 15-37 mm long, lacking concentric grooves near the tip; upper surface of leaves dark green..... ***Q. shumardii***
16 Acorn cup turbinate, covering about 1/2 of the acorn; acorn (12-) 15-26 mm long, with or without 1-3 concentric grooves near the tip; upper surface of leaves bright green.
17 Acorn (12-) 15-20 mm long, with 1-3 concentric grooves near the tip; bud silvery or tawny pubescent towards the tip; upper surface of leaves bright green; lobes 5-9 per leaf; total bristle tips 18-50/leaf; [usually of dry uplands, widespread in our area] ..... ***Q. coccinea***
17 Acorn 15-26 mm long, without concentric grooves near the tip; bud glabrous, or with the scales merely ciliate-margined; lobes 7-11 per leaf; total bristle tips 9-24/leaf; [bottomlands, from c. TN and AL westward]..... ***Q. texana***

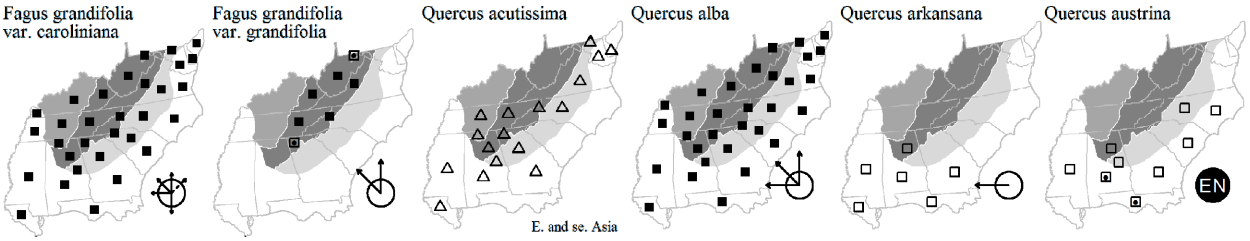
* ***Quercus acutissima*** Carruthers, Sawtooth Oak. Commonly cultivated as a suburban street tree and also widely planted in "wildlife food plots", rarely naturalizing; native of Japan. This species has been a popular recommendation for "wildlife plantings" in the recent past, and entire stands can be encountered in relatively remote areas, planted by federal and state land management agencies; why "wildlife" species in our area need more oak trees is somewhat mystifying! See Whittemore (2004) for additional information. Spreading from plantings in Knoxville, TN (D. Estes, pers. comm. 2007). [= K; *? Q. acutissima* ssp. *acutissima*]

Quercus alba Linnaeus, White Oak. Mesic to xeric forests. April; September-November (of the same year). ME west to MN, south to Panhandle FL and e. TX. Historically, one of the most valuable timber trees of eastern North America. *Q. alba* is

probably the most abundant native plant in our area, and in eastern North America, based on biomass, leaf area, and ubiquity. Hardin (1975) discusses introgression between *Q. alba* and many other species of *Quercus* subgenus *Quercus*. [= RAB, C, F, FNA, G, K, W, WH, WV; < *Q. alba* – S (also see *Q. austrina*)]

Quercus arkansana Sargent, Arkansas Oak. Dry bluffs. Sw. and wc. GA and Panhandle FL west in a fragmented distribution to sw. AR and e. TX. [= FNA, K, S, WH; > *Q. caput-rivuli* W.W. Ashe]

Quercus austrina Small, Bluff Oak. River bluffs, mesic hammocks, dry hammocks, natural levees of brownwater rivers, over mafic rocks, on shell or calcareous sediments. April; October (of the same year). Essentially a Southeastern Coastal Plain endemic, ranging from sc. NC south to n. FL and west to MS, nowhere common. [= RAB, FNA, K, WH; < *Q. alba* – S (apparently)]



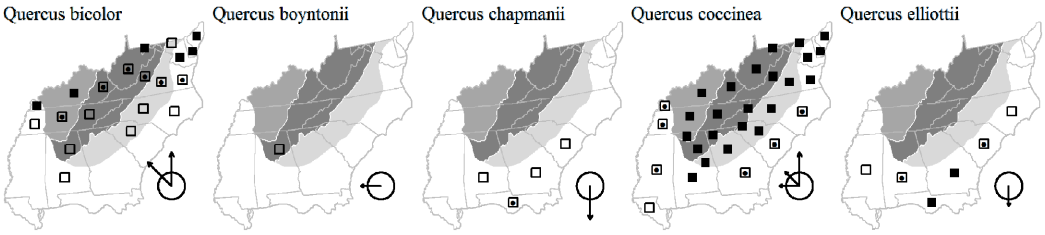
Quercus bicolor Willdenow, Swamp White Oak. Upland depression swamp forests over mafic rocks such as gabbro or diabase, bottomland swamps with calcareous sediments. April; September (of the same year). Widespread in ne. North America, south to NC, SC (Nelson 1993), TN, n. AL, and MO. [= RAB, C, F, FNA, G, GW, K, S, W]

Quercus boyntonii Beadle, Boynton Oak. Dry forests. Ne. AL and (possibly) TX. [= FNA, K, S; = *Q. stellata* Wangenheim var. *boyntonii* (Beadle) Sargent]

Quercus chapmanii Sargent, Chapman Oak. Dry pinelands, sandhills, scrub. February-March; September-November (of the same year). A Southeastern Coastal Plain endemic: se. SC south to s. FL, west to sw. AL. [= RAB, FNA, K, S, WH]

Quercus coccinea Muenchhausen, Scarlet Oak. Xeric upland forests. April; September-November (of the second year). Centered in the Appalachians, from s. ME south to c. AL, but ranging west to MS, ne. AR, s. IL, and s. MI. [= RAB, C, F, FNA, G, S, W, WV; > *Q. coccinea* var. *coccinea* – K; > *Q. coccinea* var. *tuberculata* Sargent – K]

Quercus elliottii Wilbur, Running Oak. Pine flatwoods, especially on loamy soils in the Middle Coastal Plain. March-April; September (of the first year). A Southeastern Coastal Plain endemic: se. NC south to s. FL and west to s. MS. Wilbur (2002b) and Wilbur & Ho (2008) discuss the reasons for rejecting the traditional use of *Q. pumila* for this species; Walter's diagnosis states that *Q. pumila* has leaves that are glabrous and glaucous below, ruling out application to this species. [= WH; = *Q. pumila* Walter – RAB, FNA, K, S, Z, apparently misapplied]



Quercus falcata Michaux, Spanish Oak, Southern Red Oak. Upland forests, usually xeric. April; September-November (of the second year). Widespread in se. North America, north to e. OK, s. MO, s. IL, s. IN, s. OH, WV, se. PA, NJ, and reported (apparently without specimen documentation) from Long Island, NY. "*Q. triloba* Michaux", the form with the leaves only shallowly trilobed at the apex, causes much confusion. Though even medium-sized trees sometimes have leaves only of this form (rather than the typical form, deeply 5-7-lobed, the terminal lobe long-attenuate and falcate), it has no taxonomic merit. [= C, FNA, K, W, WH, WV; = *Q. falcata* var. *falcata* – RAB, G, GW; > *Q. falcata* var. *falcata* – F; > *Q. falcata* var. *triloba* (Michaux) Nuttall – F; = *Q. rubra* – S, misapplied; ? *Q. digitata* Sudworth; > *Q. triloba* Michaux]

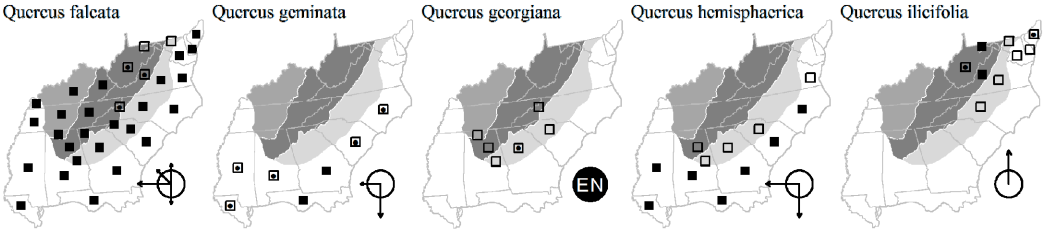
Quercus geminata Small, Sand Live Oak. Xeric sandhills (northwards restricted to areas very near the coast). April; September-November (of the same year). A Southeastern Coastal Plain endemic: se. NC south to s. FL, and west to s. MS. The alleged occurrence of *Q. geminata* as far north as se. VA is apparently based on ambiguous specimens that probably are only *Q. virginiana* (the so-called var. *maritima*). A careful study of the genetics, morphology, and ecology of *Q. geminata* and *Q. virginiana* supports their recognition as separate species (Cavender-Bares & Pahlich 2009). *Q. geminata* flowers about 2-3 weeks later than *Q. virginiana* when growing in close proximity. [= C, FNA, GW, K, S, WH; < *Q. virginiana* – RAB; *? Q. virginiana* var. *maritima* (Michaux) Sargent – F, misapplied]

Quercus georgiana M.A. Curtis, Georgia Oak. Dry slopes and bluffs, mainly over granite. April; September-October (of the second year). W. SC south and west through GA to c. AL. [= RAB, FNA, K, S]

Quercus hemisphaerica Bartram ex Willdenow, Sand Laurel Oak, Darlington Oak. Sandhills and other dry, sandy soils, an abundant component of maritime forests with *Q. virginiana*, and widely planted as a street tree in most parts of our region. March-April; September-November (of the second year). Essentially a Southeastern Coastal Plain endemic: se. VA south to s. FL and west to s. TX, north uncommonly in the interior to nc. AL, n. MS, and s. AR. Often confused with *Q. laurifolia* (see the key for distinctions). *Q. hemisphaerica* is the semi-evergreen laurel oak planted widely as a street tree in southern cities, often

intermixed with the strictly deciduous *Q. phellos*. [= C, F, FNA, Z; < *Q. laurifolia* – RAB, WH; = *Q. laurifolia* – S, misapplied; > *Q. hemisphaerica* var. *hemisphaerica* – K; > *Q. hemisphaerica* var. *maritima* (Michaux) Muller – K]

Quercus ilicifolia Wangenheim, Bear Oak, Scrub Oak. Xeric soils in ridges in the Mountains and monadnocks in the upper Piedmont, other dry sites. Late April-June; August (of the second year). Primarily Appalachian: s. ME south to w. VA, w. NC, and e. KY. In NC this scrubby oak is rare and probably declining because of fire suppression (Barden 1985), though recent ice storms have opened the tree canopy at several of its NC sites. The occurrence of *Q. ilicifolia* in KY was confirmed at the Devil's Teatable, Floyd County (Clark et al. 1997). [= RAB, C, F, FNA, G, K, S, W, WV]



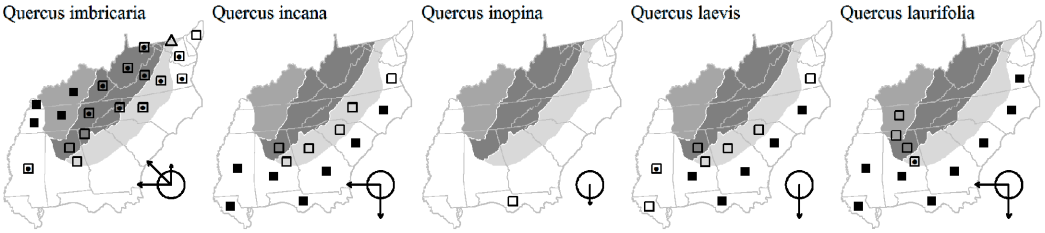
Quercus imbricaria Michaux, Shingle Oak. Rich soils of upper floodplains of rivers and creeks, often at the base of the slope into the upland, also on lower slopes, and in forests over diabase in the Piedmont of VA and n. NC. May; October (of the second year). Primarily midwestern, ranging from NJ, PA, n. OH, s. MI, n. IL, and c. IA, south to e. VA, nc. and w. NC, sc. TN, n. AL, and n. AR. [= RAB, C, F, FNA, G, K, S, W, WV, Z]

Quercus incana Bartram, Bluejack Oak. Sandhills, primarily in somewhat loamier textured, submesic soils, inland from the Coastal Plain on coarse sandy alluvium or upland ridges over quartzite or other acidic rocks. April; September-November (of the second year). Primarily a species of the Southeastern Coastal Plain, but rarely extending inland into the Piedmont (especially on coarse sandy alluvium): se. VA south to c. peninsular FL and west to e. TX, sw. AR, and se. OK. This oak is recognizable even at a distance by its bluish color. [= RAB, F, FNA, K, Z; = *Q. cinerea* Michaux – C, G, S; *? Q. humilis* Walter]

Quercus inopina W.W. Ashe, Florida Scrub Oak. Scrub, sandhills. FL peninsula, north to St. Johns County. [= FNA, K, WH] {add to synonymy}

Quercus laevis Walter, Turkey Oak. Sandhills, primarily in very xeric soils of deep sandy deposits (Carolina bay rims, old beach dunes, early Cenozoic deposits of the Sandhills Province), or inland from the Coastal Plain on dry ridges and slopes over quartzite or other acidic rock types. April; September-October (of the second year). Essentially a Southeastern Coastal Plain endemic: se. VA south to s. FL and west to e. LA. The leaves turn an intense orange-red in the autumn (November). [= RAB, C, F, FNA, G, K, S, WH, Z; = *Q. catesbaei* Michaux]

Quercus laurifolia Michaux, Laurel Oak. Mesic to seasonally flooded soils of floodplains, also (rarely) mesic slopes and swamps in maritime forests. March-April; September-November (of the second year). A Southeastern Coastal Plain endemic: se. VA south to s. FL and west to e. TX and s. AR. Sometimes confused with *Q. hemispherica*, but (in addition to the key characters above) *Q. laurifolia* has blunter leaf tips, flowers about 2 weeks earlier, and generally occupies much moister habitats. [= C, F, FNA, G, GW, K, Z; < *Q. laurifolia* – RAB, WH (also see *Q. hemisphaerica*); = *Q. obtusa* (Willdenow) Ashe – S]



Quercus lyrata Walter, Overcup Oak. Seasonally rather deeply and frequently flooded soils of floodplains of the Coastal Plain, less commonly in seasonally flooded swamps in Triassic basins in the lower Piedmont, and rarely in upland depression swamps of the Piedmont (developed over clays weathered from mafic rocks) and Coastal Plain. March-April; September-October (of the same year). Primarily a species of the Southeastern Coastal Plain: DE south to Panhandle FL, west to e. TX and se. OK, north in the inland to w. TN, s. IN, s. IL, and se. MO. Of our oaks, *Q. lyrata* tolerates the wettest habitats, both in terms of depth and duration of flooding. [= RAB, C, F, FNA, G, GW, K, S, WH]

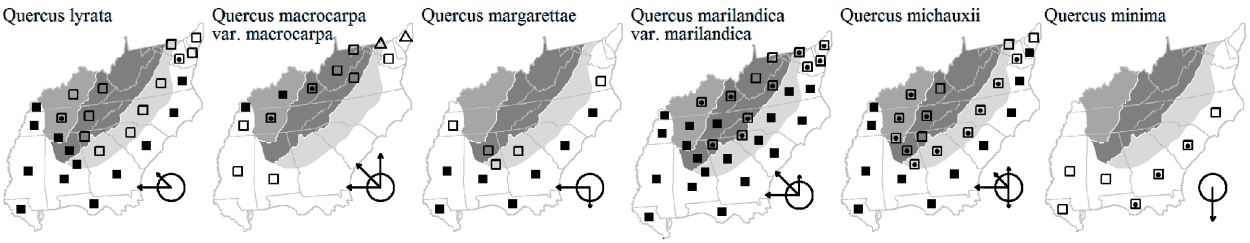
Quercus macrocarpa Michaux *var.* ***macrocarpa***, Bur Oak, Mossycup Oak. Rich bottomland forests. NB and QC west to s. MB, south to nw. VA, KY, TN, LA, and TX. Variation in this species needs additional study; *Q. macrocarpa* in our area is the typic variety or subspecies if other taxa are recognized. [= K; < *Q. macrocarpa* – C, F, FNA, G, GW, S, W, WV]

Quercus margarettae Ashe ex Small, Sand Post Oak. Sandhills, typically in slightly loamy or clayey soils, not usual in the deepest and most xeric sands. April; September-November (of the same year). Primarily a species of the Southeastern Coastal Plain: se. VA south to FL and west to TX and se. OK. As stated by Fernald (1950), this oak was "chivalrously named [by W.W. Ashe] in 1903 for Margaret Henry Wilcox, who two years later became Mrs. Ashe." There has been controversy, however, over the spelling of the specific epithet; apparently it should be corrected to the genetive "*ae*" (K. Gandhi, pers. comm. 2007). [= *Q. margaretta* – RAB, C, FNA, G, S, WH; = *Q. margarettiae* Ashe ex Small – K, orthographic variant; = *Q. stellata* var. *margaretta* (Ashe ex Small) Sargent – F]

Quercus marilandica Muenchhausen *var.* ***marilandica***, Blackjack Oak. Upland forests and woodlands, usually on periodically droughty soils, as over shrink-swell clays, sandstones, deep sands, and sands with clay lenses. April; September-November (of the second year). NY (Long Island), NJ, se. PA, w. VA, s. OH, s. IN, c. IL, s. IA, and se. NE south to s. GA, Panhandle FL, and sc. TX (west to the Prairie border). There are historical accounts of the existence of prairies or barrens in the vicinity of Charlotte in the late eighteenth century, known as the "the blackjack lands." These areas were described as open and prairie-like, until the early nineteenth century, when they became dominated by dense forests of blackjack oak. The previously open condition was almost certainly maintained by fire, perhaps set by the Waxhaw Indians. Blackjack oak has long been considered an indicator of poor soil, as in Guthrie (1820), who states in his discussion of NC, "the Black Jack land is generally poor, though it has sometimes a black appearance, it is wet and loose, and is avoided by farmers, as unproductive." Var. *marilandica* is the widespread taxon; var. *ashei* Sudworth [= *Q. neoashei* Bush] is worthy of recognition at the varietal level at least, and occurs from s. MO and s. KS south to c. AR, e. TX, and sc. TX, especially on the Edwards Plateau (Hunt 1990). [= FNA, K, Z; < *Q. marilandica* – RAB, C, F, G, S, W, WH, WV]

Quercus michauxii Nuttall, Basket Oak, Swamp Chestnut Oak. Bottomland forests, especially in fertile soils of upper terraces where flooded only infrequently and for short periods, upland depression ponds. April; September-October (of the same year). NJ south to n. peninsular FL and west to e. TX and se. OK, north in the interior to s. IL and s. IN. See discussion under *Q. montana* about the application of the name *Q. prinus* Linnaeus. [= RAB, C, F, FNA, G, GW, K, W, WH; = *Q. prinus* Linnaeus – S, name rejected (possibly misapplied, and a source of confusion)]

Quercus minima (Sargent) Small, Dwarf Live Oak. Pine flatwoods, coastal fringe sandhills. April; September-November (of the same year). A Southeastern Coastal Plain endemic: se. NC (New Hanover County) south to s. FL, west to s. MS. [= FNA, K, S, WH]



Quercus montana Willdenow, Rock Chestnut Oak. Xeric forests of ridges, slopes. April; September-November (of the same year). Primarily Appalachian but broadly distributed in e. North America: s. ME, NY, MI, s. UN, s. IL, and se. MO (Smith & Parker 2005) south to c. GA, c. AL, ne. MS (and LA?). The proper application of the Linnaean "*Q. prinus*" is controversial and unclear, having been debated and variously applied for well over a century. The name "*Q. prinus*" has nomenclatural priority over either "*Q. montana*" or "*Q. michauxii*", but it is not clear which species was intended; Whittemore & Nixon (2005) proposed its formal rejection and the proposal was formally and unanimously accepted (Brummitt 2007). [= FNA, S, W; = *Q. prinus* Linnaeus – RAB, C, F, G, K, WV, name rejected (probably misapplied, and a source of confusion)]

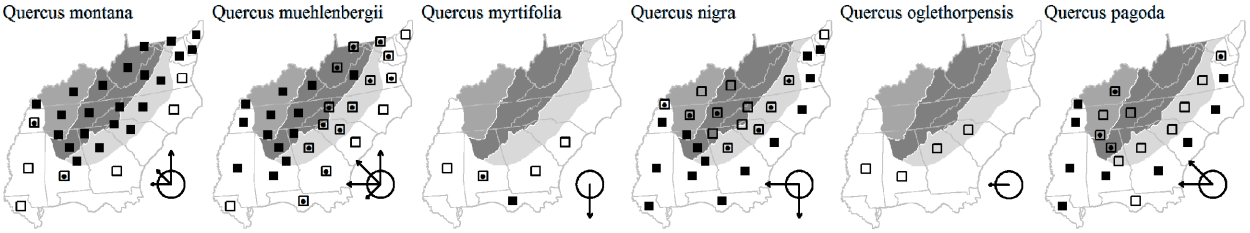
Quercus muehlenbergii Engelmann, Yellow Oak, Chinquapin Oak. Slopes and bluffs, on soils derived from calcareous or mafic rocks. April; October-November (of the same year). S. New England and ON west to WI, se. MN, and IA, south to nw. FL, TX, and n. Mexico. The similar *Q. montana* sometimes has a few leaves with somewhat sharply lobed leaves, but these are minutely mucronate and lack the well-developed callus of *Q. muehlenbergii*. Additionally, *Q. muehlenbergii* has a flaky, light gray bark, very different from the dark gray, deeply furrowed bark of *Q. montana*. [= RAB, C, F, K, WH, WV; = *Q. muhlenbergii* – FNA, S, W, orthographic variant; = *Q. prinoides* Willdenow var. *acuminata* (Michaux) Gleason – G]

Quercus myrtifolia Willdenow, Myrtle Oak. Dry pinelands. February-March; September (of the second year). A Southeastern Coastal Plain endemic: se. SC south to s. FL, west to se. MS. [= RAB, FNA, K, S, WH, Z]

Quercus nigra Linnaeus, Water Oak, Paddle Oak. Bottomland forests, especially on levees or second terraces where flooded infrequently and for short periods, less commonly on mesic slopes. April; September-November (of the second year). Primarily a species of the Southeastern Coastal Plain: s. NJ south to s. FL and west to e. TX and se. OK, north in the interior to se. TN, c. TN, w. and sc. KY (Clark et al. 2005), se. MO, and e. OK. Seedlings and fire sprouts of this species are highly variable; see discussion at end of generic treatment. [= RAB, C, FNA, G, GW, K, S, W, WH, Z; > *Q. nigra* var. *nigra* – F; > *Q. nigra* var. *heterophylla* (Aiton) Ashe – F: = *Q. aquatica* Walter]

Quercus oglethorpensis Duncan, Oglethorpe Oak. Bottomland forests, upland oak flats over clays (Iredell and Enon soils). April; September-October (of the same year). Widely scattered from w. SC, to adjacent e. GA, nw. AL (Sorrie pers. comm. 2002), MS, and LA. [= RAB, FNA, GW, K]

Quercus pagoda Rafinesque, Cherrybark Oak, Swamp Spanish Oak. Bottomland forests, especially on second terraces, also mesic upland sites. April; September-November (of the second year). A Southeastern Coastal Plain endemic: e. and c. VA south to nw. FL and west to se. TX and north in the interior to e. TN, s. IL, and s. IN. [= C, FNA, K, S, WH; = *Q. falcata* var. *pagodifolia* Elliott – RAB, F, G, GW]



Quercus palustris Muenchhausen, Pin Oak. Swamps and bottomlands, especially the broader swamps developed in the sedimentary rocks of Triassic basins of the lower Piedmont, isolated upland sag ponds, also widely planted as a street tree in towns and cities. March-April; October-November (of the second year). MA and NY west to se. IA and e. KS, south to c. NC, nw. GA, sc. TN, n. AR, and e. OK. [= RAB, C, F, FNA, G, GW, K, S, W, WV]

Quercus phellos Linnaeus, Willow Oak. Bottomland forests, especially on natural levees and second terraces, also in upland depression swamps developed on clay soils, weedy and successional on slopes and upland sites following disturbance, and widely planted as a street tree in towns and cities. March-April; September-November (of the second year). Primarily a species of the Southeastern Coastal plain: NY (Long Island), s. NJ, and se. PA south to s. GA and Panhandle FL, west to e. TX and se. OK, north in the interior to e. TN, s. KY, w. KY, s. IL, and se. MO, and e. OK. [= RAB, C, F, FNA, G, GW, K, S, W, Z]

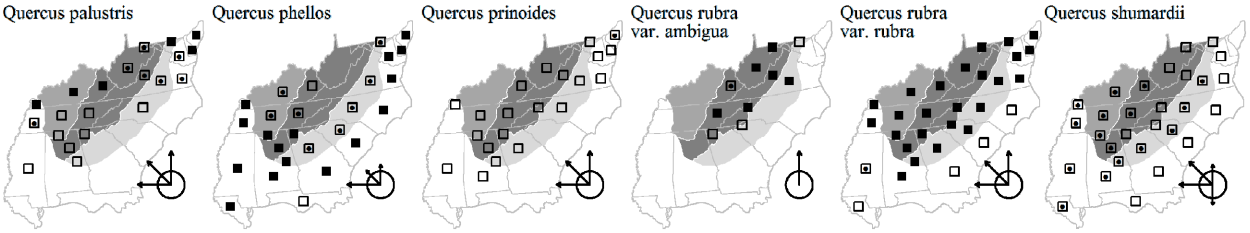
Quercus prinoides Willdenow, Dwarf Chinquapin Oak. Xeric uplands, especially on clay soils derived from mafic rocks, and probably in sites which naturally burned rather frequently. April; August-September (of the same year). MA and s. MI south to NC, OK, and TX. Fire suppression in the Piedmont sites where this rare oak occurs has nearly or entirely extirpated it from much of our area. [= RAB, C, FNA, K, S, W; > *Q. prinoides* var. *prinoides* – F; > *Q. prinoides* var. *rufescens* Rehder – F; = *Q. prinoides* var. *prinoides* – G]

* *Quercus robur* Linnaeus, English Oak. Rarely cultivated in our area; sometimes persisting or escaping in ne. United States, south at least to s. PA (Rhoads & Klein 1993; Rhoads & Block 2007). [= FNA, K] {rejected; not mapped}

Quercus rubra Linnaeus *var.* ***ambigua*** (A. Gray) Fernald, Gray Oak. Forests on ridges, slopes, and coves, mostly at over 1000 meters elevation. May; September-October (of the second year). Fairly widespread in ne. North America south to PA, and in the Appalachians to w. NC, nw. SC, and n. GA. This and var. *rubra* tend to intergrade and their distinction as even varieties may not be warranted. For discussion of the two varieties, see McDougal & Parks (1984) and Jensen (1977). [= K; = *Q. rubra* var. *borealis* (Michaux f.) Farwell – RAB, F, FNA, WV; < *Q. rubra* – C, W; = *Q. borealis* Michaux f. var. *borealis* – G; = *Q. borealis* – S]

Quercus rubra Linnaeus *var.* ***rubra***, Red Oak. Moist to fairly dry forests of slopes, coves, and ravines, below 1000 meters elevation. April; August-September (of the second year). Widespread in e. North America, south to e. VA, GA, AL, MS, AR, and OK. [= RAB, F, FNA, K, WV; < *Q. rubra* – C, W; = *Q. borealis* Michaux f. var. *maxima* (Marshall) Ashe – G; = *Q. maxima* (Marshall) Ashe – S]

Quercus shumardii Buckley, Shumard Oak. Moist and fertile soils of bottomlands and lower slopes, also in xeric sites over calcareous rocks (such as limestone). April; September-October (of the second year). Sc. PA, OH, s. MI, IN, s. IL, MO, and e. KS south to n. peninsular FL and TX. A number of varieties have been recognized in *Q. shumardii*, and the morphological and habitat variation needs additional study. Var. *schneckii* (Britton) Sargent is apparently more midwestern, but should be looked for in our area, especially on dry limestone slopes, its preferred habitat. It is allegedly distinguished by the acorn cups rounded to turbinate below (vs. flattened and saucer-shaped in var. *shumardii*). Hess & Stoynoff (1998) tentatively concluded that no varieties should be recognized within *Q. shumardii*. *Q. acerifolia* (E.J. Palmer) Stoynoff & W.J. Hess (*Q. shumardii* var. *acerifolia* Palmer] is an endemic of Magazine Mountain in n. AR and scattered sites in OK; it is best treated as a distinct species, though there has been much debate about its taxonomic status, with opinions ranging from full species to mere form (Smith 1988, Stoynoff & Hess 1990, Johnson 1992, Johnson 1994, Hess & Stoynoff 1998). [= RAB, C, S, W, WH; > *Q. shumardii* var. *shumardii* – F, FNA, G, K, WV; > *Q. shumardii* var. *schneckii* (Britton) Sargent – F, FNA, G, K, WV]



Quercus similis Ashe, Swamp Post Oak, Delta Oak. Calcareous stream flats. SC south to GA, west to e. TX. *Q. similis* resembles *Q. stellata*, differing in its less definitely cross-shaped leaves and its distinctly wetland habitat. [= FNA, K; = *Q. stellata* Wangenheim var. *paludosa* Sargent; = *Q. ashei* Sterret]

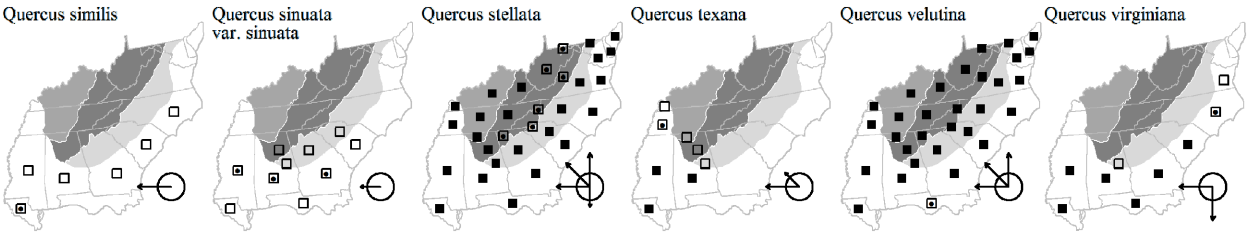
Quercus sinuata Walter *var.* ***sinuata***, Bastard Oak. Alluvial and slope forests. April-May; September-November (of the same year). Se. SC south to FL Panhandle, west to TX. [= FNA, K; > *Q. durandii* Buckley – RAB, S; < *Q. sinuata* – WH]

Quercus stellata Wangenheim, Post Oak. Upland forests and woodlands, especially in clay or rocky soils and in fire communities. April; September-November (of the same year). Se. MA, s. NY, s. PA, s. OH, s. IN, s. IA, and e. KS south to n. peninsular FL and TX. In KS, OK, and TX, post oak is one of the trees that forms the Prairie boundary. There is no question of the distinctness of *Q. margarettae* from *Q. stellata*. See *Q. similis*. [= RAB, C, FNA, G, K, S, W, WH, WV; = *Q. stellata* var. *stellata* – F; = *Q. villosa* Walter]

Quercus texana Buckley, Nuttall Oak, Texas Red Oak. Floodplain swamps and bottomlands. AL, TN, w. KY (Clark et al. 2005), west to e. TX. [= FNA, K; = *Q. nuttallii* E.J. Palmer – F, GW; = *Q. shumardii* Buckley var. *texana* (Buckley) W.W. Ashe] {not yet keyed}

Quercus velutina Lamarck, Black Oak. Upland forests and woodlands, especially in fairly xeric and sandy soils. April; September-October (of the second year). ME west to MN and NE, south to Panhandle FL and TX. [= RAB, C, F, FNA, G, K, S, W, WH, WV]

Quercus virginiana P. Miller, Live Oak. Locally common to abundant in maritime forests and maritime scrub on barrier islands, more rarely inland (though regularly on the mainland from se. NC south, and extending substantially inland from s. SC south), sometimes in dry, fire-maintained habitats more usually occupied by *Q. geminata*, also planted (especially in the outer Coastal Plain). April; September-November (of the same year). A Southeastern Coastal Plain endemic: se. VA south to s. FL and west to TX. *Q. fusiformis* Small of TX has sometimes been treated as a variety of *Q. virginiana*, but is best separated as a species. Flowering before *Q. geminata* when growing together. [= C, FNA, GW, K, S; < *Q. virginiana* – RAB, G (also see *Q. geminata*); < *Q. virginiana* var. *virginiana* – F; ? *Q. sempervirens* Walter]



158. MYRICACEAE Blume 1829 (Bayberry Family) [in FAGALES]

A family of about 3-5 genera and 55 species, trees and shrubs, nearly cosmopolitan. See *Morella* for discussion of our 3 genera. References: Bornstein in FNA (1997); Wilbur (1994)=Z; Elias (1971b)=Y; Kubitzki in Kubitzki, Rohwer, & Bittrich (1993).

1 Leaves oblong or linear-lanceolate, pinnatifid, stipulate; fruit in a bristly involucre formed by 8 bractlets ..... ***Comptonia***
1 Leaves mostly obovate or oblanceolate, entire or toothed (especially apically), estipulate; fruit either exposed and densely waxy (*Morella*), or partially enclosed in 2 wing-like bractlets (*Myrica*).
  2 Fruit spherical, densely waxy, exposed (the 4-6 bractlets small and inconspicuous); terminal buds present; aments inserted on old wood mainly below the leaves; [in our area, common and in the Coastal Plain, Mountains, and Piedmont] ..... ***Morella***
  2 Fruit flattened, not waxy, partially enclosed in 2 wing-like bractlets; terminal buds lacking; aments inserted at the summit of the branchlets of the preceding year; [in our area, very rare and restricted to bogs in the Mountains] ..... ***Myrica***

Comptonia L'Heritier ex Aiton 1789 (Sweet-fern)

A monotypic genus, a shrub, of e. North America, known as fossils from a much broader area. References: Bornstein in FNA (1997); Kubitzki in Kubitzki, Rohwer, & Bittrich (1993).

Comptonia peregrina (Linnaeus) J.M. Coulter, Sweet-fern. In the mountains on xeric ridges at low to medium elevations, usually in fire-maintained habitats, also in xeric and fire-maintained habitats on monadnocks in the upper Piedmont and in dry, sandy sites in the lower Piedmont and fall-line sandhills. April; August-September. NB, ON and MN, south to sc. and w. NC, w. SC, ne. GA, nc. TN, and IL. [= RAB, C, FNA, K, S, W, WV; > *Comptonia peregrina* var. *asplenifolia* (Linnaeus) Fernald – F, Y; > *Comptonia peregrina* var. *peregrina* – F, Y; > *Myrica asplenifolia* Linnaeus var. *asplenifolia* – G; > *Myrica asplenifolia* var. *tomentosa* (Chevallier) Gleason – G]

Morella Loureiro 1790 (Bayberry, Wax-myrtle, Candleberry)

Wilbur (1994) makes a compelling case for the recognition of three genera among eastern North American Myricaceae, and for application of the name *Myrica* to *Myrica gale*. The typification of the genus *Myrica* with *Myrica gale* Linnaeus has been confirmed (Brummitt 1999); thus, the familiar southeastern species placed by many authors in *Myrica* must take another name. Wilbur (1994) prefers to treat our species as subgenus *Cerothamnus* (Tidestrom) Wilbur of genus *Morella* Loureiro; subgenus *Morella* is restricted to e. Asia, the Philippines, and Malaysia, and differs in a number of ways from subgenus *Cerothamnus*, including its fleshy and succulent, rather than waxy and hard, berries. Small maintained *Cerothamnus* at the generic level. Wilbur's inclusion of *Cerothamnus* in *Morella* may well be warranted (and is followed here), but I disagree with his provisional decision to include the taxon treated below as *Morella pumila* in *Morella cerifera*, and the taxon treated below as *Morella pensylvanica* in *Morella caroliniensis*, though their appropriate rank may be questioned. References: Bornstein in FNA (1997); Wilbur (1994)=Z; Wilbur (2002a); Kubitzki in Kubitzki, Rohwer, & Bittrich (1993).

1 Fresh leaves odorless when crushed; staminate flowers with 6-10 stamens (or as few as 3 in distal flowers); leaves usually entire; [of s. GA south and west]; [subgenus *Cerothamnus*, series *Faya*] ..... ***M. inodora***

1 Fresh leaves aromatic when crushed; staminate flowers with 3-5 (-7) stamens; leaves usually serrate, at least near the tip; [collectively widespread in our area]; [subgenus *Cerothamnus*, series *Cerothamnus*].
2 Leaves oblanceolate (generally narrowly so), most of them 0.5-1.5 cm wide, 4-6× as long as wide, evergreen; mature fruits 2.0-3.5 mm in diameter.
3 Medium shrub to small tree (usually 2-10 m tall), not stoloniferous; leaves of fertile branches 4-9 cm long, 8-20 mm wide; [of a wide range of wetland habitats, including wet Coastal Plain pinelands; also planted and naturalized in upland sites] ..... ***M. cerifera***
3 Small shrub (usually < 1 m tall), strongly stoloniferous; leaves of fertile branches 1.5-4 cm long, 3-8 mm wide; [restricted to Coastal Plain pinelands (or areas formerly so)] ..... ***M. pumila***
2 Leaves elliptic to broadly oblanceolate, most of them 1.5-4 cm wide, 2-4× as long as wide, evergreen to deciduous; mature fruits 3.0-7.0 mm in diameter.
4 Leaves subcoriaceous and more or less evergreen, not revolute (or slightly so if sun-grown), the larger ones usually about 9 cm long and 3.5 cm wide, with punctate glands dense on the lower surface and nearly or entirely absent on the upper surface; fruits 3-4.5 mm in diameter, the fruit wall glabrous or sparsely glandular, the warty protuberances glandular; twigs densely hairy to rarely glabrous; older branches blackish; [of various boggy habitats, widespread in our area] ..... ***M. caroliniensis***
4 Leaves coriaceous, tardily deciduous, often revolute, the larger ones about 6 cm long and 2 cm wide, with punctate glands fairly dense on both surfaces; fruits 4-6 (-7) mm in diameter, the fruit wall and warty protuberances densely hirsute when young; twigs glabrous to sparsely hairy; older branches whitish gray; [usually of dunes, from Dare County, NC northward] ..... ***M. pensylvanica***

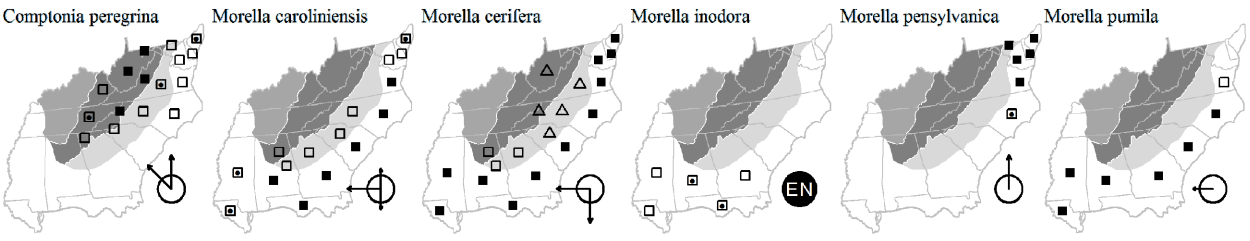
Morella caroliniensis (P. Miller) Small, Pocosin Bayberry, Evergreen Bayberry. Pocosins, wet savannas and pine flatwoods, sandhill seepage bogs, and other peaty or sandy-peaty wetlands. April; August-October. Primarily limited to the Southeastern Coastal Plain, from NJ south to FL and west to TX and AR. [= K; = *Myrica heterophylla* Rafinesque – RAB, C, FNA, W, Y; > *Myrica heterophylla* var. *heterophylla* – F; > *Myrica heterophylla* var. *curtissii* (Chevallier) Fernald – F; < *Myrica pensylvanica* – G; < *Cerothamnus carolinensis* – S (also see *Morella pensylvanica*); < *Morella caroliniensis* (P. Miller) Small – Z (also see *Morella pensylvanica*)]

Morella cerifera (Linnaeus) Small, Common Wax-myrtle, Southern Bayberry. Interdune swales (where often dominant), pocosins, brackish marshes, other wet to moist habitats, now also widely planted (including in the Piedmont) as an ornamental or landscaping shrub and preistent or naturalizing in suburban woodlands. April; August-October. Widespread in the Coastal Plain of Southeastern United States: NJ south to FL and west to TX. Our most common *Morella*, and also the largest, sometimes becoming a small tree, to at least 10 m tall and 20 cm DBH. See *Morella pumila* for a discussion of the controversial taxonomy of *Morella cerifera* and *Morella pumila*. [= *Myrica cerifera* Linnaeus var. *cerifera* – RAB, Y; < *Myrica cerifera* – C, FNA, GW (also see *C. pumilus*); = *Myrica cerifera* – F, G; = *Cerothamnus ceriferus* (Linnaeus) Small – S; < *Morella cerifera* (Linnaeus) Small – K, Z (also see *Morella pumila*)]

Morella inodora (Bartram) Small, Odorless Bayberry. Acid wetlands, especially in wooded, acid, streamhead "bogs" and bayheads, often associated with *Magnolia virginiana, Persea palustris, Cyrilla racemiflora, Cliftonia monophylla*, and *Woodwardia areolata*. A Southeastern Coastal Plain endemic: se. GA west to s. MS. [= K, Z; = *Myrica inodora* Bartram – FNA, GW, Y; = *Cerothamnus inodorus* (Bartram) Small – S]

Morella pensylvanica (Mirbel) Kartesz, Northern Bayberry. Dunes, sometimes even on the foredune and stoloniferously colonizing the upper beach, more typically behind the foredune on secondary dunes and sandy flats, often growing intermixed with *Morella cerifera*, but able to occupy drier sites higher on the dunes, from VA north, also ranging inland in sandy situations. April; August-October. This species reaches its southern limit at Avon (Kinnakeet), Dare County, NC. On interdune flats, it often grows intermixed with *Morella cerifera*, but is readily distinguished (even at a distance) by its stoloniferous growth (appearing as dome-shaped clones 3-20 m in diameter), stouter twigs, and tardily deciduous leaves. The twigs of this species are noticeably stouter than those of *Morella cerifera*; measured at 10 cm from the twig tips, they are (2-) 3-5 mm in diameter, those of *Morella cerifera* ca. 1.5-2.5 mm. [= K; = *Myrica pensylvanica* Loiseleur – RAB, C, F, FNA, GW, Y; < *Myrica pensylvanica* – G (also see *Morella heterophylla*); < *Cerothamnus carolinensis* – S (also see *Morella pensylvanica)*; < *Morella caroliniensis* (P. Miller) Small – Z; = *Cerothamnus pensylvanicus* (Mirbel) Moldenke]

Morella pumila (Michaux) Small, Dwarf Bayberry, Dwarf Wax-myrtle. Savannas, pine flatwoods, relatively moist to extremely dry sites in sandhills (under *Quercus laevis* and *Q. geminata*). April; August-October. A Southeastern Coastal Plain endemic: se. VA south to FL and west to LA (or TX). Some authors dismiss the distinction between this taxon and *Morella cerifera* as merely environmental, while others treat the two as distinct at the varietal or specific level. In our area at least, they appear to be genetically distinct. They often occur in close proximity (though their typical habitats differ, they can be seen side by side in wet spodosolic pine savannas, sometimes also intermixed with *Morella caroliniensis*), and maintain their distinctiveness. There are some observations that there is a phenologic difference, with *Morella pumila* peak flowering 3 weeks later than *Morella cerifera* (J. Townsend, pers. comm. 2002). Though the issue remains unresolved, the stoloniferous growth of *Morella pumila* is not merely a fire response; I here maintain the two as distinct, pending further research. [= *Myrica cerifera* Linnaeus var. *pumila* Michaux – RAB, Y; < *Myrica cerifera* – C, FNA, GW; = *Myrica pusilla* Rafinesque – F, G; = *Cerothamnus pumilus* (Michaux) Small – S; < *Morella cerifera* (Linnaeus) Small – K, Z]



Myrica Linnaeus 1753 (Sweet Gale)

A genus of two species, shrubs, of temperate and subarctic regions of North America and Eurasia. References: Bornstein in FNA (1997); Kubitzki in Kubitzki, Rohwer, & Bittrich (1993).

Myrica gale Linnaeus, Sweet Gale. Peaty bogs. April; August-September. A circumboreal species, south in North America to NJ, PA, MI, MN, and OR, disjunct from PA and s. NJ to Henderson County, NC, where considered extirpated at one time, as a result of the destruction of the famous East Flat Rock Bog. This shrub has been relocated at a single site, where it is abundant in a small area (less than 0.25 hectare). [= C, FNA, G, GW, K, S, W, Y; = *Gale palustris* Chevallier – RAB; > *Myrica gale* var. *gale* – F]

159. JUGLANDACEAE A. Richard ex Kunth 1824 (Walnut Family) [in FAGALES]

A family of about 8 genera and 60 species, trees and shrubs, mostly temperate. References: Stone in FNA (1997); Manos & Stone (2001); Elias (1972); Stone in Kubitzki, Rohwer, & Bittrich (1993).

1 Nutlets 6-7 mm long, with 2 wings; leaves even-pinnate, the rachis usually winged..... ***Pterocarya***
1 Nuts > 15 mm long, unwinged; leaves odd-pinnate, the rachis unwinged.
  2 Fruit with husk dehiscent into 4 valves; pith of twigs continuous; leaves with (3-) 5-17 (-19) leaflets, the largest usually the terminal or final 2 lateral; nut with shell smooth, ridged, or irregularly wrinkled (but not deeply furrowed); terminal buds with imbricate (overlapping) or valvate scales; [tribe *Juglandeae*, subtribe *Caryinae*] ..... ***Carya***
  2 Fruit with husk indehiscent; pith of twigs chambered (not always developing until autumn of the first year's growth); leaves with (7-) 11-19 (-23) leaflets, the largest usually about halfway up the leaf; nut with shell deeply furrowed in a complex corrugated pattern; terminal buds with valvate; [tribe *Juglandeae*, subtribe *Juglandinae*] ..... ***Juglans***

Carya Nuttall (Hickory)
(by A.S. Weakley & R.K. Peet)

A genus of about 18 species, trees, of e. North America (south into s. Mexico), and e. Asia. *Carya* in our area is separated into two sections, section *Apocarya* (*C. aquatica, C. cordiformis, C. illinoinensis*) and section *Carya* (*C. carolinae-septentrionalis, C. glabra, C. laciniosa, C. myristiciformis, C. ovalis, C. ovata, C. pallida, C. tomentosa*). The southeastern United States is the center of diversity of *Carya*. Our four-state area includes 11 of 13 North American species (including the naturalized *C. illinoinensis* and lacking only a more southern species, *C. floridana* Sargent of peninsular FL, and a south-central species, *C. texana* Buckley, of sc. United States), and 11 of 18 species worldwide. Section *Rhamphocarya* includes a single Asian species. The remaining 4 species in the genus are all in section *Apocarya*: *C. palmeri* Manning of Mexico and 3 Asian species. *C. cordiformis, C. aquatica, C. illinoinensis, C. myristiciformis, C. laciniosa, C. ovata,* and *C. carolinae-septentrionalis* are diploids, with n = 16. *C. pallida, C. glabra, C. ovalis*, and *C. tomentosa* are tetraploids with n = 32 (Stone 1961). As suggested by Stone, Adrouny, & Flake (1969), it seems possible that reticulate evolution involving extant or extinct diploid species is responsible for some of the difficulties in the *C. glabra-ovalis* complex. Many hybrids have been described, but some are questionable. Additionally, Hardin & Stone (1984) state that "most of these hybrids are localized and have not led to introgressive populations, or at least none that have been recognized". Ecologically, *Carya* is one of the more diverse and ubiquitous genera of trees in our area, surpassed in number of species, abundance, and ecological amplitude only by *Quercus* and *Pinus*. This has led to a long tradition of describing large parts of our area (in particular the Piedmont) as being characterized by "oak-hickory" or "oak-pine-hickory" forests (e.g. Küchler 1964; Greller 1988; Schafale & Weakley 1990; Skeen, Doerr, & Van Lear 1993). Ware (1992) and others have recently questioned this tradition, pointing out that *Carya* only rarely dominates or codominates, primarily in specialized circumstances (such as in soils with greater cation concentrations, derived from mafic rocks). The association of many (but certainly not all) species of hickories with soils with high base status was noted in print as early as 1820 in an account of the landscape of North Carolina. "The sandy pine barrens, and all the lands on which pine is the exclusive growth, are unfriendly to agriculture; but where the pine is intermixed with oak and hickory, the soil is good. Some of our strongest lands have tall pine, mixed not only with hickory and oak, but also with walnut and cherry, and such trees that indicate the best soil. Where hickory prevails, the land is strong" (Guthrie 1820). References: Stone in FNA (1997); Hardin (1992); Hardin & Stone (1984); Elias (1972); Stone, Adrouny, & Flake (1969); Stone (1961); Mohlenbrock (1986); Sargent (1918); Manning (1950); Hardin (1952); Little (1969); Harrar & Harrar (1962); Stone in Kubitzki, Rohwer, & Bittrich (1993). Key based in part on an unpublished manuscript prepared by Stone & Hardin for the Flora of the Southeastern United States.

Identification notes: Surface vestiture of leaves and bud scales is useful in distinguishing species of *Carya*. Some use of these characters can be made with a 10× or 20× hand lens; better still is a dissecting microscope. It is important to understand the different trichome types mentioned in the key (terminology follows Hardin 1990 and Hardin & Stone 1984). **Short acicular trichomes** are simple, unicellular trichomes tapered to a pointed tip, 0.10-0.35 mm long and with rough walls. **Long acicular trichomes** ("solitary" of Hardin & Stone 1984) are similar to short acicular, but are much larger, 0.45-1.6 mm long, and have smooth walls. **Fasciculate trichomes** are multicellular and have 2-8 straight or curled rays radiating from a clustered base. **Multiradiate trichomes** are similar to fasciculate, but have 8-17 rays, the inner (and usually more upright) rays attached basally above the outer (and usually more spreading) rays. **Capitate glandular trichomes** are unicellular or multicellular, and are distinguished by their bulbous or expanded tip; they are usually 0.02-0.1 mm long. **Peltate scales** are flat or dome-shaped shields or disks, slightly to strongly glandular, (sometimes regularly or irregularly lobed) and can be either sessile or stalked (they are often referred to as scales,

resin dots, peltate glands, or lepidote scales). On the lower surfaces of leaflets, peltate scales are of two types: **large peltate scales** are 0.08-0.3 mm in diameter and are round, with smooth or slightly irregular margins, while **small peltate scales** are 0.025-0.12 mm in diameter and are either round, irregularly lobed or regularly 2- or 4-lobed.

1 Terminal buds elongate, flattened in cross-section, with 4-6 valvate scales; leaves with 7-13 (-19) leaflets, these symmetrical to strongly falcate; fruit sutures narrowly winged.
  2 Leaves with 7-9 (-11) leaflets, these symmetrical to slightly falcate; fasciculate trichomes with 2-4 rays; terminal bud, 9-19 mm long, bright orangey yellow to dull orange-tan; [common and widely distributed tree in our area, typically in floodplain and slope forests]..... ..... ***C. cordiformis***
  2 Leaves with (7-) 9-19 leaflets, these slightly to strongly falcate; fasciculate trichomes with 2-8 rays; terminal bud {} mm long, brown to rusty-brown.
    3 Leaves with (7-) 9-11 (-13) leaflets, the lower surfaces pubescent at least along the midrib and in the main vein axils; bark shaggy; lateral petiolules 0-2 mm long; nut flattened and angled in cross-section; kernel bitter; [native, of swamp forests, primarily in the Coastal Plain] ..... ***C. aquatica***
    3 Leaves with (7-) 11-19 leaflets, the lower surfaces nearly glabrous; bark scaly, with small exfoliating plates; lateral petiolules 0-7 mm long; nut round in cross-section; kernel sweet; [introduced, frequently cultivated, long persistent, and occasionally naturalized] .... ***C. illinoinensis***
1 Terminal buds ovoid, terete in cross-section, with 6-15 imbricate scales; leaves with (3-) 5-9 (-11) leaflets, these symmetrical to slightly falcate; fruit sutures not winged (except *C. myristiciformis*).
  4 Bark shaggy (on large trees separating in segments to a meter in length); leaves with (3-) 5 (-7) leaflets; serrations of the leaflets densely (or only moderately) ciliate when young, most densely so just below the tooth apex, the hairs sloughing with age but leaving a subapical tuft of white trichomes on at least some teeth; fallen foliage turning black.
    5 Twigs slender, hardened first-year growth or second-year growth 1-3 mm in diameter; terminal bud 6-15 mm long, glabrous to sparsely puberulent (except for ciliate fringe on the scales), reddish-brown (usually turning black on drying); lower surface of leaflets nearly glabrous, except for tufts of trichomes in the main vein axils, and only slightly lepidote with a few, scattered scales, the large peltate scales yellow and round, the small peltate scales brown, 2- and 4-lobed; terminal leaflet 2-5 (-6) cm wide ... ***C. carolinae-septentrionalis***
    5 Twigs stout, hardened first-year growth or second-year growth (2.5-) 3-6 mm in diameter; terminal bud 9-18 mm long, tomentose, tan to brown (rarely turning black on drying); lower surface of leaflets moderately to densely hirsute with acicular and fasciculate hairs (sometimes the hairs more or less limited to the main veins), and also moderately lepidote, the large peltate scales yellow and round, the small peltate scales dark brown and mostly round; terminal leaflet (4-) 6-15 cm wide ..... ***C. ovata***
  4 Bark tight (the ridges typically forming an interlocking diamond pattern), scaly, or shaggy (when shaggy, the separated segments normally much < 1 meter long); leaves with (3-) 5-9 (-11) leaflets; serrations of the leaflets glabrous or ciliate, but lacking subapical tufts of trichomes; fallen foliage not notably blackening.
    6 Twigs stout; terminal buds 8-20 mm long; leaves with (5-) 7-9 (-11) leaflets; lower surface of leaflets moderately to densely hirsute with a mixture of acicular (single), fascicled (2-8 rays), and multiradiate (8-many rays) hairs; small peltate scales of the lower surface of leaflets all round; fruit husk 4-13 mm thick; nuts slightly to strongly 4-angled toward the apex.
      7 Bark shaggy; petiole hirtellous; leaflet apex acuminate; lower surface of leaflets hirsute with acicular (single), 2-6-rayed fascicled, and occasional multiradiate hairs; fruit husk pubescent, lacking pustulate bumps; fruit 4-7 cm long; nut 3-6 cm long; [rare in our area]..... ***C. laciniosa***
      7 Bark tight; petiole hirsute; leaflet apex acute; lower surface of leaflets densely hirsute with acicular (single) and abundant 2-8-rayed fascicled and multiradiate hairs; fruit husk glabrous, with pustulate bumps; fruit 3.5-5 cm long; nut 2.5-3.5 cm long; [common in our area]..... ***C. tomentosa***
    6 Twigs slender; terminal buds 3-15 mm long; leaves with (3-) 5-7 (-9) leaflets; lower surface of leaflets mostly glabrous, except for along the midrib and primary veins, and sometimes hirsute on the surface with acicular (single) and infrequent fascicled (2-8 rays) hairs (lacking multiradiate trichomes); small peltate scales of the lower surface of leaflets of various types, 4-lobed and/or irregular scales often more frequent than round scales; fruit husk 2-5 mm thick; nuts not 4-angled toward the apex.
      8 Terminal bud 5-15 mm long, predominantly pubescent (also sparsely lepidote); leaves with (3-) 5-7 (-9) leaflets; lower surface of spring leaflets slightly to densely lepidote with irregular and round peltate scales (4-lobed peltate scales uncommon).
        9 Fruit husk indehiscent at maturity or tardily splitting to base along 1 suture; leaves with (3-) 5 (-7) leaflets, glabrous to pubescent beneath; petiole usually green; fruits ellipsoidal, pyriform, or subglobose; bark tight..... ***C. glabra***
        9 Fruit husk spitting to base at maturity along 2-4 sutures; leaves with (5-) 7 leaflets, pubescent beneath; petiole reddish; fruits typically ellipsoidal; bark tight or often scaly or somewhat shaggy ..... ***C. ovalis***
      8 Terminal bud 4-10 mm long, predominantly lepidote (also pubescent); leaves with (5-) 7 (-9) leaflets; lower surface of spring leaflets densely lepidote with 4-lobed, irregular, and round peltate scales, giving the undersurface a reflective, silvery-tan, rusty-brown, or bronze sheen.
        10 Lepidote scales initially silver, soon turning bronze, and giving the buds, young twigs, and undersurface of the leaves a metallic bronze sheen; fruit 2-3 cm long; [of calcareous swamps, bottomlands and slopes of the Coastal Plain of se. NC southwards]..... ..... ***C. myristiciformis***
        10 Lepidote scales silvery-tan or rusty-brown, giving the buds, young twigs, and undersurface of the leaves a dull or slightly shiny tan or rusty-brown color; fruit 3-5 cm long; [usually of upland and acidic forests and woodlands, collectively widespread in our area].
          11 Undersurface of the leaflets with dense, silvery-tan large peltate scales, and fewer and less conspicuous fewer small peltate scales (thus the leaves appearing overall silvery-tan); petiole and rachis hirsute with fasciculate trichomes, and also with concentrations of hairs near the leaflet insertions; [widespread in our area, of upland and acidic forests and woodlands]..... ..... ***C. pallida***
          11 Undersurface of the leaflets with dense, rusty-brown small peltate scales, and fewer and less conspicuous sivery-tan large peltate scales (thus the leaves appearing overall rusty-brown); petiole and rachis with few fasciculate hairs (but densely scaly), and lacking concentrations of hairs near the leaflet insertions; [of the sc. United States, east to MS, w. KY, w. TN, and perhaps AL and GA, of upland or lowland, acidic or calcareous forests and woodlands] ..... ***C. texana***

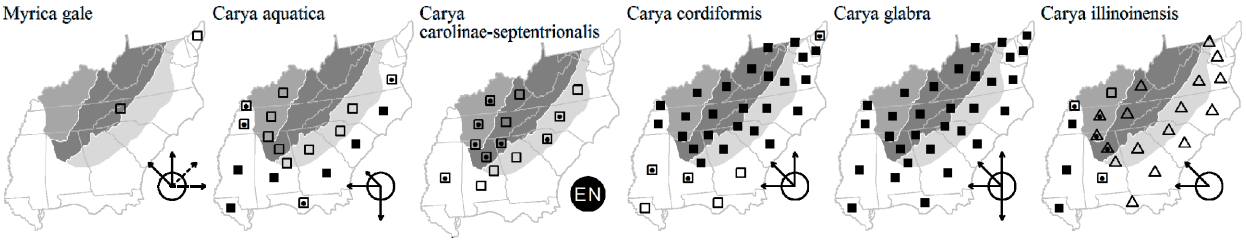
Carya aquatica (Michaux f.) Elliott, Water Hickory, Bitter Pecan. Swamp forests, where flooded during the winter months. April-May; October. Se. VA south to s. peninsular FL, west to e. TX, north inland to se. MO, s. IL, and se. OK. [= RAB, C, F, FNA, G, GW, K, WH; = *Hicoria aquatica* (Michaux f.) Britton – S]

Carya carolinae-septentrionalis (Ashe) Engler & Graebner, Carolina Shagbark Hickory, Carolina Hickory. Upland flats, especially those weathered from mafic rocks and with shrink-swell soils dominated by montmorillonitic clays, less typically on slopes and bottomlands. April-May; October. Sc. VA (Halifax County) south to GA, AL, and MS, and inland northward to c. TN and sc. KY. First reported for VA by Wieboldt et al. (1998). The taxonomic status of *C. carolinae-septentrionalis* has been controversial, with some workers reducing it to variety of *C. ovata* or not recognizing it at all. It seems to us morphologically and ecologically distinctive and to represent an independent evolutionary lineage. Hardin & Stone (1984) found differences in trichomes, and in a study of nut oils, Stone, Adrouny, & Flake (1969) found *C. ovata* "surprisingly distant" from *C. carolinae-septentrionalis*. There are reports that the two taxa are also phenologically separated, *C. carolinae-septentrionalis* leafing out about two weeks earlier than *C. ovata*, when growing together in the c. Piedmont of NC. Though usually ecologically and/or geographically segregated, the two species sometimes occur together or in close proximity to one another; they maintain their distinctness. [= RAB, C, G, K; = *C. ovata* (P. Miller) K. Koch var. *australis* (Ashe) Little – FNA; = *Hicoria carolinae-septentrionalis* Ashe – S; = *C. ovata* var. *carolinae-septentrionalis* (Ashe) Reveal; = *C. australis* Ashe]

Carya cordiformis (Wangenheim) K. Koch, Bitternut Hickory. Forests and woodlands, especially in rich, moist alluvial or slope forests. April; October. ME and s. QC west to MN and NE, south to Panhandle FL and e. TX. [= RAB, C, F, FNA, G, GW, K, W, WH; = *Hicoria cordiformis* (Wangenheim) Britton – S]

Carya glabra (P. Miller) Sweet, Pignut Hickory. In a wide variety of forests and woodlands. April-May; October. S. NH west to s. MI, se. IA, and se. KS, south to c. peninsular FL and e. TX. The *C. glabra*-*C. ovalis* portion of this treatment is tentative; in our area, this group has been variously treated as consisting of between 1 and 10 (or more) taxa. Here we recognize two species (*C. glabra* and *C. ovalis*) and no varieties, but further study of variation in this group is needed. Var. *megacarpa* in particular seems to show correlation of morphological traits and geographic distribution, with larger fruits (2.5-5 cm long vs. 1.5-3.5 cm long), thicker husks (ca. 3.5 mm thick vs. ca. 2 mm thick), large terminal leaflets (often to 20-25 cm long, vs. 10-17 cm long), and a primarily southern Coastal Plain distribution. glabrous. [= RAB, C, GW, K, WH; > *C. glabra* var. *glabra* – F, G; > *C. glabra* var. *megacarpa* (Sargent) Sargent – F, G; > *C. ovalis* (Wangenheim) Sargent var. *hirsuta* (Ashe) Sargent – F; < *C. glabra* – FNA; > *Hicoria glabra* (P. Miller) Britton var. *glabra* – S; > *Hicoria glabra* (P. Miller) Britton var. *hirsuta* Ashe – S; *?* *Hicoria austrina* Small – S; = *C. glabra* var. *glabra* – W]

* ***Carya illinoinensis*** (Wangenheim) K. Koch, Pecan. Bottomlands, eastwards persistent around dwellings and in pecan orchards, escaped to suburban woodlands, rural forest edges and floodplains, commonly cultivated. April-May; October. Native to the sc. United States, now more widespread in the se. United States as a result of cultivation. The spelling of the specific epithet has been a source of controversy. [= C, FNA, K, WH; = *C. illinoensis* – RAB, F, G, GW, orthographic variant; > *Hicoria pecan* (Marshall) Britton – S; > *Hicoria texana* LeConte – S]



Carya laciniosa (Michaux f.) G. Don, Kingnut Hickory, Big Shellbark Hickory. Moist, circumneutral, alluvial levee forests along brownwater rivers of the Coastal Plain (NC), streams of the Piedmont (NC) and Mountains (GA). April-May; October. NY and s. ON west to IA, south to NC, nw. GA, MS, and OK. This species is sometimes planted, but occurs native in nw. GA, along the Roanoke River (Halifax and Northampton counties, NC) and New Hope Creek (Durham County, NC). [= RAB, C, F, FNA, G, GW, K, W; = *Hicoria laciniosa* (Michaux f.) Sargent – S]

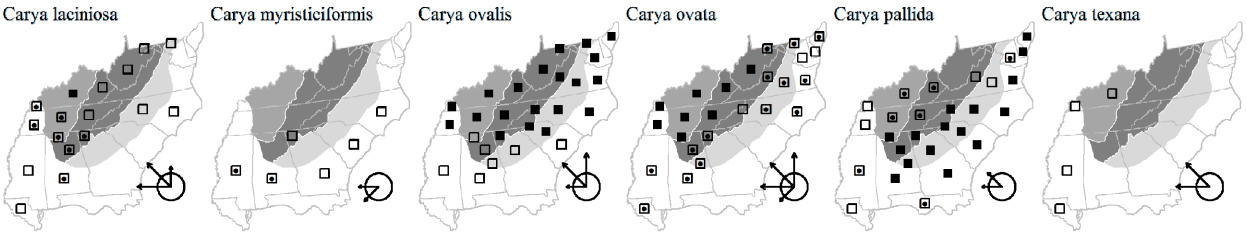
Carya myristiciformis (Michaux f.) Elliott, Nutmeg Hickory. Nonriverine swamps over calcareous substrates, including calcareous clays and coquina limestone ("marl"), oak flatwoods. April; October. Se. NC south to GA, and from wc. AL west to e. TX and se. OK; disjunct in Mexico (Nuevo Léon and Tamaulipas). The bronze sheen of the leaflets of this species is diagnostic. First reported for NC by Leonard (1971b). [= FNA, K; = *C. myristicaeformis* – RAB, GW, orthographic variant; = *Hicoria myristicaeformis* (Michaux f.) Britton – S]

Carya ovalis (Wangenheim) Sargent, Red Hickory. Forests and woodlands. April-May; October. MA west to WI, south to GA, MS, and MO. [= RAB, C, K; > *C. ovalis* var. *obcordata* (Muhlenberg & Willdenow) Sargent – F, G; > *C. ovalis* var. *obovalis* Sargent – F, G; > *C. ovalis* var. *odorata* (Marshall) Sargent – F, G; < *C. glabra* – FNA; = *Hicoria microcarpa* (Nuttall) Britton – S; = *C. glabra* (P. Miller) Sweet var. *odorata* (Marshall) Little – W]

Carya ovata (P. Miller) K. Koch, Common Shagbark Hickory. Rich moist bottomlands, slopes, occasionally on dry upland flats. May; October. S. ME and s. QC west to MN and NE, south to GA and TX; also disjunct in Mexico. [= RAB, C, F, G, GW, K, W; > *C. ovata* var. *ovata* – F; > *C. ovata* var. *pubescens* Sargent – F; = *C. ovata* var. *ovata* – FNA; = *Hicoria ovata* (P. Miller) Britton – S]

Carya pallida (Ashe) Engler & Graebner, Sand Hickory, Pale Hickory. Dry sandy or rocky forests and woodlands. April-May; October. S. NJ south to Panhandle FL, west to TX, inland in the interior to w. NC, KY, s. IL, and AR. [= RAB, C, F, FNA, G, K, W; = *Hicoria pallida* Ashe – S]

Carya texana Buckley, Black Hickory. Dry slopes and ridges, especially calcareous. April-May; October. Reported to occur as far east as KY, TN, and MS (FNA). Jones (2005) states that w. KY material of *C. pallida* is transitional to *C. texana*. [= FNA, K; > *C. texana* var. *arkansana* (Sargent) Little – C; > *C. texana* var. *texana* – F; > *C. buckleyi* Durand var. *arkansana* (Sargent) Sargent – G; = *Hicora texana* LeConte, misapplied – S]



Carya tomentosa (Lamarck ex Poiret) Nuttall, Mockernut Hickory, White Hickory. Forests and woodlands. April-May; October. MA west to IN and IA, south to n. peninsular FL and TX. One of the most common forest trees of much of our area. There has been confusion and controversy for several centuries over the specific epithet. The oldest basionym available is *Juglans alba* Linnaeus, which apparently included disparate elements, including this taxon and *C. ovata*. Following a more circumscribed typification by Crantz in 1766, the epithet "*alba*" should have been applied to this taxon, but continued to be applied in various ways. Rehder (1945) proposed that *C. alba* should be considered a *nomen ambiguum*, but agreed that it applied correctly to what has often been called *C. tomentosa*. He argued that the use of *C. alba* should be rejected "in order to avoid confusion and ambiguity." In 2008, Ward & Wiersema (2008) formally proposed rejection of *Juglans alba* (the basionym of *Carya alba*), and the Committee has recommended its rejection unanimously (Brummitt 2010). For further discussion see Rehder (1945), Howard & Staples (1983), Wunderlin, Hansen, & Hall (1985), and Brummitt (2010). [= C, F, FNA, G, RAB, W; = *C. alba* (Linnaeus) Nuttall ex Elliott – K, WH; = *Hicoria alba* (Linnaeus) Britton – S]

Juglans Linnaeus (Walnut)

A genus of about 21 species, trees and shrubs, of Mediterranean Europe to e. Asia, and North America to Andean South America. Stanford, Harden, & Parks (2000) present a molecular phylogeny and a discussion of biogeography; our two species are distantly related within the genus, with *J. nigra* most closely related to sw. North American *J. microcarpa* and *J. major,* and *J. cinerea* most closely related to several e. Asian species. References: Whittemore & Stone in FNA (1997); Stanford, Harden, & Parks (2000); Stone in Kubitzki, Rohwer, & Bittrich (1993); Stanford (1998).

1 Lower surface of the leaflets densely hirsute with 4-8-rayed fascicled hairs; fruit ellipsoid, densely pubescent with reddish-brown glandular hairs; leaf scars with a velvety ridge along the upper margin; leaves with (7-) 11-17 leaflets; pith dark brown; terminal buds 12-18 mm long; bark of mature trees pale; [section *Trachycaryon*] ..... ***J. cinerea***

1 Lower surface of the leaflets hirsute with single and 2-rayed fascicled hairs; fruit spherical or nearly so, lepidote with peltate scales and occasional glandular hairs; leaf scars without a velvety ridge along the upper margin; leaves with (9-) 15-19 (-23) leaflets; pith light brown; terminal buds 8-10 mm long; bark of mature trees dark; [section *Rhysocaryon*] ..... ***J. nigra***

Juglans cinerea Linnaeus, Butternut, White Walnut. Mt (GA, NC, SC, VA, WV), Pd (DE, NC, SC, VA), Cp (VA): moist, nutrient-rich forests; uncommon. April-May; October. NB west to MN, south to n. GA and AR. This tree, formerly common, is afflicted with butternut canker disease, which now threatens its continued existence. [= RAB, C, F, FNA, G, K, W, WV; = *Wallia cinerea* (Linnaeus) Alefeld – S]

Juglans nigra Linnaeus, Black Walnut. Mt (GA, NC, SC, VA, WV), Pd (DE, GA, NC, SC, VA), Cp (DE, FL, GA, NC, SC, VA); moist, nutrient-rich forests of floodplains and slopes, calcareous hammocks; common (uncommon in the Coastal Plain of NC and SC, rare in FL). April; October. MA west to MN, south to Panhandle FL and TX. The dark brown wood is famous for cabinetry and other uses; it is one of the most prized of North American hardwoods. The nuts, though difficult to crack, are prized for their intense flavor. The husk is used as a dye. Country people dehusk the nuts by putting them in dirt or gravel driveways where the passage of car tires removes the husk but does not crack the nut. [= RAB, C, F, FNA, G, K, W, WH, WV; = *Wallia nigra* (Linnaeus) Alefeld – S]

Pterocarya Kunth (Wingnut)

A genus of 6 species, trees, of e. and sw. Asia.

* ***Pterocarya stenoptera*** C. de Candolle, Japanese Wingnut. Cp (LA): uncommonly cultivated, rarely naturalized or persistent; rare, native of e. Asia (China, Japan, and Korea). April-May; August-September. Naturalized in e. LA. [= K]

160. CASUARINACEAE R. Brown 1814 (Casuarina Family) [in FAGALES]

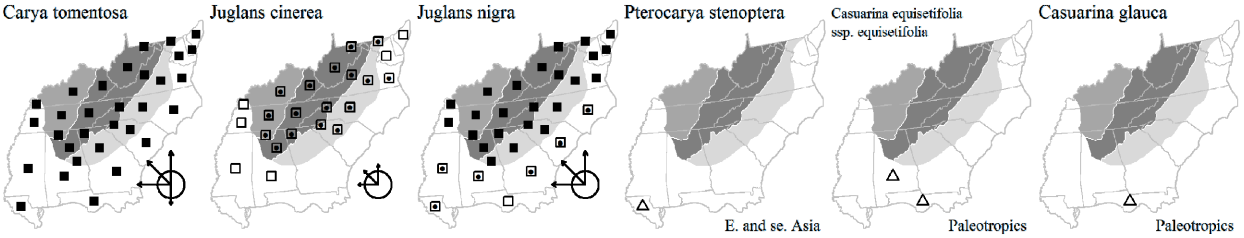
A family of 4 genera and about 100 species, trees and shrubs, of Malesia, Australia, and Melanesia. References: Johnson & Wilson in Kubitzki, Rohwer, & Bittrich (1993); Rogers (1982c).

Casuarina Linnaeus 1759 (Casuarina, Beefwood, She-oak)

A genus of about 17 species, trees, tropical to warm temperate in s. Asia, Australia, and Polynesia. References: Johnson & Wilson in Kubitzki, Rohwer, & Bittrich (1993); Rogers (1982c)=Z.

1 Leaves (teeth in whorls at each node) 6-8 per node; longitudinal ridges of branchlets sharply angular; plant monoecious; branchlet segments 5-8 (-13) mm long, 0.5-0.7 (-1) mm in diameter ..... ***C. equisetifolia*** *ssp.* ***equisetifolia***
1 Leaves 10-14 (-17) per node; longitudinal ridges of branchlets flattened or rounded; plant dioecious; branchlet segments 8-20 mm long, 0.9-1.2 mm in diameter..... ***C. glauca***

* ***Casuarina equisetifolia*** Linnaeus *ssp.* ***equisetifolia***, Casuarina, Australian-pine, Horsetail Casuarina, Beach She-oak, Coastal She-oak. Beaches, dunes, suburban areas, disturbed areas; native of Malaysia, s. Asia, and Oceania. *C. equisetifolia* was reported as planted and persistent on the Outer Banks of NC by Brown (1959); it is not established so far north, however. Ssp. *incana* (Bentham) L.A.S. Johnson is not known to be introduced in se. North America. [= FNA; < *C. equisetifolia* – K, S, WH, Z]
* ***Casuarina glauca*** Sieber ex Sprengel, Gray She-oak, Suckering Australian-pine, Scaly-bark Beefwood. Disturbed beaches and yards; native of Australia. Reported for Panhandle FL by Kunzer et al. (2009). [= FNA, K, WH]



162. BETULACEAE S.F. Gray 1821 (Birch Family) [in FAGALES]

A family of 6 genera and about 150 species, primarily of subarctic to cold temperate regions of the Northern Hemisphere, but extending through Central America to n. South America. The two subfamilies recognized here are sometimes elevated to family status, as by Govaerts & Frodin (1998). References: Furlow in FNA (1997); Furlow (1990)=Z; Hardin (1971)=Y; Govaerts & Frodin (1998); Kubitzki in Kubitzki, Rohwer, & Bittrich (1993).

1 Scales of the pistillate catkins persistent; leafy involucre absent; fruit a small winged nut; [subfamily *Betuloideae*].
  2 Pistillate scales woody, forming a persistent conelike catkin; plant a shrub, < 4 m tall (except *A. glutinosa*)..... ***Alnus***
  2 Pistillate scales deciduous with or soon after the fruits; plant a tree, > 10 m tall at maturity ..... ***Betula***
1 Scales of the pistillate catkins caducous; leafy involucre present, conspicuous; fruit an unwinged nut; [subfamily *Coryloideae*].
  3 Nut spherical, 1-1.5 cm in diameter, closely enveloped by the involucre ..... ***Corylus***
  3 Nut ovoid, 0.4-0.6 cm long, loosely or not at all enveloped by the involucre.
    4 Infructescence bracts flat, 1-3 lobed, not enclosing the nut; bark gray, smooth; trunk moderately to strongly fluted; buds 4-angled ..... ***Carpinus***
    4 Infructescence bracts inflated, loosely enclosing the nut; bark brown, shreddy; trunk not fluted; buds not 4-angled..... ***Ostrya***

Alnus P. Miller 1754 (Alder)

A genus of about 25-35 species, shrubs and trees, of subarctic to warm temperate regions of the Northern Hemisphere, and in montane situations south to n. South America. References: Furlow in FNA (1997); Furlow (1990)=Z; Hardin (1971)=Y; Schrader & Graves (2002)=X; Kubitzki in Kubitzki, Rohwer, & Bittrich (1993). Key based in part on Schrader & Graves (2002).

1 Fruit broadly winged; winter buds sessile, covered by multiple, imbricate, unequal scales; [subgenus *Alnobetula*]..... ***A. viridis*** *var.* ***crispa***
1 Fruit narrowly winged; winter buds stalked, covered by 2-3 equal scales.
  2 Pistillate catkins mostly 1-1.5 (-2) cm long, subsessile and often clustered together closely; typical leaves with 8-14 principal veins on each side of the midrib; [subgenus *Alnus*].
    3 Fruiting catkins drooping; leaves broadest at or below the middle, pale green to glaucous beneath, doubly serrate, the teeth of various sizes, usually some of them coarse; bark dark reddish-brown, shiny, with prominent light-colored lenticels ..... ***A. incana*** *ssp.* ***rugosa***
    3 Fruiting catkins erect; leaves broadest at or above the middle, green beneath, finely serrate, the teeth approximately equal in size; bark light gray or brown, with inconspicuous lenticels ..... ***A. serrulata***
  2 Pistillate catkins mostly 1.5-3 cm long, evidently pedunculate and therefore spaced; typical leaves with 5-8 principal veins on each side of the midrib.
    4 Flowering spring; plant a tree; leaves broadly rounded to slightly notched at the tip; [alien, rarely planted and possibly persistent in our area]; [subgenus *Alnus*] ..... ***A. glutinosa***

4 Flowering late summer or autumn; plant a shrub; leaves obtuse to short-acuminate at the tip; [native of e. MD, DE, and GA]; [subgenus *Clethropsis*].
5 Strobili (14-) 14.5-19 (-24) mm long, <1.3× as long as wide; large shrub or tree 5.5-9.5 m tall, with a narrow crown; [of nw. GA] ..... ***A. maritima*** *ssp.* ***georgiensis***
5 Strobili (15.2-) 18.5-22 (-25) mm long, >1.3× as long as wide; medium to large shrub 3.5-6 (-7.5) m tall, with a narrow to broad crown; [of s. DE and e. MD] ..... ***A. maritima*** *ssp.* ***maritima***

* ***Alnus glutinosa*** (Linnaeus) Gaertner, Black Alder, European Alder. Disturbed areas, suburban woodlands; native of Europe. Sometimes cultivated, especially northward, and naturalized at least as far south as s. PA (Rhoads & Klein 1993); it has also been reported for Morgan County, TN (Chester, Wofford, & Kral 1997). [= FNA, C, F, G, K; = *Alnus alnus* (Linnaeus) Britton]

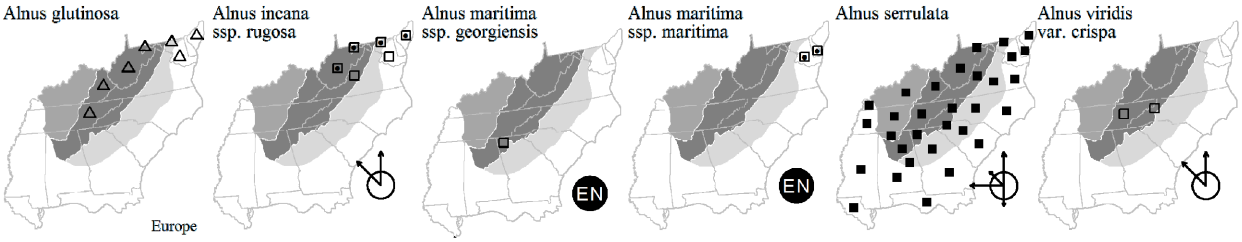
Alnus incana (Linnaeus) Moench *ssp.* ***rugosa*** (Du Roi) Clausen, Speckled Alder. Braided streamhead seepage swamps. May-June; July-August. *A. incana* is here treated as a circumpolar complex consisting of several subspecies. Ssp. *incana* occurs in nc. and ne. Eurasia. Ssp. *rugosa* occurs from nw. Canada east to the Maritime Provinces, south to MD, VA, and WV, and IL. Ssp. *tenuifolia* (Nuttall) Breitung occurs in w. North America, from AK south to CA and NM. [= FNA, K, Z; > *A. incana* var. *americana* Regel – C; > *A. rugosa* (Du Roi) Sprengel var. *americana* (Regel) Fernald – F; = *A. rugosa* (Du Roi) Sprengel – G, W, Y]

Alnus maritima (Marshall) Muhlenberg ex Nuttall *ssp.* ***georgiensis*** Schrader & Graves, Georgia Alder. Standing water of Ridge-and-Valley spring run. Endemic to a single site in Bartow County, GA. It is one of three subspecies of *A. maritima*, each endemic to a small area – ssp. *maritima* of the Delmarva Peninsula of MD and DE, ssp. *georgiensis* Schrader & Graves of nw. GA, and ssp. *oklahomensis* Schrader & Graves of sc. OK. The closest relatives of *A. maritima* are in Asia. [= X; < *A. maritima* – FNA, K]

Alnus maritima (Marshall) Muhlenberg ex Nuttall *ssp.* ***maritima***, Seaside Alder, Delmarva Alder. Streambanks, ponds, shores. Endemic to six counties in the Delmarva Peninsula of MD and DE. See above for additional discussion of *A. maritima* in general. [= X; < *A. maritima* – FNA, C, F, G, K]

Alnus serrulata (Aiton) Willdenow, Tag Alder, Smooth Alder, Hazel Alder. Streambanks, bogs, wet thickets. February-March; August-October. NS west to s. QC, MO, and OK, south to ne. FL, Panhandle FL, and TX. [= RAB, C, FNA, G, GW, K, W, Y, Z; > *A. serrulata* var. *serrulata* – F; > *A. serrulata* var. *subelliptica* Fernald – F; = *A. rugosa* – S, misapplied]

Alnus viridis (Villars) Lamarck & De Candolle *var.* ***crispa*** (Aiton) House, Green Alder, Mountain Alder. Grassy balds, shrub balds, spruce-fir forests, and rock outcrops at high elevations (1600-1900m) in the Roan Mountain Massif, Mitchell and Avery counties, NC and Carter County, locally common. May-June; July. Ssp. *crispa* has variously been considered a varietally, subspecifically, and specifically distinct from typic *A. viridis*. *A. viridis* is here treated as a circumpolar complex of 4 subspecies. Ssp. *viridis* occurs in montane portions of Europe. Ssp. *sinuata* (Regel) Á. Löve & D. Löve occurs in w. Canada and south in the montane west to nw. United States. Ssp. *fruticosa* (Ruprecht) Nyman ranges from n. CA north to coastal AK, and in ne. Asia. Ssp. *crispa* is generally far northern, ranging across n. Canada, south to MA and c. NY, and disjunct at a few localities in PA and at Roan Mountain on the NC-TN border, where it forms an extensive population. [= C; = *A. viridis* (Villars) Lamarck & De Candolle ssp. *crispa* (Aiton) Turrill – FNA, K, Z; = *A. crispa* (Aiton) Pursh – RAB, G, W, Y; > *A. crispa* var. *crispa* – F; < *A. alnobetula* (Ehrhart) K. Koch – S; > *Alnus mitchelliana* M.A. Curtis ex Gray]



Betula Linnaeus 1753 (Birch)

A genus of 35-100 species, trees, shrubs, and subshrubs, of subarctic and temperate regions of the Northern Hemisphere. Section *Betula* (including natives *B. populifolia, B. papyrifera*, and *B. cordifolia*) is widely distributed in the northern hemisphere. Section *Costatae* (including *B. alleghaniensis, B. lenta, B. nigra*, and *B. uber*) occurs in e. North America and e. Asia. References: Grant & Thompson (1975); Furlow in FNA (1997); Furlow (1990)=Z; Hardin (1971)=Y; Järvinen et al. (2004); Govaerts & Frodin (1998); Kubitzki in Kubitzki, Rohwer, & Bittrich (1993).

1 Leaf blades suborbicular, the apex rounded; [section *Costatae*] ..... ***B. lenta*** *var.* ***uber***
1 Leaf blades ovate or triangular, the apex acute to acuminate.
2 Bark yellowish-gray, yellowish, pink, reddish-brown, or dark brown; samara rounded or slightly retuse at its apex, the wings making up 1/2 or less of the width; fruiting peduncles sessile (peduncled in *B. nigra*); [section *Costatae*].
3 Inner bark of the twigs bitter, not aromatic; leaves cuneate at the base ..... ***B. nigra***
3 Inner bark of the twigs with odor and flavor of wintergreen; leaves rounded to subcordate at the base.
4 Bark of stems 5-30 cm in diameter (on larger trees look up for branches) yellow or yellowish-gray, exfoliating in papery shreds (bark of larger trunks becoming platey, the plates not prominently marked horizontally by old lenticels); scales of fruiting catkins 6-13 mm long, pubescent and marginally ciliate; twigs and buds slightly hairy ..... ***B. alleghaniensis***
4 Bark of stems 5-30 cm in diameter (on larger trees look up for branches) reddish-brown or dark brown, tight (bark of larger trunks becoming platey, the plates prominently marked horizontally by old lenticels); scales of fruiting catkins 5-7 mm long, glabrous; twigs and buds glabrous ..... ***B. lenta*** *var.* ***lenta***

2 Bark white to pale gray; samara strongly retuse at its apex, the wings making up over 1/2 of the width; fruiting catkins peduncled; [section *Betula*].
5 Leaves glabrous beneath or somewhat pubescent on the veins; bark of young stems remaining tight; leaf apex long-acuminate to attenuate; central lobe of infructescence scales shorter than the basal and lateral lobes.
6 Leaf apex long-acuminate, but not attenuate; infructescence scales sparsely pubescent on the outer surface; bark of mature trees creamy to bright white ..... ***B. pendula***
6 Leaf apex attenuate-acuminate; infructescence scales densely pubescent on the outer surface; bark of mature trees grayish white ..... ***B. populifolia***
5 Leaves pubescent beneath, at least on the veins; bark of young stems exfoliating; leaf apex acute to short-acuminate; central lobe of infructescence scales equal to or longer than than the basal and lateral lobes.
7 Leaf blades 3-4 (-6) cm long, with 3-6 lateral veins on each side of the midvein..... ***B. pubescens*** *ssp.* ***pubescens***
7 Leaf blades 5-10 (-14) cm long, with 6-12 lateral veins on each side of the midvein.
8 Twigs glabrous or slightly pubescent (and then glabrate in age); leaves cordate (rarely rounded) at the base; leaves with 9-12 lateral veins on each side of the midvein; bark pinkish-white ..... ***B. cordifolia***
8 Twigs densely pubescent; leaves cuneate to rounded (rarely truncate) basally; leaves with 6-9 lateral veins on each side of the midvein; bark chalky-white ..... ***B. papyrifera***

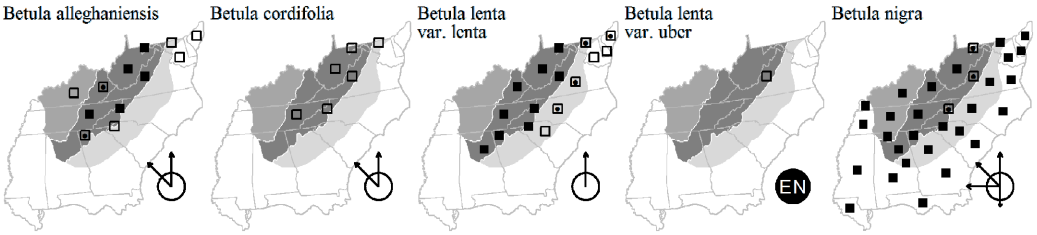
Betula alleghaniensis Britton, Yellow Birch. Forests at medium to high elevations, rarely at low elevations. April-May; June-August. NL (Newfoundland) west to se. MB, south to DE, PA, OH, n. IN, WI, MN, and IA, and in the mountains south to w. NC, n. GA, and e. TN. [= C, FNA, S, W, WV, Y, Z; = *B. lutea* Michaux f. – RAB; > *B. lutea* var. *lutea* – F, G; > *B. lutea* var. *macrolepis* Fernald – F, G; > *B. alleghaniensis* var. *alleghaniensis* – K; > *B. alleghaniensis* var. *macrolepis* (Fernald) Brayshaw – K]

Betula cordifolia Regel, Mountain Paper Birch. High elevation forests, primarily on talus of avalanche chutes, in the Black Mountains, Yancey County, NC, and on talus slopes and adjacent forests at high elevations, especially on quartzite on the western flank of the Blue Ridge, and on sandstone talus in the Ridge and Valley in VA. May-August; July-September. NL (Newfoundland) and e. QC south to the mountains of NY; disjunct in n. MN, w. VA, w. NC, and e. TN (Chester, Wofford, & Kral 1997). The question of the appropriate treatment of *B. cordifolia* and *B. papyrifera* is difficult (and still controversial). [= FNA, G, S, Y, Z; = *B. papyrifera* Marshall var. *cordifolia* (Regel) Fernald – RAB, C, F, K, W]

Betula lenta Linnaeus *var.* ***lenta***, Sweet Birch, Cherry Birch, Black Birch, "Mahogany." Forests at low to high elevations; common (uncommon in Piedmont). March-April; June-July. S. ME west to OH, south to GA and n. AL. This species is generally restricted elevationally in North Carolina to medium elevations and lower, but in VA it reaches higher elevations, where it can be as common as *B. alleghaniensis*. Once the primary source of methyl salicylate (wintergreen flavoring), used in medicines and confections; it is now produced synthetically. [= *B. lenta* – RAB, F, FNA, G, K, S, W, WV, Z; < *B. lenta* – C, Y (also including *B. uber*)]

Betula lenta Linnaeus *var.* ***uber*** Ashe, Virginia Roundleaf Birch. Mountain forests (endemic to Smyth County, VA). May-June; July-August. *B. lenta* var. *uber* is related very closely to *B. lenta* var. *lenta*, and is apparently endemic to Smyth County, VA. In addition to the characters in the key, it differs from *B. lenta* var. *lenta* in having the leaves 2-6 cm long (vs. 7-15 cm long), with 4-6 pairs of lateral veins (vs. 8-12 pairs). See Mazzeo (1974), Ogle & Mazzeo (1976), Hayden & Hayden (1984), and McAllister & Ashburner (2004) for additional information on this birch and its history. It does not breed "true" and should perhaps be considered a form of *B. lenta*. [< *B. lenta* Linnaeus – C, Y; = *Betula uber* (Ashe) Fernald – F, FNA, K, W, Z; = *B. lenta* ssp. *uber* (Ashe) E. Murray; = *B. lenta* forma *uber* (Ashe) McAllister & Ashburner]

Betula nigra Linnaeus, River Birch, Red Birch. Riverbanks, streambanks, floodplains, sandbars, disturbed uplands. March-April; May-June. NH west to se. MN and e. KS, south to ne. FL, FL Panhandle, and TX. [= RAB, C, F, FNA, G, GW, K, S, W, WV, Y, Z]

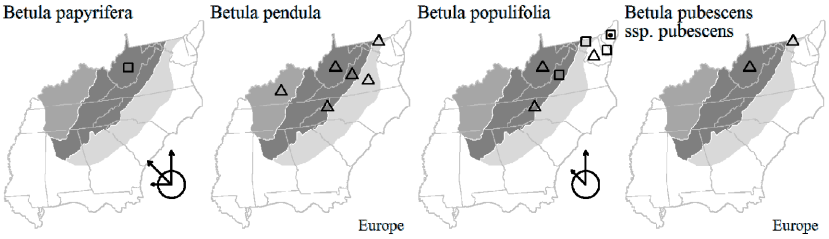


Betula papyrifera Marshall, Paper Birch, Canoe Birch. Dry soils. NL (Newfoundland), NL (Labrador) and AK, south to NJ, WV, OH, IN, IL, IA, NE, CO, and BC; it has sometimes been attributed to the Mountains of VA, but apparently these reports are based on *B. cordifolia*. [= FNA, G, WV, Y, Z; = *B. papyrifera* var. *papyrifera* – C, F, K, W]

* ***Betula pendula*** Roth, European Weeping Birch, European White Birch. Persistent and escaping from plantings; native of Europe. Reported for Watauga County, NC by Poindexter (pers. comm.). [= C, F, FNA, K]

Betula populifolia Marshall, Gray Birch, White Birch. Woods, thickets, in VA native in old fields and young forests in the Big Meadows area on greenstone (Madison & Page counties, VA), disturbed areas. May-June; June-July. NS to s. QC, south to s. NJ and MD, more or less disjunct in n. VA, s. ON, n. OH, and n. IN. [= RAB, C, F, FNA, G, K, W, Y, Z]

* ***Betula pubescens*** Ehrhart *ssp.* ***pubescens***, European White Birch, Downy Birch. Disturbed areas; native of Europe. Also reported as an introduction in e. GA (Jones & Coile 1988) and at scattered sites throughout PA (Rhoads & Klein 1993). [= FNA, K; = *B. alba* Linnaeus – C, F, G, an ambiguous name]



Carpinus Linnaeus 1753 (Hornbeam, Ironwood, Muscle-tree, Water-beech, Blue-beech)

A genus of about 26 species, trees, in temperate regions of the Northern Hemisphere, extending southward to se. Asia and Central America. The smooth gray bark gives *Carpinus* the names "Water-beech" and "Blue-beech", the fluted, sinewy appearance of the trunk the name "Muscle-tree", and the very hard, heavy wood the name "Ironwood." References: Furlow (1990)=Z; Hardin (1971)=Y; Furlow (1987a); Furlow (1987b)=X; Furlow in FNA (1997); Govaerts & Frodin (1998); Kubitzki in Kubitzki, Rohwer, & Bittrich (1993).

1 Leaves narrowly ovate to oblong-ovate, 3-8.5 cm long, 1-4.5 cm wide, the apex acute, secondary teeth small and blunt, the lower leaf surface lacking conspicuous dark glands; bracts of the infructescence with rounded to subacute tips and few, blunt teeth; [primarily of the Coastal Plain and lower Piedmont] ..... ***C. caroliniana*** *var.* ***caroliniana***
1 Leaves ovate to elliptic, 5.8-12.5 cm long, 2.5-6.0 cm wide, usually abruptly narrowed to the tip (sometimes gradually tapered to a long, acuminate apex), the secondary teeth often almost as long as the primary teeth, sharp-tipped, the lower leaf surface with conspicuous dark-brown glands; bracts of the infructescence mostly sharp-tipped and bearing several sharp teeth; [primarily of the Mountains and Piedmont] ..... ***C. caroliniana*** *var.* ***virginiana***

Carpinus caroliniana Walter *var.* ***caroliniana***, Coastal American Hornbeam. Streambanks, riverbanks, bottomland forests, lower slopes, maritime forests. March-April; September-October. S. NJ, e. MD, and e. VA south to c. peninsular FL, west to e. TX, and north in the inland to s. MO and s. IL. The validity of 2 taxa was established by Furlow (1987a, 1987b) largely through statistical methods. The two taxa have some morphologic and phytogeographic coherence, but intergradation appears to be extensive, and individual specimens (in the herbarium) or trees (in the field) may not be readily identifiable to variety. [= C, F; = *C. caroliniana* ssp. *caroliniana* – FNA, K, X, Z; < *C. caroliniana* – RAB, G, GW, S, WH, Y]

Carpinus caroliniana Walter *var.* ***virginiana*** (Marshall) Fernald, Inland American Hornbeam. Rich cove forests, streambanks, riverbanks, bottomland forests, lower slopes. March-April; September-October. ME, QC and s. ON west to MN, south to e. VA, c. NC, n. GA, n. AL, n. MS, AR, and se. OK. See above for discussion of the two varieties. [= C, F; = *C. caroliniana* ssp. *virginiana* (Marshall) Furlow – FNA, K, W, X, Z; < *C. caroliniana* – RAB, G, GW, S, Y]

Corylus Linnaeus 1753 (Hazelnut, Filbert)

A genus of about 15-18 species, shrubs and trees, of temperate regions of the Northern Hemisphere. Eurasian species of this genus, *C. avellana* Linnaeus and *C. maxima* P. Miller, are the sources of commercial filberts or hazelnuts. They are sometimes cultivated in North America, especially in the Pacific Northwest. Our wild species are also excellent eating, but wild animals, especially squirrels, usually harvest them before they are ripe. References: Furlow in FNA (1997); Kubitzki in Kubitzki, Rohwer, & Bittrich (1993); Whitcher & Wen (2001); Forest & Bruneau (2000); Govaerts & Frodin (1998).

1 Mature involucre 1.5-3 cm long, the lobes flattened and laciniate; young twigs and petioles stipitate-glandular; [section *Corylus*, subsection *Corylus*] ..... ***C. americana***
1 Mature involucre 4-7 cm long, extended into a tubular beak; young twigs and petioles villous, glandless; [section *Corylus*, subsection *Siphonochlamys*] ..... ***C. cornuta*** *var.* ***cornuta***

Corylus americana Walter, American Hazelnut, American Filbert. Rocky woodlands, mesic to rich forests and thickets. February-March; September-October. ME west to SK, south to GA, LA, and OK. [= RAB, C, FNA, K, S, W, WV, Y, Z; > *C. americana* var. *americana* – F, G; > *C. americana* var. *indehiscens* Palmer & Steyermark – F, G]

Corylus cornuta Marshall *var.* ***cornuta***, Beaked Hazelnut. Dry rocky woodlands, thickets, high elevation forests and openings, seepage swamps. February-April; August-October. The species ranges from NL (Newfoundland) west to BC, south to NJ, n. GA, e. TN (Chester, Wofford, & Kral 1997), OH, MO, CO, and CA. Var. *cornuta* occupies most of that range; var. *californica* (A. de Candolle) Sharp [ssp. *californica* (A. de Candolle) E. Murray], a small tree, is far western and grades into var. *cornuta*. [= K, Z; < *C. cornuta* – RAB, C, F, G, S, W, WV, Y; = *C. cornuta* ssp. *cornuta* – FNA]

Ostrya Scopoli 1760 (Hop-hornbeam, Ironwood)

A genus of 5-9 species, trees, of temperate regions of the Northern Hemisphere. References: Furlow in FNA (1997); Govaerts & Frodin (1998); Kubitzki in Kubitzki, Rohwer, & Bittrich (1993).

Ostrya virginiana (P. Miller) K. Koch, American Hop-hornbeam, Ironwood. Mesic to dry forests, often rocky, especially over basic rocks, reaching high elevations. April-May; August-October. NS west to MB, south to c. peninsular FL, Panhandle FL, and TX. One of our heaviest and hardest woods. [= RAB, C, FNA, G, S, W, WV, Y, Z; > *O. virginiana* var. *lasia* Fernald – F; > *O. virginiana* var. *virginiana* – F; = *O. virginiana* var. *virginiana* – K]

167. CUCURBITACEAE Durande 1782 (Gourd Family) [in CUCURBITALES]

A family of about 97-120 genera and 800-1000 species, of tropical and subtropical areas, with a few extending to temperate areas. Schaefer & Renner in Kubitzki (2011); Nesom (2011b); Nesom in FNA (in prep.).

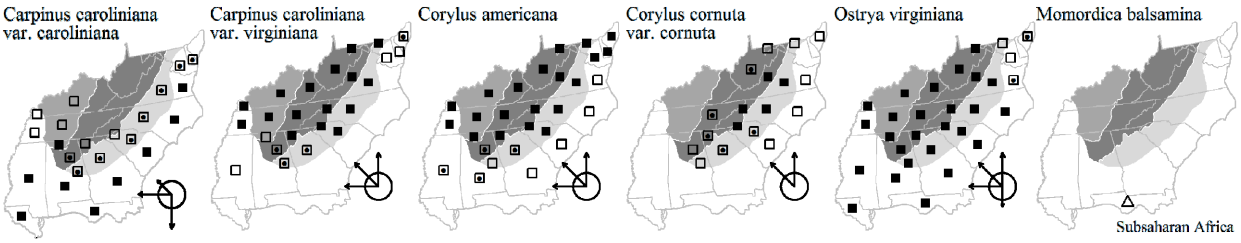
1 Ovaries and fruits muricate, tuberculate, or echinate; fruits 1-25 cm long at maturity.
  2 Plants prostrate; tendrils absent; leaves with whitish-crisped margins; [section *Bryoniae*] ..... ***2. Ecballium***
  2 Plants climbing; tendrils present; leaves with green margins
    3 Corolla 5-lobed, yellow, the petals 7-25 mm long; fruit muricate or tuberculate, 10-25-seeded, dehiscent by 3 valves or somewhat irregularly; tendrils with 1-2 branches; [tribe *Joliffieae*] ..... ***1. Momordica***
    3 Corolla 5-6-lobed, white, the petals 0.5-6 mm long; fruit echinate, 1- or 4-seeded, indehiscent or dehiscent by 2 pores; tendrils with 3 branches; [tribe *Sicyeae*].
      4 Corolla 6-lobed; fruit 4-seeded, dehiscent by 2 pores; stems and leaves glabrous or glabrescent ..... ***4. Echinocystis***
      4 Corolla 5-lobed; fruit 1-seeded, indehiscent; stem and leaves conspicuously viscid-pubescent ..... ***5. Sicyos***
1 Ovaries and fruits smooth or pubescent, but not prickly; fruits 1-70 cm long at maturity.
  5 Leaves pinnately lobed, the divisions rounded; fruit surface green and white, the flesh red or pink; [tribe *Benincaseae*] ..... ***8. Citrullus***
  5 Leaves palmately lobed, the divisions angular and toothed; fruit surface red, green, white, black, orange, yellow, or blue, the flesh white, orange, yellow, tan, or green.
    6 Fruit < 3 cm long; tendrils present, simple; [native, mostly in moist forests or thickets].
      7 Fruit surface red at maturity; pedicel of pistillate flowers and fruits 1-3 mm long; [tribe *Cucurbiteae*] ..... ***11. Cayaponia***
      7 Fruit surface black or dark green at maturity; pedicel of pistillate flowers and fruits > 20 mm long; [tribe *Benincaseae*] ..... ***7. Melothria***
    6 Fruit > 5 cm long; tendrils absent or present (if present, forked); [introduced, mostly in gardens, fields, or disturbed places].
      8 Corolla white; [bottle gourd, ivy gourd]; [tribe *Benincaseae*].
        9 Corolla campanulate; fruit scarlet at maturity; [ivy gourd] ..... ***9. Coccinia***
        9 Corolla salverform; fruit not scarlet at maturity; [bottle gourd] ..... ***10. Lagenaria***
      8 Corolla yellow; [canteloupe, cucumber, luffa, squash, gourd, pumpkin].
        10 Corolla < 3 cm long; [cantaloupe, cucumber]; [tribe *Benincaseae*] ..... ***6. Cucumis***
        10 Corolla > 5 cm long; [luffa, squash, gourd, pumpkin].
          11 Corolla campanulate; fruit indehiscent, the interior fleshy; [squash, gourd, pumpkin]; [tribe *Cucurbiteae*] ..... ***12. Cucurbita***
          11 Corolla salverform; fruit dehiscent, the interior very fibrous; [luffa]; [tribe *Luffeae*] ..... ***3. Luffa***

1. Momordica Linnaeus 1753 (Balsam-apple, Bitter Melon)

A genus of ca. 45-60 species, vines, of the Old World tropics. References: Nesom in FNA (in prep.); Schaefer & Renner in Kubitzki (2011).

1 Bract of the male flowers toothed; bract of male flowers attached at the apex of the peduncle; fruit 2.5-4 (-7) cm long ..... ***M. balsamina***
1 Bract of the male flowers entire; bract of male flowers attached near or below the midpoint of the peduncle; fruit 7-25 cm long ..... ***M. charantia*** *ssp.* ***charantia***

Momordica balsamina Linnaeus, Balsam-apple, Bitter Melon. Disturbed areas; native of Africa. May-September. [= FNA, K2, WH]



* ***Momordica charantia*** Linnaeus *ssp.* ***charantia***, Balsam-pear, Balsam-apple, Bitter Melon. Disturbed areas, roadsides, fence-rows; native of Africa. Reported for Panhandle FL by Anderson (2007) and Kunzer et al. (2009). An additional subspecies, ssp. *macroloba* Achigan-Dako & Blattner, is known from wc. Africa. [= FNA; < K, S, WH]

2. Ecballium A. Richard 1824 (Squirting Cucumber)

A monotypic genus, a vine, of Mediterranean Europe, n. Africa, and w. Asia. References: Nesom in FNA (in prep.).

* ***Ecballium elaterium*** (Linnaeus) A. Richard, Squirting Cucumber. Disturbed areas; native of Mediterranean Europe, n. Africa, and w. Asia. [= FNA, K2]

3. Luffa P. Miller 1754 (Luffa)

A genus of 5-7 species, vines, of the tropics. References: Nesom in FNA (in prep.); Schaefer & Renner in Kubitzki (2011).

1 Fruits clavate, strongly 10-angled; petals pale yellow; leaves shallowly lobed.....***L. acutangula*** *var.* ***acutangula***
1 Fruits cylindric, not angled; petals deeo yellow; leaves deeply lobed .....***L. aegyptiaca***

* ***Luffa acutangula*** (Linnaeus) Roxburgh *var.* ***acutangula***, Angled Luffa, Ridged Gourd, Sponge Gourd. Gardens, fields, trash heaps; cultivated in home gardens, sometimes volunteering from seed the following year; native of s. Asia. Var. amara (Roxburgh) Clarke is also native of s. Asia. [= FNA; < *L. acutangula* – K]
* ***Luffa aegyptiaca*** P. Miller, Smooth Luffa, Sponge Gourd, Vegetable Sponge. Gardens, fields, trash heaps; commonly cultivated in home gardens and commercially, sometimes volunteering from seed the following year; native of s. Asia. [= FNA, K; ? *L. cylindrica* (Linnaeus) M. Roemer – S]

4. Echinocystis Torrey & A. Gray 1840 (Wild-cucumber)

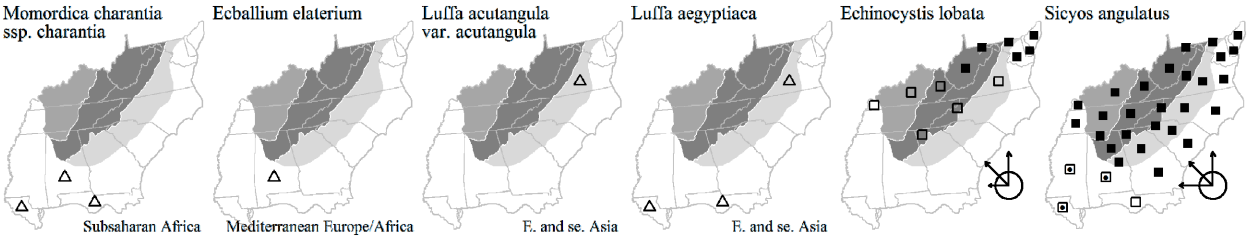
A monotypic genus, an annual vine, of e. North America. References: Nesom in FNA (in prep.); Schaefer & Renner in Kubitzki (2011).

Echinocystis lobata (Michaux) Torrey & A. Gray, Wild Balsam-apple, Wild-cucumber. Bottomland forests and thickets. July-October. NB west to SK, south to GA (?) and TX. [= RAB, C, F, FNA, G, GW, K, W, WV; = *Micrampelis lobata* (Michaux) Greene – S]

5. Sicyos Linnaeus 1753 (Bur-cucumber)

A genus of about 75 species, annual or perennial vines, of Australia, Pacific Islands, tropical America. References: Nesom (2011a)=Z; Schaefer & Renner in Kubitzki (2011).

Sicyos angulatus Linnaeus, Bur-cucumber, Nimble-Kate, Star-cucumber. Moist forests and thickets. August-November. S. ME west to MN and se. ND, south to Panhandle FL and c. TX. [= RAB, C, F, G, GW, K, S, W, WH, WV, Z]



6. Cucumis Linnaeus 1753 (Canteloupe, Muskmelon, Cucumber)

A genus of 50-60 species, herbaceous vines, native of the Old World (but see discussion under *C. melo* var. *texanus*). Infrageneric classification follows Schaefer (2007). References: Munger & Robinson (1991)= X; Schaefer (2007)=V; Kirkbride(1993)=Z; Decker-Walters et al. (2002)=Y; Silberstein et al. (1999); Stepansky, Kovalski, & Perl-Treves (1999)=U.

1 Fruits with spine-bearing tubercles (aculeae); [West Indian gherkin]; [subgenus *Cucumis*; section *Aculeatosi*].
  2 Aculei 1-2 mm long; leaves deeply 3-5-palmately lobed .....***C. anguria*** *var.* ***anguria***
  2 Aculei 4-10 (-15) mm long; leaves slightly to deeply 3-5-palmately lobed.....***C. anguria*** *var.* ***longaculeatus***
1 Fruits smooth, reticulate, or hairy, lacking aculeae; [subgenus *Cucumis*; section *Cucumis*].
  3 Leaf blade lobe broadly triangular; corolla tube of female flower 3.5-6.5 mm long; corolla tube of male flower 3.4-4.9 mm long; [cucumber] .....***C. sativus***
  3 Leaf blade central lobe elliptic, oblong or ovate; corolla tube of female 0.8-2.8 mm long; corolla tube of male flower 0.8-2.0 mm long.
    4 Fused portion of hypanthium or youngest fruits with appressed hairs; stem abundantly beset with retrorse prickles; fruit diameter 2.5-5 cm .....***C. melo*** *var.* ***texanus***
    4 Fused portion of hypanthium or youngest fruits with spreading hairs; stems smooth or nearly so; fruit diameter > 10 cm.
      5 Fruits with smooth or wrinkled rind; ripe fruits with white or green flesh, lacking musky odor .....***C. melo*** *var.* ***inodorus***
      5 Fruits with netted, warty, or scaly rind; ripe fruits with orange (rarely green) flesh, with aromatic flavor and musky odor.....
      .....***C. melo*** *var.* ***melo***

* ***Cucumis anguria*** Linnaeus *var.* ***anguria***, Bur Gherkin. Disturbed areas; native of Africa. [= FNA, K2; < *C. anguria* – S, V]

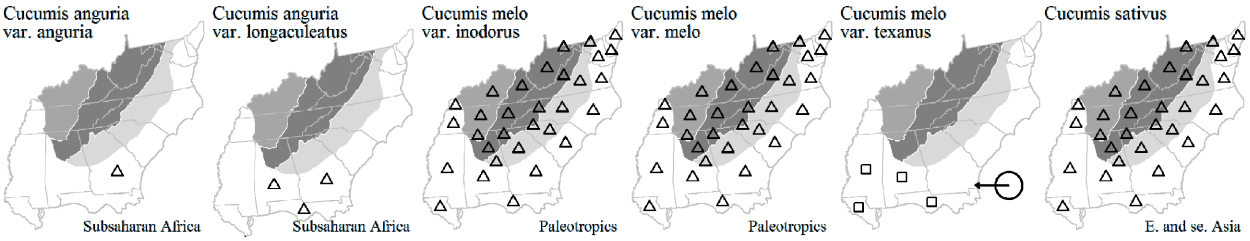
* ***Cucumis anguria*** Linnaeus *var.* ***longaculeatus*** J.H. Kirkbride, West Indian Gherkin. Disturbed areas; native of the Africa. Reported for GA (Jones & Coile 1988), FL (Wunderlin & Hansen 2003, as *C. anguria*), and AL (Diamond & Woods 2009, as *C. anguria*). [= K, Z; < *C. anguria* – S, V, WH]

* ***Cucumis melo*** Linnaeus *var.* ***inodorus*** Jacquin, Honeydew, Winter Melon. Sometimes cultivated in our area. [= U, X; < *Cucumis melo* Linnaeus – RAB, F, G, K, S, V; = *C. melo* ssp. *melo* var. *inodorus* – FNA; < *C. melo* ssp. *melo* – Z]

* ***Cucumis melo*** Linnaeus *var.* ***melo***, Canteloupe, Muskmelon. Gardens, fields, trash heaps, commonly cultivated in home gardens and commercially, sometimes volunteering from seed the following year; native of w. Africa. [= *C. melo* ssp. *melo* var. *melo* – FNA; < *Cucumis melo* Linnaeus – RAB, F, G, K, S, V, WV; = *C. melo* var. *cantalupensis* Naudin – U, X; < *C. melo* ssp. *melo* – Z]

Cucumis melo Linnaeus *var.* ***texanus*** Naudin, Gulf Coast Melon. Fields, roadsides, other disturbed areas; apparently evolved into a distinct variety in the southeastern United States from Asian stock introduced at an unknown time and by unknown means. Panhandle FL south to peninsular FL, west through s. MS, s. TX, and Mexico. Decker-Walters et al. (2002) show that var. *texanus* is morphologically and molecularly distinct from the most closely related varieties, the Asian var. *chito* (C. Morren) Naudin and var. *dudaim* (Linnaeus) Naudin; they postulate that var. *texanus* was likely introduced from Asia in pre-Columbian times. [= FNA, Y; < *Cucumis melo* Linnaeus – RAB, F, G, K, S, V; = *C. melo* ssp. *agrestis* (Naudin) Pangalo var. *texanus* – FNA; < *C. melo* var. *chito* – U, X; < *C. melo* ssp. *agrestis* (Naudin) Pangalo – Z]

* ***Cucumis sativus*** Linnaeus, Cucumber. Gardens, fields, trash heaps, commonly cultivated in home gardens and commercially, sometimes volunteering from seed the following year; native of s. Asia. [= F, FNA, G, K, V, Z]



*7. **Melothria*** Linnaeus 1753 (Melonette)

A genus of about 12 species, vines, of the New World. References: Nesom in FNA (in prep.).

Melothria pendula Linnaeus, Melonette, Creeping Cucumber, Mouse Melon. Bottomland forests, moist roadsides and disturbed areas, marshes. June-November. DC, MD, and VA west to IN, south to FL and TX. [= C, F, FNA, G, GW, RAB, W; > *M. pendula* – S; > *M. pendula* var. *pendula* – K; > *M. pendula* var. *aspera* Cogniaux – K, S; > *M. pendula* var. *crassifolia* (Small) Cogniaux – K; > *M. microcarpa* Shuttleworth – S; > *M. nashii* Small – S]

*8. **Citrullus*** Schrader 1836 (Watermelon)

A genus of 4 species, annual or perennial herbaceous vines, of Africa, Mediterranean Europe, and w. Asia. References: Dane & Lang (2004); Nesom in FNA (in prep.); Nesom (2011b)=Z; Schaefer & Renner in Kubitzki (2011).

* ***Citrullus lanatus*** (Thunberg) Matsumura & Nakai *ssp.* ***lanatus***, Watermelon. Gardens, fields, trash heaps, commonly cultivated in home gardens and commercially, sometimes volunteering from seed the following year; native of tropical Africa. [< *Citrullus lanatus* (Thunberg) Matsumura & Nakai var. *lanatus* – K; < *C. vulgaris* Schrader – F, G, RAB, WV; = *C. lanatus* ssp. *lanatus* – FNA, Z; < *C. citrullus* (Linnaeus) Karsten – S; < *C. lanatus* – WH]

*9. **Coccinia*** Wight & Arnott 1834 (Ivy Gourd)

A genus of ca. 30 species, herbaceous vines, of sub-Saharan Africa. References: Nesom in FNA [in prep.]

* ***Coccinia grandis*** (Linnaeus) Voigt, Ivy Gourd. Disturbed areas, escaped from cultivation; native of sub-Saharan Africas. May-November. [= K, WH]

*10. **Lagenaria*** Seringe 1825 (Bottle Gourd)

A genus of 6 species, Old World tropical, centered in Africa. References: Nesom in FNA (in prep.).

* ***Lagenaria siceraria*** (Molina) Standley *ssp.* ***siceraria***, Bottle Gourd, Calabash Gourd. Gardens, fields, trash heaps, commonly cultivated in home gardens and commercially, rare as a volunteer from seed the following year; native of Africa. One of the oldest cultivated plants. [= FNA; < *L. siceraria* – K, WH; < *L. vulgaris* Seringe – RAB, F; < *L. leucantha* Rusby – G; < *Cucurbita lagenaria* Linnaeus – S]

11. Cayaponia Silva Manso 1836

A genus of about 45 species, of tropical, subtropical and warm-temperate America.

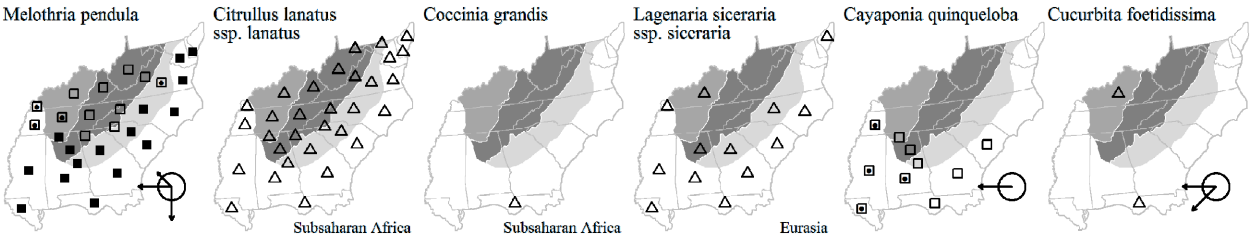
Cayaponia quinqueloba (Rafinesque) Shinners. Swamp forests, river banks. June-November. E. SC south to GA, west to e. TX, north in the interior to w. TN. [= FNA, K; = *C. boykinii* (Torrey & A. Gray) Cogniaux – RAB, S; > *C. quinqueloba* GW; > *C. grandifolia* (Torrey & A. Gray) Small – GW]

12. Cucurbita Linnaeus 1753 (Squash, Zucchini, Pumpkin, Gourd, Vegetable Marrow)

A genus of 14-22 annual or perennial vines, of the New World. References: Nesom in FNA (in prep.); Nesom (2011b)=Z.

1 Leaf blades distinctly longer than broad, triangular, usually unlobed; [coyote melon].....***C. foetidissima***
1 Leaf blades as wide or wider than long, deeply to shallowly lobed.
2 Stems and leaves variously pubescent, the hairs generally not pustulate-based.
3 Fruiting peduncles relatively soft and corky-thickened, terete and not strongly ribbed, expanding gradually along their length .....
.....***C. maxima***
3 Fruiting peduncles hardened and woody, 5-ribbed, abruptly and widely expanded at point of fruit attachment.....***C. moschata***
2 Stems and leaves hispid with pustulate-based hairs.
4 Wild plants; fruit almost always bitter, solid ivory or green-and-white striped, usually not yellow or orange; rind smooth.
5 Fruit usually solid ivory, sometimes green-and-white striped; germination within 1-4 days .....***C. melopepo*** *var.* ***ozarkana***
5 Fruit usually green-and-white striped, sometimes maturing yellow; germination within 3-7 days.....***C. melopepo*** *var.* ***texana***
4 Cultivated plants (or occurring as waifs and short-term naturalized population, usually in proximity to cultivation); fruit non-bitter (except for some ornamental gourds), variously colored, often at least partially yellow or orange; rind smooth, ribbed, or with warts.
6 [scallop, pattypan, acorn, crookneck, and straightneck squashes, most ornamental gourds]..... ***C. melopepo*** *var.* ***melopepo***
6 [cocozelle, jack-o'-lantern pumpkins, vegetable marrows, zucchini, some ornamental gourds].....***C. pepo***

* ***Cucurbita foetidissima*** Kunth, Coyote Gourd, Buffalo Gourd, Foetid Gourd, Chili Coyote. Disturbed areas; native of sc. and sw. North America (incl. Mexico). May-August. [= FNA, K2]



* ***Cucurbita maxima*** Duchesne, Hubbard Squash, Pumpkin. Gardens, fields, trash heaps, commonly cultivated in home gardens and commercially, sometimes volunteering from seed the following year; native of tropical America. [= F, K]

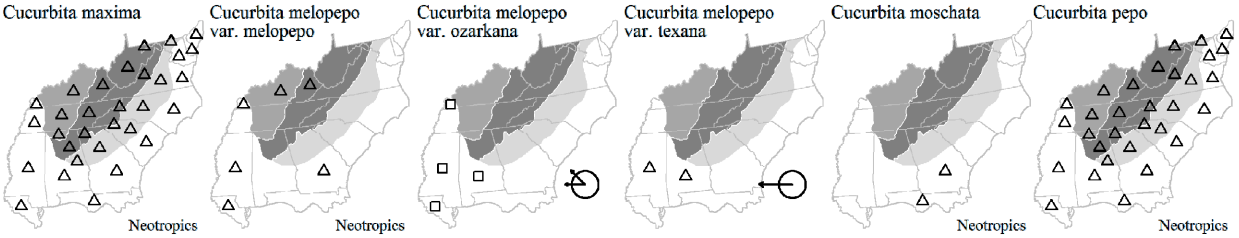
* ***Cucurbita melopepo*** Linnaeus *var.* ***melopepo***, Crookneck Squash, Straightneck Squash, Scallop Squash, Pattypan Squash, Acorn Squash, Ornamental Gourd. Gardens, fields, trash heaps; commonly cultivated in home gardens and commercially, rarely volunteering from seed the following year; native of tropical America. May-October. [= *C. melopepo* ssp. *texana* (Scheele) Nesom var. *melopepo* – Z]

Cucurbita melopepo Linnaeus *var.* ***ozarkana***, Ozark Squash. Bottomlands. {distribution} [= *C. melopepo* ssp. *texana* (Scheele) Nesom var. *ozarkana* (Decker) Nesom – Z]

Cucurbita melopepo Linnaeus *var.* ***texana***, Texas Squash. Bottomlands. {distribution} [= *C. melopepo* ssp. *texana* (Scheele) Nesom var. *texana* (Scheele) Nesom – Z]

* ***Cucurbita moschata*** Duchesne, Butternut Squash. Gardens, fields, trash heaps, commonly cultivated in home gardens and commercially, rarely volunteering from seed the following year; native of tropical America. May-October. [= F, K, WH; = *Pepo moschata* (Duchesne) Britton – S]

* ***Cucurbita pepo*** Linnaeus, Pumpkin, Zucchini, Ornamental Gourd, Vegetable Marrow. Gardens, fields, trash heaps; commonly cultivated in home gardens and commercially, sometimes volunteering from seed the following year; native of tropical America. May-October. [= Z; < *C. pepo* – F, RAB, WV; = *C. pepo* var. *pepo* – K; < *Pepo pepo* (Linnaeus) Britton ex Small – S]



170. BEGONIACEAE C. Agardh 1824 (Begonia Family) [in CUCURBITALES]

A family of 2 genera and about 900-1500 species, herbs and shrubs, of tropical and subtropical (rarely warm temperate) regions. References: de Wilde in Kubitzki (2011).

Begonia Linnaeus (Begonia)

A genus of about 900-1500 (or more) species, herbs and shrubs, of tropical and subtropical (rarely warm temperate) regions. References: de Wilde in Kubitzki (2011).

* ***Begonia cucullata*** Willdenow, Wax Begonia, Club Begonia. Disturbed places; native of South America. Escaped or persistent in e. GA (Jones and Coile 1988) and AL(Woods & Diamond 2006), south to Panhandle FL and ne. FL (Wunderlin & Hansen 2004). [= K, WH]

172a. PARNASSIACEAE Gray 1821 (Grass-of-Parnassus Family) [in CELASTRALES]

A family of 2 genera and about 16 species, herbs, of largely north temperate and arctic areas. Numerous anomalous features separate *Parnassia* from the Saxifragaceae; affinities with the Droseraceae, Clusiaceae, Celastraceae, and other families have been historically suggested. It is now clear that its affinities lie with Celastraceae, but APG III's (2009) inclusion of it in Celastraceae seems premature; it is here retained as separate. Considering the uncertainties of its relationships, *Parnassia* is best treated as a family, the Parnassiaceae, as suggested by numerous workers as early as 1821, and increasingly accepted in recent decades. The very distant relationship of *Parnassia* to the Saxifragaceae (sensu stricto) has been strongly reaffirmed by molecular analyses (Morgan & Soltis 1993, Soltis et al. 2000, Savolainen et al. 2000). References: Simmons in Kubitzki (2004). [including *LEPUROPETALACEAE*]

1 Plants diminutive, rosettes < 3 cm across; winter annual ..... ***Lepuropetalon***
1 Plants larger, rosettes over 8 cm across; perennial from rhizomes ..... ***Parnassia***

Lepuropetalon Elliott 1817 (Lepuropetalon)

A monotypic genus, of se. North America, Mexico, c. Chile, and Uruguay. Sometimes treated as part of a broad and polymorphic Saxifragaceae, *Lepuropetalon* has often been associated with *Parnassia* in the Parnassiaceae. Morgan & Soltis (1993) suggest a close relationship of *Lepuropetalon* and *Parnassia*, as well as the "distant relationship between both genera and the Saxifragoideae." The affinities of *Lepuropetalon* with *Parnassia* remain uncertain, however, as emphasized by Gastony & Soltis (1977) in their analysis of chromosomes and partially reiterated by Morgan & Soltis (1993). *Lepuropetalon* is here treated in the Parnassiaceae, as supported by molecular analyses (Soltis et al. 2000, Savolainen et al. 2000); treatment in a monotypic Lepuropetalaceae is perhaps equally warranted. References: Ward & Gholson (1987); Spongberg (1972); Gastony & Soltis (1977); Wilbur (1988b); Simmons in Kubitzki (2004).

Lepuropetalon spathulatum Elliott, Lepuropetalon. In moist open areas, such as seepage on granitic flatrocks, ditches, seasonally wet depressions. February-April. Se. NC and SC south to GA and FL Panhandle (Kunzer et al. 2009), west to e. TX and Mexico; also in Chile and Uruguay. As indicated by Ward & Gholson (1987), *Lepuropetalon* is more common than collections would indicate; the rosettes are 0.5-2 (-3) cm across, the greenish flowers are 2-3 mm across. It has been considered "the smallest terrestrial angiosperm" (Morgan & Soltis 1993). Its apparently greater abundance in the western portion of its range, where largely found by a few botanists "who have made determined efforts to establish its range" (Ward & Gholson), and in habitats such as granitic flatrocks, which have overall received close scrutiny, may be more a reflection of its diminutive size and early season of occurrence than of its real distribution and abundance. The recent increase in collections, mostly in disturbed or human-maintained habitats, also suggests a possible increase in abundance (and range?) from its original state. It should be more vigorously sought in our area. The presence of lines of red glandular dots on the leaves and sepals is a helpful diagnostic character. [= RAB, GW, K, S]

Parnassia Linnaeus 1753 (Grass-of-Parnassus, Parnassia)

A genus of 15-70 species, herbs, primarily of arctic and north temperate areas. Our species (especially *P. caroliniana*) are among the most southerly of the genus in distribution. *Parnassia* (all species) are among the most beautiful of our native plants. From a distance the white flowers are attractive but not extraordinary; when observed closely, though, the delicate tracery of the green veins on the waxy white petals is astonishing. References: Gastony & Soltis (1977); Spongberg (1972); GW; Simmons in Kubitzki (2004).

Identification notes: Note that the five staminodia are (in our species) deeply three-lobed to the base, thus appearing as 15.

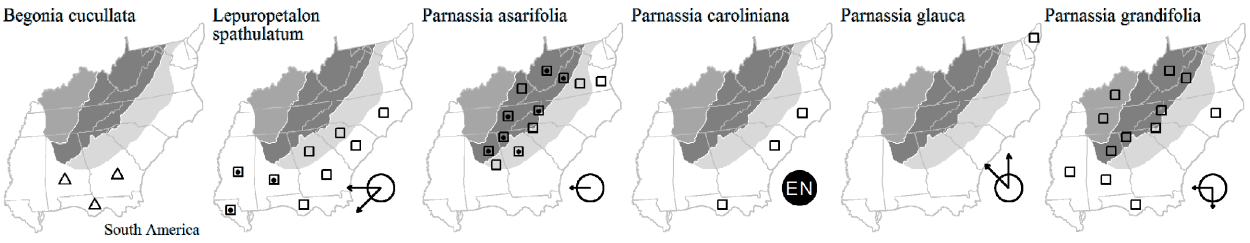
1 Leaf blades reniform, as wide or wider than long, the base strongly cordate; staminodia shorter than the stamens [note that the stamens elongate after the staminodia; thus at a certain early stage the stamens of *P. asarifolia* may be shorter than the staminodia; check several flowers] ..... ***P. asarifolia***
1 Leaf blades ovate, longer than wide, the base rounded, broadly cuneate, truncate, or cordate; staminodia longer than the stamens (*P. caroliniana* and *P. grandifolia*) or shorter than the stamens (*P. glauca*).
  2 Staminodia shorter than the stamens; [of NJ, PA, and OH northward] ..... ***P. glauca***
  2 Staminodia longer than the stamens; [of VA, WV, MO, OK southward].
    3 Main parallel veins of each petal (9-) 11-17 (counted at a point halfway between the base and the apex and ignoring short laterals), usually not dilated toward the apex of the petal; outer- or basal-most main vein branching pseudo-dichotomously several times; rhizome horizontal, long-creeping, the leaves scattered or loosely clustered, tending to form clonal patches to several m in diameter; ovary white; [of Coastal Plain pinelands] ..... ***P. caroliniana***
    3 Main parallel veins of each petal 5-9 (counted at a point halfway between the base and the apex and ignoring short laterals), often strongly dilated toward the apex of the petal; outer- or basal-most main vein with numerous short laterals on the outer side, extending to the petal margin with few or no branchings; rhizome erect, short, the leaves strongly clustered, not forming large clonal patches; ovary green, sometimes white toward the base; [primarily of the Mountains, rarely also disjunct in the Coastal Plain] ..... ***P. grandifolia***

Parnassia asarifolia Ventenat, Kidney-leaved Grass-of-Parnassus, Appalachian Grass-of-Parnassus, Brook Parnassia. Bogs, sphagnous seeps, brookbanks, generally in more acidic habitats than *P. grandifolia*, up to elevations over 1800 m. (July-) August-October. VA, e. WV, sw. AR south to GA and e. TX, primarily in the Appalachian and Ozarkian highlands. [= RAB, C, F, G, GW, K, S, W, WV]

Parnassia caroliniana Michaux, Carolina Grass-of-Parnassus, Savanna Parnassia, Eyebright. Wet longleaf pine, pond pine, or pond cypress savannas (especially but not strictly where shallowly underlain by coquina limestone), sandhill seepage bogs. September-November (-December). Se. and sc. NC south through SC; disjunct in the Panhandle of FL, the distribution (at least now) fragmented and disjunctive. In NC, locally common in three small areas, centered around Maple Hill (Pender and Onslow counties), Old Dock (Columbus and Brunswick counties), and the Green Swamp (Brunswick County). Following Michaux's discovery of the species it was apparently not reported again in the Carolinas until found by H.A. Rankin near Hallsboro. His comments, quoted in Alexander (1934) are interesting. "What if our savannas are sometimes steaming, it is the condition necessary for the development for many wonderful plants which find here their most congenial surroundings. But Grass-of-Parnassus does not star the meadows during the steaming season, instead, by local tradition, the 'Eyebright,' its local name, times its first flowers to come just two weeks before frost ... As a matter of fact, I saw the first flowers this year on October 12th and our first frost came the morning of the 25th. Its chosen habitat is the wet savannas and hundreds of acres may be seen liberally dotted with its white stars, but it finds its best development in the lower places, and here it often almost covers the ground. Today, November 1st, it is in its prime and is the most conspicuous flower on many acres and in one little depression less than two feet in diameter I counted seventy-two flowers and buds." With the extensive destruction of our wet savannas (by conversion to pine tree farms, agriculture, and developed areas) and fire suppression, very few such places now remain. [= RAB, GW, K, S, WH]

Parnassia glauca Rafinesque, American Grass-of-Parnassus, Fen Grass-of-Parnassus. Fens. NL (Newfoundland), QC, and SK south to NJ (Ocean County), s. PA (Rhoads & Klein 1993), OH, IN, IA, and SD. [= C, F, G, K]

Parnassia grandifolia A.P. de Candolle, Bigleaf Grass-of-Parnassus, Limeseep Parnassia. Fens, gravelly seepages, pineland seepage bogs and ecotomes, primarily or solely over calcareous, mafic, or ultramafic rocks, in the outer Coastal Plain in seepage over marl on nearly vertical river bluffs on the Cape Fear River (NC) and in pineland seepage bogs. September-October. VA, WV, s. MO, and OK south to n. GA, Panhandle FL, s. MS (Sorrie & Leonard 1999), AR, and e. TX, primarily in the Appalachian and Ozarkian highlands. The discovery of populations of this species in Brunswick and Columbus counties, NC, was remarkable. In the Panhandle of FL and the West Gulf Coastal Plain of LA and TX it also occurs in wet savannas and pitcherplant bogs (MacRoberts, MacRoberts, & Jackson 2004), in FL sometimes in close proximity to *P. caroliniana*; *Parnassia* in Coastal Plain savannas should not necessarily be assumed to be *P. caroliniana*. [= RAB, C, F, G, GW, K, S, W, WH, WV]



172b. CELASTRACEAE R. Brown 1814 (Bittersweet Family) [in CELASTRALES]

A family of ca. 98 genera and ca. 1200 species, trees, shrubs, lianas, perennial and annual herbs, nearly cosmopolitan, especially in the tropics and subtropics. References: Brizicky (1964); Simmons in Kubitzki (2004).

1 Leaves spiny-toothed, coriaceous; [rare waif in our area] ..... ***Crossopetalum***
1 Leaves entire to serrate (but not spiny-toothed), herbaceous to coriaceous; [collectively common in our area].
2 Leaves alternate; twining woody vines ..... ***Celastrus***
2 Leaves opposite; upright to trailing shrubs or climbing woody vines.
3 Leaves widely spaced, averaging < 1 pair per cm of stem; leaves 2.5-12 cm long, (0.5-) 1-6 cm wide; [shrubs to small trees, mostly > 0.4 m tall, collectively in many habitats] ..... ***Euonymus***
3 Leaves closely spaced, 2-4 pairs per cm of stem; leaves 1.1-2.5 cm long, 0.2-0.6 cm wide; [shrub < 0.4 m tall, native to calcareous rock outcrops, rarely naturalized elsewhere] ..... ***Paxistima***

Celastrus Linnaeus 1753 (Bittersweet)

A genus of ca. 30 species, scandent shrubs, primarily in e. Asia, Malaysia, Oceania, Madagascar, and Central and South America. The one species native to e. North America is related to e. Asian species. The grammatical gender of the genus has been conserved as masculine (Brummitt 2005). References: Duncan (1969)=Z ; Leicht-Young et al. (2007); Simmons in Kubitzki (2004).

1 Flowers in 2-3-flowered axillary cymes; mature leaves mostly obovate, averaging 1.2-1.4 (-1.7)× as long as wide; expanding leaves folded (conduplicate); capsule yellow (contrasting with the seeds); pollen white ..... ***C. orbiculatus***
1 Flowers in 6-many-flowered terminal panicles; mature leaves mostly ovate-lanceolate to elliptic, averaging (1.8-) 2.0-2.6× as long as wide; expanding leaves rolled (involute); capsule orange (similar in color to the seeds); pollen yellow ..... ***C. scandens***

* ***Celastrus orbiculatus*** Thunberg, Oriental Bittersweet. Thickets, roadsides, forests; native of Asia. May; August-September. *C. orbiculatus*, though attractive, is becoming a noxious weed in our area. The first reports of its occurrence in our area appear to be in the 1960's; it is now much more common than its native relative, *C. scandens*. [= RAB, C, F, W, Z; = *C. orbiculata* – G, K, orthographic variant]

Celastrus scandens Linnaeus, American Bittersweet. Mesic forests. May-June; August-September. QC west to MB and WY, south to w. SC, n. GA, AL, LA, and TX. [= RAB, C, F, G, K, S, W, Z]

Crossopetalum P. Browne 1756 (Christmas-berry)

A genus of about 26 species, trees and shrubs, of the West Indies and tropical America. References: Simmons in Kubitzki (2004).

* ***Crossopetalum ilicifolium*** (Poiret) Kuntze, Holly-leaf Rhacoma, Christmas-berry. Disturbed, acid, peaty soil; native of subtropical FL. Presumably introduced via cattle at an agricultural experiment station near Wenona, Washington County, NC (Hayes 1946). The species has probably not persisted in our area. [= K, WH; = *Rhacoma ilicifolia* (Poiret) Trelease – S]

Euonymus Linnaeus 1753 (Spindle-tree, Euonymus, Strawberry-bush)

A genus of ca. 129 species, of temperate and tropical areas, trees, shrubs, and lianas. The genus name was variously spelled "*Euonymus*" and "*Evonymus*" by Linnaeus. The spelling *Euonymus* has been nomenclaturally "conserved." The genus is now considered to be grammatically masculine, and specific epithets therefore end in "*-us*." References: Ma & Funston (2008)= Y; Voss (1985)=Z; Simmons in Kubitzki (2004).

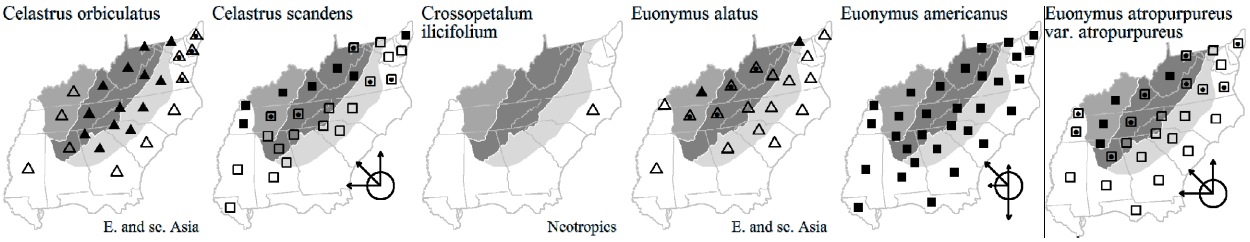
1 Leaf undersurface with mostly erect hairs to ca. 0.2 mm long; petioles 8-20 mm long; flowers 4-merous; [native]; [section *Euonymus*] ..... ***E. atropurpureus*** *var.* ***atropurpureus***
1 Leaf undersurface glabrous (or with some hairs on the midrib); petioles 1-33 mm long; flowers 4- or 5-merous; [introduced or native].
2 Leaves evergreen; flowers 4-merous; [introduced species, rarely naturalized]; [section *Ilicifolii*].
3 Leaves 2-5.5 cm long, 2-3.5 cm wide; capsule 5-6 mm in diameter ..... ***E. fortunei***
3 Leaves (3-) 5-10 (-12) cm long, (2-) 3-5 (-5.5 cm long; capsule 6-9 (-12) mm in diameter ..... ***E. japonicus***
2 Leaves deciduous; flowers 4- or 5-merous; [introduced or native].
4 Petioles 5-33 mm long; flowers 4-merous; [introduced, rarely naturalized]; [section *Euonymus*].
5 Leaf apex acute to short-acuminate; larger leaves 8-11 per cm ..... ***E. europaeus***
5 Leaf apex long-acuminate; larger leaves with teeth 6-8 per cm ..... ***E. maackii***
4 Petioles 1-5 mm long; flowers 4- or 5-merous; [native and introduced].
6 Twigs and branches with 2-4 corky wings; flowers 4-merous; capsules smooth; [introduced, rarely naturalized]; [section *Melanocarya*] ..... ***E. alatus***
6 Twigs and small branches lacking corky wings, terete (or nearly so); flowers 5-merous; capsules muricate; [native species]; [section *Echinococcus*].
7 Primary stems erect, to 20 dm tall; upper leaves widest at or below the middle; petioles mostly 1-3 mm long; [widespread in our area] ..... ***E. americanus***

7 Primary stems trailing or decumbent, the tips and flowering branches ascending to 3 (-6) dm tall; upper leaves widest at or beyond the middle; petioles mostly 3-5 mm long; [of the Mountains] ..... ***E. obovatus***

* ***Euonymus alatus*** (Thunberg) Siebold, Winged Euonymus. Suburban woodlands; native of e. Asia. Reported for NC (Jackson Co.) by Pittillo & Brown (1988). [= C, F, G, WV, Y; = *Euonymus alata* – K, Z; > *Euonymus alatus* var. *alatus*; > *Euonymus alatus* var. *apterus* Regel]

Euonymus americanus Linnaeus, Strawberry-bush, Heart's-a-bustin'-(with-love). Mesic to submesic forests. May-June; September-October. Se. NY west to s. OH and se. MO, south to n. peninsular FL and TX. A variety, var. *angustifolia* (Pursh) A. Wood, with narrowly lanceolate to linear leaves, has been named and occurs in our area; it is of uncertain status (Brizicky 1964). [= RAB, C, F, G, S, W, WH, WV; = *Euonymus americana* – K]

Euonymus atropurpureus Jacquin *var.* ***atropurpureus***, American Wahoo, Burning Bush. Bottomland forests, riverbanks, mostly on rich alluvial sediments, or on slopes over mafic or calcareous rocks. May; October. NY west to ND, south to Panhandle FL and TX. Var. *cheathumii* Lundell is endemic to TX. [= *E. atropurpurea* var. *atropurpurea* – K; < *Euonymus atropurpureus* – RAB, C, F, G, S, W, WH, WV; < *Euonymus atropurpurea* – Z]



* ***Euonymus europaeus*** Linnaeus, European Spindle-tree. Suburban woodlands, uncommonly cultivated, rarely naturalized; native of Europe. [= C, F, G; = *Euonymus europaea* – K, Z]

* ***Euonymus fortunei*** (Turczaninow) Handel-Mazzetti, Wintercreeper, Chinese Spindle-tree. Bottomlands, swamps, upland suburban woodlands; native of China. Sometimes climbing into the canopy. [= F, G, Y, Z; > *Euonymus kiautschovica* – K; > *E. fortunei* (Turczaninow) Handel-Mazzetti var. *radicans* (Siebold ex Miquel) Rehder – K; ? *E. hederaceus* Champ. ex Bentham – K2]

* ***Euonymus japonicus*** Thunberg, Japanese Spindle-tree. Disturbed areas, especially on barrier islands; native of Japan. Widely planted on barrier islands and in other maritime situations because of its resistance to salt damage (Brown 1959). [= C, Y; = *E. japonica* – K]

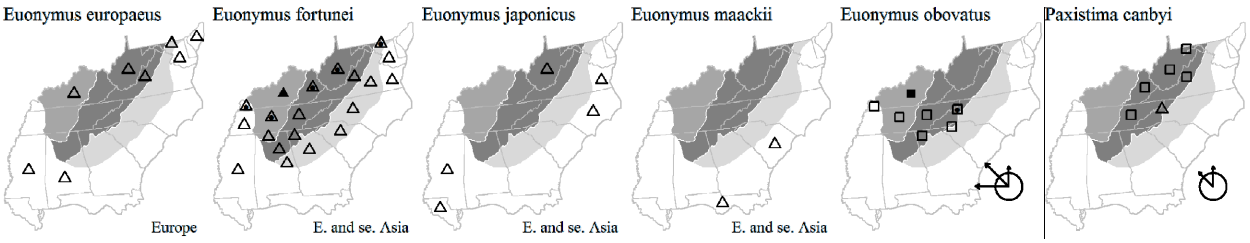
* ***Euonymus maackii*** Ruprecht, Winterberry. Cultivated, rarely naturalized; native of n. China. [= WH, Y; > *Euonymus bungeanum* Maximowicz – K; ? *E. hamiltonianus* Wallich var. *hamiltonianus* – K2]

Euonymus obovatus Nuttall, Running Strawberry-bush. Cove forests, northern hardwood forests, other mesic forests, especially in boulderfields, where sometimes quite abundant locally. May-June; September-October. W. NY west to s. MI, south to sw. NC, ne. GA, TN, and MO. [= RAB, C, F, G, S, W; = *Euonymus obovata* – K, Z]

Paxistima Rafinesque 1838 (Mountain-lover)

A genus of 2 species, rhizomatous shrubs, of temperate North America. The only other species in the genus is *P. myrsinites* (Pursh) Rafinesque of the Western Cordillera; its two subspecies are ssp. *myrsinites*, ranging from BC and AB south to AZ and NM, and ssp. *mexicana* Navaro & Blackwell of mountainous Mexico (Coahuila, Nuevo León, and Tamaulipas). For discussion of the long confusion and controversy over the appropriate spelling of the genus, see Navaro & Blackwell (1990) and Uttal (1986). The first validly published spelling of the name was "*Paxistima*," and this spelling should be retained. References: Navaro & Blackwell (1990)=Z; Simmons in Kubitzki (2004).

Paxistima canbyi A. Gray, Cliff-green, Canby's Mountain-lover, Ratstripper. On calcareous bluffs and cliffs (generally near the top of the cliffs or bluffs, rarely far below the crest), mostly on limestone and dolostone, but rarely on greenstone or shale; in NC naturalized at the site of a plant nursery and possibly also native (see discussion below). April-May; September. The species is a Central Appalachian endemic: sc. PA (Bedford County) (Rhoads & Klein 1993), e. WV, w. VA, s. OH, e KY, ne. TN, and w. NC (where questionably native). The only collection definitely known from NC is that from an old nursery site (Hardin 1963). Navaro & Blackwell (1990) note that "the presence of *P. canbyi* in North Carolina was, however, noticed as long ago as 1883 by Chapman, and *P. canbyi* is likely native to North Carolina." Small (1933) reports it from "n. NC." Casting doubt on its native status in NC is the species' habitat: limestone ravines and bluffs, a very rare habitat in NC. [= RAB, C, K, W, Z; = *Pachistima canbyi* – F, WV (the name not validly published); = *Pachystima canbyi* – G, S (the name not validly published)]



175. OXALIDACEAE R. Brown 1818 (Wood-sorrel Family) [in OXALIDALES]

A family of 5-6 genera and 600-775 species, herbs, shrubs, vines, and small trees, nearly cosmopolitan (especially temperate). References: Cocucci in Kubitzki (2004).

Oxalis Linnaeus 1753 (Wood-sorrel, Oxalis)

A genus of about 500-700 species, herbs, shrubs, and vines. References: Ward (2004a)=Z; Eiten (1963)=Y; Lourteig (1979)=X; Nesom (2009b)=V; Nesom (2009c)=U; Robertson (1975)=Q; Cocucci in Kubitzki (2004). Taxonomy and key based in part on Nesom (2009b).

1 Plant acaulescent; leaves basal; flowers white, pink, or purple.
  2 Leaflets obdeltoid.
    3 Leaflets green; plants with bulbs and bulblets ..... ***O. intermedia***
    3 Leaflets purple; plants with scale-clad rhizomes ..... ***O. triangularis***
  2 Leaflets obcordate.
    4 Flowers solitary; plants rhizomatous; tips of sepals plane; [section *Oxalis*] ..... ***O. montana***
    4 Flowers in umbels; plants bulbous; tips of sepals with orange callosities; [section *Ionoxalis*].
      5 Sepals conspicuously appressed-pubescent; leaflets with reddish-brown callosities mostly along the margins; [naturalized] ..... ***O. articulata***
      5 Sepals glabrous or sparsely pubescent; leaflets with reddish-brown callosities **either** scattered over the surface **or** only at the apical notch; [native or naturalized]
        6 Leaflets 25-45 mm long; leaflets with reddish-brown callosities scattered over the surface; [naturalized] ..... ***O. debilis***
        6 Leaflets 8-15 mm long; leaflets with reddish-brown callosities only at the apical notch; [native] ..... ***O. violacea***
1 Plant caulescent; leaves alternate; flowers yellow; [section *Corniculatae*].
  7 Stems evenly strigose from base to peduncles and pedicels ..... ***O. dillenii***
  7 Stems pilose to villous to nearly glabrous, rarely strigose and then only on peduncles or pedicels.
    8 Petals 10-20 mm long, red-lined in the throat.
      9 Corolla throats strongly red-lined within; petals 14-20 mm long; flowers 1 or (2-) 3-8 in umbelliform cymes above the level of the leaves; stems densely and pilose with stiffly spreading non-septate hairs; stoloniform rhizomes lignescent or ligneous and numerous on an individual plant ..... ***O. priceae***
      9 Corolla throats yellow, very faintly to strongly red-lined within; petals 10-18 mm long; flowers 1 or 2-4 (-8) in regular or irregular cymes, above or within the level of the leaves; stems nearly glabrous to sparsely or densely pilose or villous with septate hairs or a mixture of septate and non-septate hairs; stoloniform rhizomes usually 1 or few, herbaceous or lignescent.
        10 Plants arising from slender, lignescent, stoloniform rhizomes without tubers; leaflets with upper shoulders usually rounded, margins often with a narrow purple margin; flowers produced above the level of the leaves; petals 10-14 mm long, throat yellow to very faintly or weakly red-lined within ..... ***O. grandis***
        10 Plants arising from slender, herbaceous, stoloniform rhizomes at intervals producing white, horizontal, fusiform tubers or tuberlike thickenings; leaflets with upper shoulders flattened, margins green; flowers produced mostly within the level of the leaves; petals 12-18 mm long, throat strongly red-lined within ..... ***O. illinoensis***
    8 Petals 4-9 (-11) mm long, yellow, without red lines in the throat.
      11 Stems repent, rooting at most nodes; seeds brown, transverse ridges not white; stipules oblong with distinct flanges and free auricles. ..... ***O. corniculata***
      11 Stems erect, usually arising singly from the base, rarely decumbent, not or very rarely rooting at the nodes, from a short, thin, often herbaceous to slightly lignescent rhizome etc. ; seeds all brown or with white transverse ridges; stipules absent or so reduced to be barely evident.
        12 Stems (5-) 8-30 (-35) cm, sparsely pilose with non-septate hairs to almost completely glabrous, arising from a taproot, often producing lignescent stolons; flowers 1 or 2 (-3, rarely 4-5) in umbelliform cymes; capsules glabrous to sparsely puberulent, not villous ..... ***O. florida***
        12 Stems 20-60 (-90) cm long, sparsely to very sparsely pilose with nonseptate hairs or a mixture of nonseptate and septate hairs or densely villous with septate hairs, arising singly from the base from a short herbaceous to lignescent rhizome; flowers usually (3-) 5-7 (-15) in regular (rarely irregular) cymes; capsules villous to puberulent and villous to glabrate ..... ***O. stricta***

* ***Oxalis articulata*** Savigny in Lamarck. Roadsides, old gardens; native of South America. [= V; > *O. rubra* St. Hilaire – RAB, K, Q, WH; *? Ionoxalis martiana* (Zuccarine) Small – S, misapplied; > *O. articulata* Savigny ssp. *rubra* (St. Hilaire) Lourteig]

* ***Oxalis corniculata*** Linnaeus, Creeping Lady's-sorrel. Gardens, fields, disturbed areas, sometimes more natural areas including pinelands, dunes; probably native of New World tropics, but possibly including the deeper South. February-December. Now nearly worldwide in distribution, probably native of the New World tropics and subtropics. [= RAB, C, F, K, Q, WV, Y; = *O.*

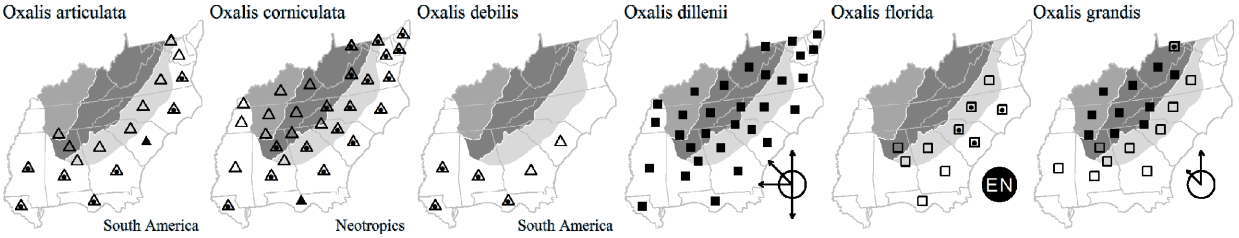
repens Thunberg – G; > *Xanthoxalis corniculata* (Linnaeus) Small – S; > *Xanthoxalis langloisii* Small – S; < *O. corniculata* – WH; > *O. corniculata* var. *corniculata* – Z; > *O. corniculata* var. *atropurpurea* Planchon – Z]

* ***Oxalis debilis*** Kunth. Disturbed areas; native of South America. See Kartesz (1999). [= V; > *O. corymbosa* A.P. de Candolle – Q, Z; > *Oxalis debilis* Kunth var. *corymbosa* (A.P. de Candolle) Lourteig – K, WH]

Oxalis dillenii Jacquin, Southern Yellow Wood-sorrel. Roadsides, pastures, lawns, a wide variety of other habitats. February-May (-October). NS west to SK, south to FL, TX, NM; introduced elsewhere. [= C, K; > *O. dillenii* – RAB; > *O. florida* var. *florida* – RAB; > *O. florida* Salisbury var. *filipes* (Small) Ahles – RAB; = *O. stricta* Linnaeus – G, WV, misapplied; > *O. dillenii* ssp. *dillenii* – Q, W, Y, Z; > *O. florida* – F; > *Xanthoxalis brittoniae* (Small) Small – S]

Oxalis florida Salisbury. Floodplain forests, moist fields, ditches, bluffs, and moist slopes. March-May (-August). VT and CT south to FL, west to LA, AR, and MO. [= *Oxalis priceae* Small ssp. *colorea* (Small) Eiten – K, Q, Y; = *O. recurva* Elliott var. *recurva* – F; < *O. recurva* – G; = *O. florida* Salisbury var. *recurva* (Elliott) Ahles – RAB; = *O. macrantha* (Trelease) Small – C; > *Xanthoxalis colorea* Small – S; > *Xanthoxalis recurva* Elliott) Small – S; > *O. filipes* – F; > *Xanthoxalis filipes* (Small) Small – S; > *O. dillenii* Jacquin ssp. *filipes* (Small) Eiten – Q, W, Y, Z; >< *O. lyonii* Pursh – WH]

Oxalis grandis Small, Great Yellow Wood-sorrel. Rich moist forests, rocky bluffs. May-August. PA, OH, and IN, south to SC, GA, AL, MS. [= RAB, C, F, G, K, Q, W, Y; = *Xanthoxalis grandis* (Small) Small – S]



Oxalis illinoensis Schwegman, Illinois Wood-sorrel. Dry to dry-mesic forests and bluffs, often but not necessarily calcareous. S. IN and s. IL south through KY to c. TN. [= K]

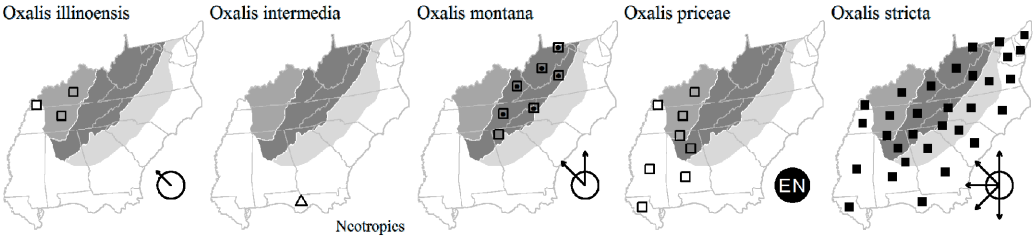
* ***Oxalis intermedia*** A. Richard, West Indian Wood-sorrel. Moist disturbed areas; native of West Indies. April-September. [= V; < *O. latifolia* Kunth – WH]

Oxalis montana Rafinesque, American Wood-sorrel, White Wood-sorrel. Spruce-fir forests, northern hardwood forests, at high elevations. May-July. QC and NY west to SK, south to GA, NC, and TN. Closely related to the Eurasian *O. acetosella*, and sometimes treated as a geographic subspecies or phase (see synonymy). [= F, K, S, WV; < *O. acetosella* Linnaeus – RAB, C, G, W; = *O. acetosella* ssp. *montana* (Rafinesque) Hultén ex D. Löve – Q]

Oxalis priceae Small, Sadie Price's Yellow Wood-sorrel. {habitats} KY and TN south to GA, Panhandle FL, AL, MS, and se. LA. [= *Oxalis priceae* Small ssp. *priceae* – K, Q, Y; = *O. recurva* Ellitt var. *macrantha* (Trelease) Wiegand – F; < *O. recurva* – G; > *Xanthoxalis priceae* Small – S; > *Xanthoxalis hirsuticaulis* (Small) Small – S; > *Xanthoxalis macrantha* (Trelease) Small – S, misapplied; >< *O. lyonii* Pursh – WH]

Oxalis stricta Linnaeus, Common Yellow Wood-sorrel. Disturbed sites, also in a variety of natural habitats. May-October. Widespread in North America, now widespread nearly worldwide. [= RAB, C, K, Q, W, WV, Y, Z; > *O. europaea* Jord. var. *europaea* – F; > *O. europaea* var. *bushii* (Small) Wiegand – F; = *O. europaea* – G; > *Xanthoxalis stricta* (Linnaeus) Small – S; > *Xanthoxalis bushii* Small – S; > *Xanthoxalis rufa* Small – S; > *Xanthoxalis cymosa* (Small) Small – S; < *O. corniculata* – WH]

Oxalis texana (Small) Fedde. Reported for GA (GANHP, Kartesz 1999); not in GA (Ward 2004). Rejected for our area. [= *O. priceae* Small ssp. *texana* (Small) Eiten – K, Q, Y] {not keyed or mapped}



* ***Oxalis triangularis*** A. St.-Hilaire. Disturbed areas; native of Brazil and Argentina. April-May. [= V; < *Oxalis triangularis* A. St.-Hilaire ssp. *papilionacea* (Hoffmannsegg ex Zuccarini) Lourteig – WH]

Oxalis violacea Linnaeus, Violet Wood-sorrel. Dry to moist forests. March-April. MA, VT, MI, SD, and CO south to FL, TX, and AZ. [= RAB, C, G, K, Q, V, W, WH, Z; > *O. violacea* var. *violacea* – F, WV; > *O. violacea* var. *trichophora* Fassett – F, WV; = *Sassia violacea* (Linnaeus) Holub; = *Ionoxalis violacea* (Linnaeus) Small – S]

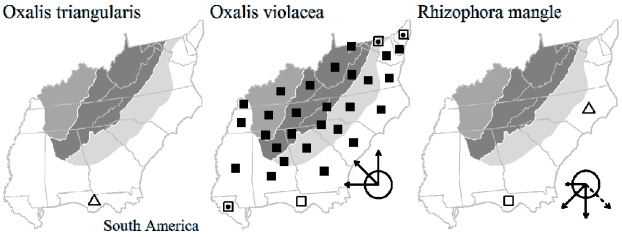
181. RHIZOPHORACEAE R. Brown 1814 (Red Mangrove Family) [in MALPIGHIALES]

A family of about 15 genera and 120 species, of tropical areas of the Old and New World.

Rhizophora Linnaeus (Red Mangrove)

A genus of 8-9 species, trees and shrubs, of tropical shores.

Rhizophora mangle Linnaeus, Red Mangrove. Cp (FL, GA, NC, SC): beaches; rare. Well-established from n. FL southwards into the West Indies and beyond in tropical America. The distinctive floating seedlings of *Rhizophora* occasionally wash up as jetsam on beaches of GA, NC, and SC, particularly following hurricanes. Photographic evidence has been supplied from Bear Island, Onslow County, NC, 11 June 1996 (Dave Owen, pers. comm. and photograph). These propagules may sprout and grow for some time, forming a young sapling with leaves, but do not survive because of frost. *Rhizophora* is not currently truly an established part of the flora north of FL," but is repeatedly introduced naturally. [= GW, K, S, WH]



184. EUPHORBIACEAE A.L. de Jussieu 1789 (Spurge Family) [in MALPIGHIALES]

A family of about 313-322 genera and 8100-9000 species, trees, shrubs, vines, and herbs, nearly cosmopolitan in distribution, as defined broadly. Molecular systematics suggests that various units traditionally included in the Euphorbiaceae should be segregated (Soltis et al. 2000, Chase et al. 2002). In our flora, this includes *Phyllanthus* (in Phyllanthaceae). References: Webster (1967), Webster (1994); Govaerts, Frodin, & Radcliffe-Smith (2000). [also see *PHYLLANTHACEAE*]

1 Shrub or tree (woody).
  2 Leaves entire.
    3 Leaf blades 2-5× as long as wide; petioles 0.2-1.0 cm long; plant a native shrub; [subfamily *Euphorbioideae*] ..... ***Ditrysinia***
    3 Leaf blades 1-1.5× as long as wide; petioles 2-6 cm long; plant an alien tree; [subfamily *Acalyphoideae*] ..... ***Triadica***
  2 Leaves crenate, serrate, or palmately lobed.
    4 Leaves elliptic or lanceolate, with crenate or serrate margins.
      5 Petiole lacking glands; [subfamily *Acalyphoideae*] ..... ***Sapium***
      5 Petiole with 2 glands at summit; [subfamily *Euphorbioideae*] ..... ***Stillingia***
    4 Leaves ovate or orbicular in outline, palmately lobed.
      6 Inflorescence a panicle; petals absent; [subfamily *Acalyphoideae*] ..... ***Ricinus***
      6 Inflorescence a dichasium; petals present; [subfamily *Crotonoideae*] ..... ***Vernicia***
1 Herb.
  7 Leaves palmately or ternately lobed or divided.
    8 Leaves peltate; calyx green or purple; plant glabrous; stamens 100-1000; [subfamily *Acalyphoideae*] ..... ***Ricinus***
    8 Leaves cordate at base; calyx petaloid, white; plant glabrous or ith conspicuous stinging trichomes; stamens 8-10; [subfamily *Crotonoideae*].
      9 Plant with stinging trichomes; stamens connate ..... ***Cnidoscolus***
      9 Plant lacking stinging trichomes; stamens separate ..... ***Manihot***
  7 Leaves generally not lobed, entire or serrate (rarely pinnately lobed in *Euphorbia*).
    10 Plant with copious white latex; flowers enclosed in a cyathium; [subfamily *Euphorbioideae*] ..... ***Euphorbia***
    10 Plant without white latex (the sap clear, or slightly milky in *Stillingia*); flowers not enclosed in a cyathium.
      11 Pubescence of stellate trichomes and/or scales; [subfamily *Crotonoideae*] ..... ***Croton***
      11 Pubescence of simple trichomes, or glabrous.
        12 Flowers in terminal spikes; stout perennial with several to many stems arising from a subterranean crown [subfamily *Euphorbioideae*] ..... ***Stillingia***
        12 Flowers strictly axillary or both axillary and terminal, in small clusters, racemes, or spikes; finer perennial or annual, not typically with > 1 stem arising from a subterranean crown.
          13 Ovules and seeds 2 per locule (the capsule thus 6-seeded); flowers in small axillary clusters of 2-4 ..... ***[see Phyllanthus – PHYLLANTHACAE]***
          13 Ovules and seeds 1 per locule (the capsule thus 3-seeded, or fewer by abortion); flowers in axillary spikes or in racemes borne in leaf axils or opposite the leaves; [subfamily *Acalyphoideae*].
            14 Pistillate flowers lacking a leafy bract; plant with stinging trichomes; styles undivided ..... ***Tragia***
            14 Pistillate flowers subtended by a conspicuous leafy bract; plant lacking stinging trichomes; styles laciniate
              15 Leaves alternate; carpels 3 (sometimes fewer by abortion) ..... ***Acalypha***
              15 Leaves opposite; carpels 2 ..... ***Mercurialis***

Acalypha Linnaeus 1753 (Copperleaf, Three-seeded Mercury)

A genus of about 430-462 species, shrubs, herbs, and trees, of primarily tropical and subtropical regions (rarely warm temperate). References: Levin in FNA (in prep.); Levin (1999b)=Z; Levin (1999a); Govaerts, Frodin, & Radcliffe-Smith (2000)=Y. Key based in part on Levin in FNA.

1 Bracts of pistillate flowers with linear tips or lobes longer then the broad basal portion; pistillate flowers all or chiefly in terminal spikes, the staminate flowers in axillary clusters (except sometimes in *A. arvensis*).
  2 Pistillate inflorescences with the bracts densely crowded, completely hiding the inflorescence axis; bracts of pistillate flowers with lobes consisting of deltate bases bearing long linear tips, long-hirsute with nonglandular hairs to 2 mm long ..... ***A. arvensis***
  2 Pistillate inflorescences with the bracts loosely arranged, the axis visible between the bracts; bracts of pistillate flowers with the lobes linear throughout, glabrous or pubescence with nonglandular hairs < 0.25 mm long (glandular hairs may be longer).
    3 Leaves cordate at base; fruit tuberculate, but not pubescent ..... ***A. ostryifolia***
    3 Leaves rounded to widely cuneate at base; fruit pubescent with pustular-based trichomes ..... ***A. setosa***
1 Bracts of the pistillate flowers with deltate or lanceolate tips or lobes; pistillate and staminate flowers all in axillary inflorescences, the staminate flowers above and pistillate flowers below in each inflorescence.
  4 Bracts subtending the pistillate flowers (5-) 7-9 (-11) lobed, usually stipitate-glandular; petiole 0.5-1.5× as long as the leaf blade; stems with only short, incurved trichomes.
    5 Fruit 2-seeded; seeds 2.4-3.2 mm long ..... ***A. deamii***
    5 Fruit 3-seeded; seeds 1.2-2.0 mm long ..... ***A. rhomboidea***
  4 Bracts subtending the pistillate flowers 9-15 (-16) lobed, stipitate-glandular or merely pubescent; petiole 0.2-0.5× as long as the leaf blade; stems with short incurved trichomes, with or without longer, straight, spreading trichomes as well.
    6 Bracts subtending the pistillate flowers usually stipitate-glandular, the bract lobes ovate to deltoid, the longest <2 mm long ..... ***A. gracilens***
    6 Bracts subtending the pistillate flowers usually with non-stipitate, pointed hairs, the bract lobes linear to oblong, the longest usually > 3 mm longbroadly ..... ***A. virginica***

* ***Acalypha arvensis*** Poeppig & Endlicher. Disturbed ground; native of West Indies, Mexico, and Central America. [= FNA, K, WH]

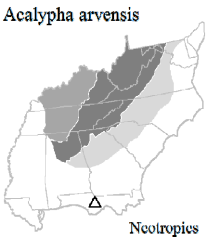
Acalypha deamii (Weatherby) Ahles, Big-seeded Copperleaf, Two-seeded Copperleaf. Pd (VA), Mt (VA), Cp (VA): alluvial forests, especially on sandy levees; uncommon. W. PA (Rhoads & Klein 1993), s. OH, and s. IN south to w. TN (Chester, Wofford, & Kral 1997) and AR; apparently disjunct in c. VA (where now known from 23 counties, mainly in the Piedmont), but perhaps only overlooked elsewhere. This plant is up to a meter tall and occurs in moist bottomland forests. [= C, FNA, K, Z; = *A. rhomboidea* var. *deamii* (Weatherby) Weatherby – F, G; = *A. virginica* Linnaeus var. *deamii* Weatherby – Y]

Acalypha gracilens A. Gray, Shortstalk Copperleaf. Cp (DE, FL, GA, NC, SC, VA), Pd (DE, GA, NC, SC, VA), Mt (GA, NC, SC, VA, WV): woodlands, disturbed ground; common (uncommon in WV). Late June-November. ME west to WI, south to FL and TX. The related *A. monococca* (Engelmann ex A. Gray) Lill. W. Miller & Gandhi is of broadly Ozarkian distribution and warrants specific status (Levin 1999a, 1999b). Var. *fraseri* is generally more southern and is considered to differ in having more elongate staminate spikes, to 3-4 cm long (vs. 0.5-1.5 cm long). It may have merit, but was not recognized by Levin (1999a, 1999b). [= RAB, FNA, K, S, W, Z; > *A. gracilens* var. *gracilens* – C, F, G; > *A. gracilens* var. *fraseri* (Müller of Aargau) Weatherby – C, F, G; = *A. virginica* Linnaeus var. *gracilens* (A. Gray) Müller of Aargau – Y; = *A. gracilens* ssp. *gracilens*]

Acalypha ostryifolia Riddell ex J.M. Coulter, Rough-pod Copperleaf. Pd (GA, NC, SC, VA), Mt (GA, NC, VA, WV), Cp (FL, GA, SC): disturbed ground; uncommon (rare in WV). Late June-November. NJ west to IN and NE, south to FL, TX, Mexico, and the West Indies. [= FNA, K, W, Y; = *A. ostryaefolia* – RAB, C, F, G, S, orthographic variant]

Acalypha rhomboidea Rafinesque, Rhombic Copperleaf. Cp (DE, FL, GA, NC, SC, VA), Pd (DE, GA, NC, SC, VA), Mt (GA, NC, SC, VA, WV): woodlands, disturbed ground; common. Late June-November. NS and ME west to ND, south to Panhandle FL and e. TX. [= RAB, C, FNA, G, GW, K, S, W, Z; = *A. rhomboidea* var. *rhomboidea* – F; = *A. virginica* Linnaeus var. *rhomboidea* (Rafinesque) Cooperrider – Y]

* ***Acalypha setosa*** A. Richard in R. Sagra, Cuban Copperleaf. Cp (FL, GA, SC): disturbed ground; rare, native of west Indies, Mexico, Central America, and n. South America. June-November. [= RAB, FNA, K, S, Y]



Acalypha virginica Linnaeus, Virginia Copperleaf. Mt (GA, NC, SC, VA, WV), Pd (DE, GA, NC, SC, VA), Cp (DE, NC, SC, VA): woodlands and disturbed ground; common. Late June-November. ME west to IN, IL, MO, and KS, south to c. GA and TX. [= RAB, C, F, FNA, G, GW, K, S, W, Z; = *A. virginica* Linnaeus var. *virginica* – Y]

Cnidoscolus Pohl 1827 (Spurge-nettle)

A genus of about 75 species, herbs, of America. References: McVaugh (1944)=Y; Govaerts, Frodin, & Radcliffe-Smith (2000)=Z.

Cnidoscolus stimulosus (Michaux) Engelmann & A. Gray, Spurge-nettle, Tread-softly, Finger-rot, Bull-nettle. Cp (FL, GA, NC, SC, VA), Pd (GA, NC, SC), Mt (NC, SC): sandhills, dry sandy woodlands, other dry sandy soils; common (rare in Piedmont and Mountains). Late March-August; May-September. Se. VA south to s. FL, west to e. LA, mostly on the Coastal Plain, but further inland southward. Beset with stinging trichomes. Allied to *C. urens* of Mexico, Central America, and n. South America, and sometimes treated as a variety of it. [= RAB, C, F, G, K, W, WH, Y; = *Bivonea stimulosa* (Michaux) Rafinesque – S; = *C. urens* (Linnaeus) Arthur var. *stimulosus* (Michaux) Govaerts – Z]

Croton Linnaeus 1753 (Croton, Doveweed, Rushfoil)

A genus of about 1250 species, herbs, shrubs, and (rarely) trees, of nearly cosmopolitan distribution. Webster (1992, 1993) considers the 2 species traditionally treated as *Crotonopsis* to be closely related to sections within *Croton*, such as section *Gynamblosis*; his reasoning has been supported by molecular phylogenetic studies and all recent floristic treatments and is followed here. References: van Ee & Berry in FNA (in prep.); van Ee, Riina, & Berry (in press); Webster (1992)=Z; Webster (1993)=Y; Govaerts, Frodin, & Radcliffe-Smith (2000).

1 Evergreen shrub, (1-) 2-3 m tall; pistillate flowers with petals; [section *Alabamenses*]..... ***C. alabamensis*** *var.* ***alabamensis***
1 Herbaceous or suffrutescent, 0.1-1.2 m tall; pistillate flowers lacking petals.
2 Leaves with coarsely serrate margins; 1-2 glands present near the junction of the petiole and the leaf blade; [section *Geiseleria*]..... ..... ***C. glandulosus*** *var.* ***septentrionalis***
2 Leaves with entire margins; glands absent at the junction of the the petiole and the leaf blade.
3 Leaves sessile or with short petioles (to 3.2 mm long), the petiole < 1/5 the length of the leaf blade; fruit 1-locular, indehiscent; seed 1 per fruit, 2-2.5 mm long; [section *Crotonopsis*].
4 Branches monopodial; stellate hairs of the upper leaf surface with arms to 0.3 mm long, not overlapping the arms of the nearby stellae ..... ***C. michauxii***
4 Branches dichotomous and trichotomous; stellate hairs of the upper leaf surface with arms to 1.0 mm long, overlapping the arms of nearby stellae ..... ***C. willdenowii***
3 Leaves with relatively long petioles (5-90 mm long), at least some of the petioles 1/2 or more the length of the leaf blades; fruit 3-locular (2-locular in *C. monanthogynus*), dehiscent; seeds 3 per fruit (1 per fruit in *C. monanthogynus*, the second locule aborting), 2.5-5 mm long.
5 Stem leaves mostly 2× or more as long as wide); lobes of the calyx of the pistillate flowers 5-9 (-12); [section *Pilinophytum*].
6 Leaves (the larger) 4-15 cm long, 1.5-6 cm wide (generally 2-3× as long as wide), lanceolate to elliptic, cordate at the base; hairs of 2 colors, the shorter gray, the longer tan; lobes of the calyx of the pistillate flowers (6-) 7-9 (-12); [alien, of disturbed habitats].. ..... ***C. capitatus***
6 Leaves (the larger) 2.5-6 cm long, 0.7-1.5 cm wide (generally 3-6× as long as wide), linear to linear-lanceolate, cuneate at the base; hairs of 1 color, all gray; lobes of the calyx of the pistillate flowers 5-6; [native, of Coastal Plain pondshores]..... ***C. elliottii***
5 Stem leaves mostly < 2× as long as wide, 1-8 cm long, broadly cuneate to rounded at the base (a few rarely subcordate); lobes of the calyx of the pistillate flowers 5.
7 Styles 3, each 4-lobed, the style branches thus 12; capsule erect, 5-7 mm long; seeds 4.5-5.0 mm long; lower leaf surface silvery; plant an annual or perennial; [of coastal dunes]; [section *Drepadenium*]..... ***C. punctatus***
7 Styles 2 or 3, each 2-lobed, the style branches thus 4 or 6; capsule pendulous, 3-6 mm long; seeds 2.5-4.0 mm long; lower leaf surface white to silvery; plant an annual; [of limestone outcrops, fields, or weedy situations].
8 Fruit 2-locular; seeds 1 per fruit; styles 2, each 2-lobed; [of limestone outcrops or weedy situations]; [section *Gynamblosis*] .... ***C. monanthogynus***
8 Fruit 3-locular; seeds 3 per fruit; styles 3, each 2-lobed or 4-lobed; [of fields or weedy situations]; [section *Velamea*] .... ***C. lindheimerianus*** *var.* ***lindheimerianus***

Croton alabamensis E.A. Smith ex Chapman *var.* ***alabamensis***, Alabama Croton. Dry to mesic limestome glades, woodlands, and wooded ravines. Endemic to scattered populations in c. AL; alleged populations in sc. TN (Chester, Wofford, & Kral 1997) are apparently based on mislabeled specimens (Wurdack 2006). *C. alabamensis* var. *texensis* S. Ginzbarg is endemic to c. TX (Ginzbarg 1992; Aplet et al. 1994), where it occurs in canyons in the Edwards Plateau. The species is most closely related to species of the West Indies, Central America, and South America; its distribution is obviously relictual. [= K; < *Croton alabamensis* – S]

* *Croton bonplandianus* Baillon. Cp (VA): chrome ore piles; rare. Reported for chrome ore piles at Newport News, VA and Canton, MD (Reed 1964). [= K] {not keyed; not mapped; rejected}

* ***Croton capitatus*** Michaux, Woolly Croton, Hogwort, Capitate Croton. Pd (GA, NC, SC, VA), Mt (GA, NC, SC, VA, WV), Cp (DE, FL, GA, NC, SC): fields, disturbed areas; common (uncommon in NC, SC, and VA, rare in DE and WV), native of sc. United States, the exact limits of the original native distribution unclear. July-October. [= F, S; = *Croton capitatus* Michaux var. *capitatus* – C, G, K1, K2; < *Croton capitatus* – RAB, W, WH]

Croton elliottii Chapman, Pondshore Croton, Elliott's Croton. Cp (FL, GA, SC): shores and exposed drawdown zones of clay-based Carolina bays and limesink ponds (dolines); rare (GA Special Concern, SC Rare). Se. SC south to Panhandle FL, west to se. AL. [= K, S, WH]

* ***Croton glandulosus*** Linnaeus *var.* ***septentrionalis*** Müller of Aargau, Doveweed, Tooth-leaved Croton, Sand Croton. Cp (DE, GA, NC, SC, VA), Pd (GA, NC, SC, VA), Mt (GA, NC, SC, VA, WV): fields, roadsides, disturbed areas; common (uncommon in DE and WV). May-October. *C. glandulosus* is widespread in tropical and subtropical America; var. *septentrionalis* is the northernmost variety, but its pre-Columbian range is obscure because of its weedy nature. [= RAB, C, F, G, K, S, W; < *Croton glandulosus* var. *glandulosus* – WH; < *Croton glandulosus* – WV]

* ***Croton lindheimerianus*** Scheele *var.* ***lindheimerianus***, Lindheimer's Croton. Pd (NC): fields and other disturbed soils; rare, adventive from further west. June-October. [= K; < *Croton lindheimerianus* – RAB]

Croton michauxii Webster, Sand Rushfoil, Michaux's Croton. Cp (FL, GA, SC, VA?): sandhills, disturbed sandy soils; common (uncommon in GA, rare north of GA). June-October. SC south to s. FL, west to TX, north in the interior to MO, IL, and IA. Fernald (1950) alleges that this species extends as far north as VA, but the documentation is unknown to me. [= K, WH, Z; = *Crotonopsis linearis* Michaux – RAB, C, F, G, S]

Croton monanthogynus Michaux, Prairie-tea, One-seed Croton. Mt (GA, NC, VA, WV), Pd (GA, SC, VA*), Cp (GA, VA*): limestone outcrops, blackland prairies, disturbed dry soil; rare. June-October. Sw. VA, OH, IN, IA, NE, and CO, south to nw. GA, FL, TX, and Mexico; adventive as a weed at scattered locations east of the Blue Ridge. [= RAB, C, F, G, K, S, W, WV]

Croton punctatus Jacquin, Silverleaf Croton, Beach-tea, Gulf Croton. Cp (FL, GA, NC, SC): beach dunes, coastal grasslands, usually with *Uniola paniculata* and/or *Spartina patens*; common. Late May-November. NC (Dare County) south to s. FL, west to TX, and south into Central and South America. [= RAB, K, S, WH]

Croton willdenowii Webster, Glade Rushfoil, Outcrop Rushfoil, Willdenow's Croton. Pd (GA, NC, SC, VA), Cp (DE, FL, GA, NC, SC, VA), Mt (GA, NC, SC): granitic flatrocks, diabase barrens, calcareous barrens, thin soils around other rock outcrops, disturbed sandy soil; common (uncommon in VA, rare in DE and FL). June-October. CT, se. PA (Rhoads & Klein 1993), IL, and se. KS, south to ne. FL, Panhandle FL, and TX. [= K, WH, Z; = *Crotonopsis elliptica* Willdenow – RAB, C, F, G, S, W]

Croton argyranthemus Michaux, Silver Croton, Sandhill Croton, Healing Croton. Cp (FL, GA): sandhills; common. C. GA and s. AL south to c. peninsular FL; w. LA and sw OK south through e. and c. TX to Nuevo León and Tamaulipas. [= K1, K2, S, WH] {not yet keyed}

Croton lindheimeri (Engelmann & A. Gray) Alph. Wood. In GA and westward. [= *Croton capitatus* Michaux var. *lindheimeri* (Engelmann & A. Gray) Müller of Aargau – K; = *C. engelmannii* Ferguson – S] {not yet keyed}

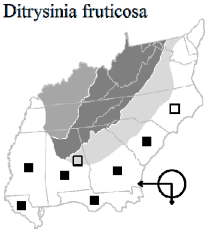
* ***Croton texensis*** (Klotzsch) Müller of Aargau *var.* ***texensis***, Texas Croton. Cp (DE): disturbed areas; rare, native of c. North America. [= K] {not yet keyed; add to synonymy

Ditrysinia Rafinesque 1825 (Sebastian-bush)

A monotypic genus, a shrub, of the Southeastern United States Coastal Plain. Perhaps as close to *Gymnanthes* as to *Sebastiania*. References: Govaerts, Frodin, & Radcliffe-Smith (2000)=Z.

Ditrysinia fruticosa (W. Bartram) Govaerts & Frodin, Sebastian-bush. Swamp forests, other wet to moist, mostly shaded, habitats. May-June; July-October. Se. NC south to c. peninsular FL, west to e. TX. [= Z; = *Sebastiania fruticosa* (W. Bartram) Fernald – GW, K, WH; = *Sebastiania ligustrina* (Michaux) Müller of Aargau – RAB; = *Sebastiana ligustrina* – S (orthographic error)]

Ditrysinia fruticosa



Euphorbia Linnaeus 1753 (Spurge)

A genus of ca. 1900 species, herbs, shrubs, and trees, nearly cosmopolitan in distribution. References: Huft (1979)=Z; Park (1998)=Y; Bridges & Orzell (2002)=X; Zimmermann, Ritz, & Hellwig (2010); Govaerts, Frodin, & Radcliffe-Smith (2000)=Q.

1 Leaves strictly opposite, oblique or inequilateral at base; branches often prostrate ..... **Key A (subgenus *Chamaesyce*)**
1 Leaves alternate or opposite, not oblique or asymmetric at base; branches usually erect.
  2 Bracteal leaves lobed or toothed (rarely linear), usually marked with red or white at the base or purple-spotted; glands of the cyathia usually 1 (rarely more), bilabiate, lacking petaloid appendages ..... **Key B (subgenus *Poinsettia*)**
  2 Bracteal leaves entire, not marked with red (white-margined in E. marginata); glands of the cyathia 4-5, not bilabiate, with or without petaloid appendages.
    3 Glands of the cyathia 5 (or 7-10 on the central cyathium in *E. pubentissima*), with petaloid appendages 0.1-5.0 mm long (measured along a radius), these white, maroon, red, pink, or green; stipules present, glandlike, often minute ..... **Key C (subgenus *Tithymalopsis*)**
    3 Glands of the cyathia 4 (except 5 in *E. purpurea*), oval, reniform, or crescent-shaped, lacking petaloid appendages (the glands themselves yellowish or green); stipules absent or vestigial ..... **Key D (subgenus *Esula*)**

Key A – subgenus *Chamaesyce*

1 Young stems and leaves glabrous; leaves **either** entire **or** serrulate, at least at the apex (use 10× magnification).
  2 Leaves serrulate, at least at the apex (use 10× magnification); seeds with 2-4 transverse ridges.
    3 Seeds 1.0-1.3 mm long, with 3-4 transverse ridges ..... ***[E. glyptosperma]***
    3 Seeds 0.8-1.0 mm long, with 2-3 (-4) transverse ridges ..... ***E. hyssopifolia***
  2 Leaves absolutely entire; seeds smooth.
    4 Stipules united into a triangular scale-like structure (this often lobed or fringed), thus appearing as 2 stipules at each node ..... ***E. serpens***

4 Stipules separate, lacerate, appearing as 4 stipules at each node.
5 Leaves **either** 1.5-2× **or** 4-5× as long as wide, not fleshy; mature seeds 1.0-1.2 (-1.4) mm long, angled; [of inland sandhills or coastal dunes].
6 Leaves 1.5-2× as long as wide, green throughout; [more widespread] ..... ***E. cordifolia***
6 Leaves 4-5× as long as wide, the leaf margin red; [FL] ..... ***E. cumulicola***
5 Leaves 2-3× as long as wide, often somewhat fleshy; mature seeds (1.3-) 1.5-2.6 mm long, rounded; [of barrier island dunes and other sandy coastal habitats].
7 Mature seeds (1.3-) 1.5-1.9 mm long; cyathia terminal on the stems and also axillary ..... ***E. bombensis***
7 Mature seeds (2.0-) 2.2-2.6 mm long; cyathia terminal on the stems ..... ***E. polygonifolia***

1 Young stems and leaves pubescent (at least in lines along the stems); leaves serrulate, at least at the apex (use 10× magnification).
8 Ovary and capsule glabrous.
9 Seeds 0.8-1.0 mm long, light gray, the faces with 2-3 (-4) horizontal, low, blunt ridges, sometimes connected by 1-2 cross ridges; stems glabrous when young (uncommonly puberulent along 1 side of the branchlets); capsule 1.5-2.0 mm long ..... ***E. hyssopifolia***
9 Seeds 1.0-1.3 mm long, dark gray, faces without ridges, though irregularly and finely wrinkled; stems puberulent when young on 1 side only; capsule 2.0-2.5 mm long.
10 Stems ascending or suberect, puberulent when young ..... ***E. nutans***
10 Stems prostrate or widely spreading, spreading-hirsute ..... ***E. vermiculata***
8 Ovary and capsule pubescent.
11 Stems with 2 types of trichomes, the longer 3-5 mm long; cyathia in axillary and terminal cymes, at least some of the peduncles > 10 mm long ..... ***E. hirta***
11 Stems with 1 type of trichome, these < 2 mm long; cyathia solitary or several in axils, the peduncles < 5 mm long.
12 Capsules spreading-villous, especially or solely on the angles; styles 0.2-0.3 mm long, bifid nearly to the base; seeds sharply quadrangular-angled, the faces with 3-4 transverse ridges ..... ***E. prostrata***
12 Capsules minutely appressed-puberulent, on the entire surface (though sometimes primarily on the lower portion); styles 0.3-0.7 mm long, bifid only in the upper half or third; seeds quadrangular but not angled, the faces with inconspicuous transverse ridges or nearly smooth.
13 Involucre cleft on 1 side half its length; leaves mostly obovate, 1.5-2× as long as wide; styles 0.5-0.7 mm long, filiform; seed faces nearly smooth; adventitious roots formed at middle nodes along the stem ..... ***E. humistrata***
13 Involucre cleft on 1 side a fourth to a third its length; leaves mostly oblong, 2-3× as long as wide; styles 0.3-0.4 mm long, clavate; seed faces transversely ridged; adventitious roots not formed ..... ***E. maculata***

Key B – subgenus *Poinsettia*

1 Principal stem leaves opposite, dentate, neither lobed nor linear; plant pubescent ..... ***E. dentata***
1 Principal stem leaves alternate, either lobed or linear; plant usually glabrous
2 Cyathial gland 2-lipped, the opening elongate; bracteal leaves red or green at base; seeds not angular ..... ***E. cyathophora***
2 Cyathial gland with a circular opening; bracteal leaves purple-spotted or green; seeds angular ..... ***E. heterophylla***

Key C – subgenus *Tithymalopsis*

1 Upper stem leaves and bracteal leaves with white margins, ovate, the apex acute; [alien, cultivated and rarely persisting or a waif]; [section *Petaloma*] ..... ***E. marginata***
1 Upper stem leaves and bracteal leaves entirely green, obovate, elliptic, narrowly elliptic, or oblanceolate, the apex rounded or obtuse; [native]; [section *Tithymalopsis*].
2 Petaloid appendages (0.5-) 1.0-4.4 mm long (measured along a radius), about as long as wide or longer, white; stems (1.5-) 3-9 (-11) dm tall, erect; leaves not ciliate-margined.
3 Nodes below the umbel (25-) 35-60 (-115); cyathia (5-) 6.5-8.0 (-11.0) mm wide (across the appendages); stems (1-) 3-10 from a crown, each (1.2-) 2.5-5 (-7) mm in diameter at the base; plants (2-) 4-9 (-1.3) dm tall; leaves ascending, leathery, sessile or subpetiolate; plants flowering June-September; [NH and MA west to s. ON, MI, WI, MN, and NE, south to se.VA, c. NC, n. GA, s. AL, and e. TX] ..... ***E. corollata***
3 Nodes below the inflorescence (6-) 15-26 (-41); cyathia (3.5-) 4.0-5.5 (-6.5) mm wide (across the appendages); stems usually 1-2 (-3) from a crown, each (0.8-) 1.5-2.8 (-3.5) mm in diameter at the base; plants (1.5-) 3-5 (-6.5) dm tall; leaves usually reflexed (*E. pubentissima*) or usually ascending (*E. discoidalis*), thin, petiolate or subpetiolate; plants flowering March-July; [c. MD, VA, and c. and sw. TN, south to Panhandle FL and s. MS, west to e. TX].
4 Leaves 1.9-7.2 cm long, 0.1-0.5 cm wide, averaging > 10× as long as wide; primary inflorescence rays usually 3; [e. and c. GA (or e. SC?) south and west to Panhandle FL and e. TX] ..... ***E. discoidalis***
4 Leaves (1.6-) avg. 3.8 (-6.1) cm long, 0.5-2.2 cm wide, averaging < 4× as long as wide; primary inflorescence rays usually 5; [c. MD, VA, and c. and sw. TN, south to Panhandle FL and s. MS] ..... ***E. pubentissima***
2 Petaloid appendages 0.05-0.6 mm long (measured along a radius), shorter than wide, green, red, white, or pink; stems (0.8-) 1.5-4.5 (-6) dm tall, erect, ascending or decumbent; leaves ciliate-margined (*E. mercurialina* and *E. curtisii*) or not.
5 Leaf margins ciliate; cyathia 3.5-5.9 mm wide (across the appendages), green; leaves not fleshy, 1.7-2.2 (-3)× as long as wide, not especially variable; [of mesic forests with rich soils] ..... ***E. mercurialina***
5 Leaf margins not ciliate (except some marginal hairs in *E. curtisii*); cyathia 2.0-3.4 mm wide (across the appendages), green or maroon; leaves slightly to strongly fleshy, 0.7-20× as long as wide, often very variable in shape, even on the same plant; [of more or less xeric sandhill woodlands with acidic, sandy soils].
6 Stems usually 10-18 per crown, decumbent to weakly ascending; leaves opposite (scales on the lower stem sometimes alternate), fleshy, blue-green with a narrow, thickened, red-hyaline margin; branching dichotomous from the base of the plant (the branches typically equal, though sometimes unequal) ..... ***E. ipecacuanhae***

6 Stems 1-4 (-9) per crown, erect to strongly ascending; leaves alternate, opposite, or in whorls of 3 (at least some alternate on a plant), less fleshy, green to blue-green, without a red margin (or with a very narrow, slightly red-hyaline, but not thickened margin in *E. exserta*); branching alternate below the inflorescence (rarely dichotomous or trichotomous), the branches typically unequal.
7 Cyathia and capsules green; petaloid appendages white or pink; leaves thin-textured, green, finely pubescent with appressed white hairs (0.1-0.3 mm long) on the lower surface and margins (visible at 10× or greater); branching primarily alternate; leaves primarily alternate (typically opposite or 3-whorled below the inflorescence); cyathia unisexual, plants usually unisexual (dioecious) ..... ***E. curtisii***
7 Cyathia and capsules maroon; petaloid appendages maroon-red; leaves slightly fleshy, somewhat blue-green, glabrous; branching primarily opposite; leaves primarily opposite (usually some alternate on upper branches); cyathia bisexual, plants bisexual..... ***E. exserta***

Key D – subgenus *Esula*

1 Principal stem leaves finely serrulate (especially toward the apex); [subgenus *Esula*, section *Tithymalus*].
2 Ovary and capsule smooth ..... ***E. helioscopia***
2 Ovary and capsule verrucose-roughened.
3 Seeds smooth or very obscurely reticulate, 2-2.5 mm long ..... ***E. obtusata***
3 Seeds distinctly alveolate, 1.5-1.8 mm long ..... ***E. spathulata***
1 Principal stem leaves entire.
4 Stem leaves opposite, decussate (each succeeding pair turned by 90 degrees); seeds 4-6 mm long; [subgenus *Esula*, section *Lathyris*] ..... ***E. lathyris***
4 Stem leaves alternate (or mostly so); seeds 1-3 mm long.
5 Stem leaves linear to narrowly oblong, averaging ca. 10× as long as wide; [subgenus *Esula*, section *Esula*].
6 Stem leaves 1-3 cm long, 1-3 mm wide ..... ***E. cyparissias***
6 Stem leaves 3-8 cm long, 4-8 mm wide ..... ***E. esula***
5 Stem leaves oblanceolate, obovate, elliptic, or oblong, 1-10 cm long, 5-30 mm wide, averaging 1-5× as long as wide.
7 Principal stem leaves elliptic to oblong, (5-) 7-10 cm long; rhizomatous perennial to 1 m tall; seeds smooth, 3-5 mm long; rays of the umbel usually 5-8; [subgenus *Esula*, section *Tithymalus*] ..... ***E. purpurea***
7 Principal stem leaves oblanceolate to obovate, 1-2 cm long; annual, or perennial by basal offshoots, to 0.4 m tall; seeds pitted, 1.3-2.0 mm long; rays of the umbel 3 (-5); [subgenus *Esula*, section *Esula*].
8 Seeds pitted only on one face, the inner face furrowed ..... ***E. peplus***
8 Seeds pitted on both the inner and outer faces.
9 Seeds finely pitted with numerous, evenly distributed, circular pits; bracteal leaves broader than long; glands of the cyathia crescent-shaped, the horns slender, elongate, and caudate ..... ***E. commutata***
9 Seeds coarsely pitted with transversely elongate pits in 4 vertical rows (appearing nearly transversely rugose); bracteal leaves longer than broad; glands of the cyathia crescent-shaped, the horns short and blunt ..... ***E. falcata***

Euphorbia bombensis Jacquin, Southern Seaside Spurge, Dixie Sandmat. Cp (FL, GA, NC, SC, VA): open sands of dunes, dune blowouts and overwashes, often growing with perennial grasses such as *Uniola paniculata*, but preferring open sands with little competition, sometimes mixed with the more common *E. polygonifolia*; common (uncommon in GA, NC, and SC, rare in VA). June-October. E. VA south to s. FL along the Atlantic, from s. FL to TX and Mexico along the Gulf of Mexico, and south into n. South America. Johnson (1992) contrasts the habitat of this species with that of the closely similar *E. polygonifolia*; *E. bombensis* prefers areas behind the foredune, while *E. polygonifolia* prefers the pioneer situation on the upper beach and foredune front. [= Q; = *Chamaesyce bombensis* (Jacquin) Dugand – K, WH, Z; = *Euphorbia ammannioides* Kunth – RAB, C, F, G; > *Chamaesyce ingallsii* Small – S]

Euphorbia commutata Engelmann ex A. Gray, Woodland Spurge, Tinted Spurge. Mt (GA, NC, VA, WV), Pd (GA, NC, SC, VA), Cp (FL, GA, VA): rich forests and rock outcrops, over calcareous or mafic rocks; uncommon (rare in Coastal Plain, rare in NC). March-July. PA west to s. ON and MN, south to FL and TX. The southern var. *erecta* J.B.S. Norton may be worthy of recognition; we probably have both it and the typic var. *commutata* in our area. Var. *erecta* (ranging north to VA, KY, and MO) has all the cauline leaves oblanceolate and with petioles 5-12 mm long; var. *commutata* has leaves varying from oblanceolate to obovate or ovate, the upper leaves usually broad and sessile. [= RAB, F, K, Q, W, WH, WV; > *Eu. commutata* var. *commutata* – C, G; > *Eu. commutata* var. *erecta* J.B.S. Norton – C, G; = *Galarhoeus commutatus* (Engelmann) Small – S]

Euphorbia cordifolia Elliott, Heartleaf Sandmat. Cp (FL, GA, NC, SC): open sands of very dry sandhills; uncommon (rare north of FL). July-October. Se. NC south to s. FL and west to s. TX. [= RAB, Q; = *Chamaesyce cordifolia* (Elliott) Small – K, S, WH, Z]

Euphorbia corollata Linnaeus, Eastern Flowering Spurge. Mt (GA, NC, SC, VA, WV), Pd (DE, GA, NC, VA), Cp (DE, VA): woodlands and forests; common. June-September. NH and MA west to s. ON, MI, WI, MN, and NE, south to se.VA, c. NC, n. GA, s. AL, and e. TX. Huft (1979) considered *Eu. marilandica* a sporadic growth form of *Eu. corollata*. [= K, WV, Y, Z; = *Eu. corollata* var. *corollata* – RAB; > *Eu. corollata* var. *corollata* – C, F; > *Eu. marilandica* Greene – C, F, G; >< *Eu. corollata* – G, W (also see *Eu. pubentissima*); = *Tithymalopsis corollata* (Linnaeus) Klotzsch – S; < *Eu. corollata* var. *corollata* – Q (also see *Eu. discoidalis*)]

Euphorbia cumulicola (Small) Oudejans. Cp (FL): dunes and scrub; rare. Peninsular FL; w. Panhandle FL (Escambia County). [= Q; = *Chamaesyce cumulicola* Small – K, S, WH]

Euphorbia curtisii Engelmann, White Sandhills Spurge, Curtis's Spurge. Cp (FL, GA, NC, SC): sandhills; common. Late March-June. Sc. and se. NC to ne. FL and w. Panhandle FL, on the Coastal Plain. Less variable in leaf shape than *Eu. ipecacuanhae* or *Eu. exserta*. [= RAB, GW, K, Q, WH, Y, Z; > *Tithymalopsis curtisii* (Engelmann) Small – S; > *Tithymalopsis eriogonoides* Small – S]

Euphorbia cyathophora Murray, Painted Leaf, Fire-on-the-mountain. Cp (FL, GA, NC, SC, VA), Pd (GA, NC, SC, VA): disturbed habitats, dunes; common (uncommon in GA, NC, SC, and VA). June-October. E. VA, KS, and CA south into the New World tropics, the original range obscure. [= C, K, Q; > *Eu. heterophylla* Linnaeus var. *heterophylla* – RAB, F, misapplied; > *Eu. heterophylla* var. *graminifolia* Engelmann – RAB, F; = *Eu. heterophylla* – G; > *Poinsettia cyathophora* (Murray) Klotzsch & Garcke – S; > *Poinsettia heterophylla* – S, misapplied]

* ***Euphorbia cyparissias*** Linnaeus, Cypress Spurge, Graveyard Spurge. Mt (GA, NC, SC, VA, WV), Pd (DE, GA, NC, SC, VA), Cp (DE, VA): roadbanks, graveyards, waste places; common (uncommon in DE and WV), native of Europe. March-May (occasionally later). [= RAB, C, F, G, K, Q, W, WV; = *Galarhoeus cyparissias* (Linnaeus) Small ex Rydberg – S; = *Tithymalus cyparissias* (Linnaeus) Lamarck]

* ***Euphorbia dentata*** Michaux, Painted Leaf, Wild Poinsettia, Toothed Spurge. Mt (GA, NC, VA, WV), Pd (NC, SC, VA), Cp (VA): disturbed areas, hedgerows, thickets, railroad cinders; common, native of w. North America. July-October. [= RAB, C, F, G, Q, W, WV; ? *Eu. dentata* var. *dentata* – K; = *Poinsettia dentata* (Michaux) Klotzsch & Garcke – S]

Euphorbia discoidalis Chapman, Summer Spurge. Cp (FL, GA): sandhills; uncommon. E. and c. GA (or e. SC?) south and west to Panhandle FL and e. TX. Park (1998) includes in synonymy *Eu. corollata* var. *angustifolia* Elliott, which has a stated type locality in e. SC. [= K, WH, Y; = *Tithymalopsis discoidalis* (Chapman) Small – S; < *Eu. corollata* var. *corollata* – Q] {augment}

* ***Euphorbia esula*** Linnaeus *var.* ***esula***, Wolf's-milk, Leafy Spurge Mt (WV), Pd (VA): disturbed areas; rare, native of Eurasia. May-September. [= K; < *Eu. esula* – C, F, G, WV; = *Eu. esula* ssp. *esula* – Q; < *Tithymalus esula* (Linnaeus) Scopoli]

Euphorbia exserta (Small) Coker, Maroon Sandhills Spurge, Coastal Sand Spurge. Cp (FL, GA, NC, SC, VA): sandhills; uncommon. March-June. Sc. NC south to c. peninsular and e. Panhandle FL; disjunct in se. VA (Sussex County) (Belden et al. 2004). The leaves are extremely variable in size and shape, from linear to rotund. Park (1998) recognizes *Eu. exserta* and *Eu. gracilior* as distinct from one another, differing in the involucre (purple in *Eu. exserta* and green in *Eu. gracilior*) and the appendages (rudimentary and purple in *Eu. exserta* and semicircular and white in *Eu. gracilior*). [= K, Q, WH, Z; = *Eu. gracilior* Cronquist – RAB; > *Tithymalopsis exserta* Small – S; > *Tithymalopsis gracilis* (Boissier) Small – S; > *Eu. exserta* – Y; > *Eu. gracilior* – Y]

* ***Euphorbia falcata*** Linnaeus. Mt (VA, WV), Pd (VA): disturbed areas; rare, native of Europe. [= C, F, G, K, WV; > *Eu. falcata* ssp. *falcata* – Q]

* ***Euphorbia helioscopia*** Linnaeus, Wartweed. Pd (GA, NC, SC, VA), Mt (VA), Cp (DE, VA): cultivated ground; rare, native of Europe. Late March-June. [= RAB, C, F, G, K; = *Galarhoeus helioscopia* (Linnaeus) Haworth – S; > *Eu. helioscopia* ssp. *helioscopia* – Q]

Euphorbia heterophylla Linnaeus, Fiddler's Spurge, Mexican Fireplant. Cp (FL, GA): disturbed areas; uncommon. All year. [= K, Q; > *Poinsettia heterophylla* (Linnaeus) Klotzsch & Garcke ex Klotzsch – S; > *Poinsettia geniculata* Ortega – S; = *Poinsettia heterophylla* (Linnaeus) Klotzsch & Garcke ex Klotzsch – S, WH]

Euphorbia hirta Linnaeus, Pillpod Sandmat. Cp (FL, GA, NC, SC), Pd (GA, SC, VA): fields, disturbed ground, waste areas, in and around greenhouses; rare, perhaps only adventive in the northern part of our area. (January-) June-October (-December). E. NC, c. SC, south to s. FL, west to TX, and south into Central and South America. Reported for Goldsboro, NC and Abbeville, Abbeville County, SC (C.N. Horn, pers.comm. 2008). [= RAB, C, G, Q; = *Chamaesyce hirta* (Linnaeus) Millspaugh – K, S, WH, Z]

Euphorbia humistrata Engelmann, Spreading Sandmat. Cp (FL, VA*), Mt (VA*, WV*), Pd (GA*, VA*): floodplain forests, exposed river shores, rocky riverside gravel bars, disturbed areas; uncommon (rare in FL, GA, and WV, rare in VA Mountains and Coastal Plain), some of the easternmost occurrences apparently adventive from further west. ON and MN south to Panhandle FL and TX; scattered eastwards, apparently as an adventive. [= C, F, G, Q, WV; = *Chamaesyce humistrata* (Engelmann) Small – GW, K, S, WH, Z]

Euphorbia hyssopifolia Linnaeus, Hyssopleaf Sandmat. Cp (FL, GA, SC): disturbed ground; common. May-October. SC south to s. FL, west to LA; also in w. TX, s. NM, and n. Mexico, and south to s. South America. Its status in our area has been muddled by confusion with *E. nutans*. [= Q: = *Chamaesyce hyssopifolia* (Linnaeus) Small – GW, K, WH, Z]

Euphorbia ipecacuanhae Linnaeus, Carolina Ipecac. Sandhills. February-May (and later, especially in response to fire). CT (formerly), NY (Long Island), NJ, and se. PA (Rhoads & Klein 1993) south to ec. GA, on the Coastal Plain. The leaves are extremely variable in size and shape, from linear to rotund. Huft (1979) considered *Eu. arundelana* Bartlett (reported from MD, SC, and GA) a sporadic form of *Eu. ipecacuanhae*. Park (1998) suggested that *Eu. ipecachuanhae* is actually a member of *Chamaesyce* (treated by Park as a subgenus), rather than of *Euphorbia*. [= RAB, C, G, K, Q, Z; > *Eu. ipecacuanhae* – F; > *Eu. arundelana* Bartlett – F; = *Tithymalopsis ipecacuanhae* (Linnaeus) Small – S]

* ***Euphorbia lathyris*** Linnaeus, Caper Spurge, Myrtle Spurge, Mole Plant. Mt (NC, SC, VA, WV), Pd (VA), Cp (VA): roadsides, disturbed areas; uncommon (rare in NC and SC, rare in VA Piedmont, rare in VA Coastal Plain), native of Europe. June-August. [= RAB, F, K, Q, W, WV; = *Eu. lathyrus* – C, G, an orthographic variant; = *Galarhoeus lathyrus* – S]

Euphorbia maculata Linnaeus, Milk-purslane, Spotted Spurge. Cp (DE, FL, GA, NC, SC, VA, WV), Pd (DE, GA, NC, SC, VA), Mt (GA, NC, SC, VA): gardens, fields, disturbed places, crevices in pavement or sidewalks; common. January-December. QC west to ND, south to s. FL and TX; introduced in various places worldwide. [= C, G, Q, W; = *Chamaesyce maculata* (Linnaeus) Small – GW, K, S, WH, Z; > *Euphorbia supina* Rafinesque – RAB, F, WV]

* ***Euphorbia marginata*** Pursh, Snow-on-the-mountain. Cp (FL, GA, NC, SC, VA), Pd (GA, VA), Mt (VA, WV): roadsides, disturbed areas; uncommon (rare in FL), native w. North America. July-November. [= RAB, C, F, G, K, Q, WH, WV; = *Lepadena marginata* (Pursh) Nieuwland – S; = *Agaloma marginata* (Pursh) A. & D. Löve]

Euphorbia mercurialina Michaux, Cumberland Spurge, Mercury Spurge. Mt (GA), Pd (GA?, NC, SC, VA*): rich moist forests over mafic or calcareous rocks; rare. May-June. S. KY south through e. TN to nw. GA and n. AL; disjunct in sc. NC, where found in 1992, and in nc. SC. Apparently introduced in VA. [= C, F, G, K, Q, W, Y, Z; = *Tithymalopsis mercurialina* (Michaux) Small – S]

Euphorbia nutans Lagasca y Segura, Eyebane. Cp (DE, FL, GA, NC, SC, VA), Pd (DE, GA, NC, SC, VA), Mt (GA, NC, SC, VA, WV): fields, gardens, waste places, disturbed ground; common. May-October. NH west to MI and ND, south to Panhandle FL and TX; introduced in various places worldwide. [= C, Q, W = *Chamaesyce nutans* (Lagasca y Segura) Small – GW, K, WH, Z; = *Euphorbia maculata* Linnaeus – RAB, F, WV, misapplied; = *Euphorbia preslii* Guss. – G; = *Chamaesyce hyssopifolia* (Linnaeus) Small – S, in part, misapplied]

Euphorbia obtusata Pursh, Woodland Spurge. Pd (NC, SC, VA), Cp (NC, SC, VA), Mt (NC, SC, VA, WV): rich bottomland forests; uncommon (rare in Mountains). April-July. Sc. PA west to IN and IA, south to SC and TX. [= RAB, C, F, G, W, WV; < *Eu. spathulata* Lamarck – K, Q; = *Galarhoeus obtusatus* (Pursh) Small – S]

* ***Euphorbia peplus*** Linnaeus, Petty Spurge. Mt (NC, VA, WV), Pd (VA), Cp (DE): disturbed areas; rare, native of Eurasia. Naturalized in Watauga County, NC (Poindexter, pers. comm.). [= C, F, G, K; = *Galarhoeus peplus* (Linnaeus) Haworth – S; > *Eu. peplus* var. *minima* A.P. de Candolle – Q; > *Eu. peplus* var. *peplus* – Q; = *Tithymalus peplus* (Linnaeus) Hill]

Euphorbia polygonifolia Linnaeus, Northern Seaside Spurge, Northern Sandmat. Cp (DE, FL, GA, NC, SC, VA): open sands of dunes, upper beach, dune blowouts and overwashes, sometimes growing with perennial grasses such as *Uniola paniculata*, but preferring open sands with little competition, sometimes mixed with the less common *E. bombensis*; common (rare in FL). May-October. NS to ne. FL along the Atlantic Ocean; disjunct to the Great Lakes. See *E. bombensis* for discussion of the habitats of these related species. [= RAB, C, F, G, Q; = *Chamaesyce polygonifolia* (Linnaeus) Small – K, S, WH, Z]

* ***Euphorbia prostrata*** Aiton, Prostrate Sandmat. Pd (GA, NC, SC, VA), Cp (FL, NC, SC, VA), Mt (NC, SC, VA, WV): crevices of pavement or sidewalks, disturbed places; rare, probably native of tropical America and only naturalized in our area. January-December. [= C, Q; = *Chamaesyce prostrata* (Aiton) Small – K, S, WH, Z; = *Euphorbia chamaesyce* Linnaeus – RAB, F, G, misapplied]

Euphorbia pubentissima Michaux, Southeastern Flowering Spurge. Cp (FL, GA, NC, SC, VA), Pd (GA, NC, SC, VA), Mt (GA, NC, SC, VA, WV): dry woodlands, sandhills; common (uncommon in FL, rare in WV). March-July. C. MD, VA, and c. and sw. TN, south to Panhandle FL and s. MS. [= K, Y, Z; > *Eu. corollata* Linnaeus var. *zinniiflora* (Small) Ahles – RAB; >< *Eu. corollata* Linnaeus var. *corollata* – RAB, in part; = *Eu. corollata* var. *paniculata* Boissier – C, F, Q; > *Eu. zinniiflora* Small – F, WV; > *Eu. apocynifolia* Small – F; > *Eu. corollata* var *mollis* Millspaugh – F; < *Eu. corollata* – G, W; > *Tithymalopsis zinniiflora* (Small) Small – S; > *Tithymalopsis apocynifolia* (Small) Small – S; > *Tithymalopsis paniculata* (Boissier) Small – S; = *Agaloma pubentissima* (Michaux) D.B. Ward]

Euphorbia purpurea (Rafinesque) Fernald, Glade Spurge, Darlington Spurge, Purple Spurge. Mt (NC, VA, WV), Pd (DE), Cp (DE): rich moist forests in bottomlands or on slopes, in rich soil around rock outcrops, in swamps or seeps, especially over calcareous rocks (such as dolomite) or mafic rocks (such as amphibolite); rare. May-September. NJ, PA, and OH south to w. NC. [= RAB, C, F, G, K, Q, W, WV; = *Galarhoeus darlingtonii* (A. Gray) Small – S]

Euphorbia serpens (Kunth) Small. Cp (FL, GA): dry sandy hammocks; rare. Allegedly in se. PA (Rhoads & Klein 1993). [= C, F, G, Q; = *Chamaesyce serpens* (Kunth) Small – K, S, WH]

Euphorbia spathulata Lamarck, Prairie Spurge, Warty Spurge. Mt (NC?, VA), Cp* (FL*): rocky woodlands, disturbed areas; rare. May-June. MN and WA south to w. VA, AL, LA, TX, and Mexico. [= C, W, WH; ? *Eu. dictyosperma* Fischer & Meyer – F, G; < *Eu. spathulata* – K, Q (also see *Eu. obtusata*); ? *Galarhoeus arkansanus* (Engelmann & A. Gray) Small ex Rydberg – S]

Euphorbia vermiculata (Rafinesque) House, Hairy Spurge. Mt (VA, WV): disturbed areas; rare. Widespread and common in PA (Rhoads & Klein 1993). [= C, F, G, Q, WV; = *Chamaesyce vermiculata* (Rafinesque) House – K]

* ***Euphorbia davidii*** Subils, David's Spurge. Mt (NC), Pd (NC): disturbed areas; rare, native of {}. Introduced in se. TN (Chester, Wofford, & Kral 1997). [= K, Q; ? *Eu. dentata* var. *gracillima* Millspaugh] {not yet keyed}

Euphorbia exigua Linnaeus, Dwarf Spurge. Mt (WV): disturbed areas; rare, native of {}. In PA and WV (Kartesz 1999). [= K, WV; ? *Eu. exigua* ssp. *exigua* – Q] {not yet keyed}

Euphorbia floridana Chapman, Florida Spurge. Cp (FL, GA): sandhills, scrub; common. May-September. Panhandle FL and sw. GA west to s. MS. Reported for sw. GA by Bridges & Orzell (2002) and Jones & Coile (1988). [= K, Q, WH, X; = *Galarhoeus floridanus* (Chapman) Small - S] {not yet keyed}

Euphorbia glyptosperma Engelmann, Ridge-seed Spurge. East to sc. TN (Chester, Wofford, & Kral 1997). In VA, WV, LA (Q). [= C, F, G, Q; = *Chamaesyce glyptosperma* (Engelmann) Small – K]

* ***Euphorbia graminea*** Jacquin. Landscaped areas, other disturbed areas. Native of tropical America. Naturalized in FL Panhandle, FL peninsula. [= *Agaloma graminea* (Jacquin) D.B. Ward] {not yet keyed; not mapped}

* ***Euphorbia hexagona*** Nuttall ex Sprengel, Six-angle Spurge. Pd (DE): disturbed areas; rare, native of c. North America. [= K] {not yet keyed; add to synonymy}

Euphorbia hypericifolia Linnaeus, reported for SC (Kartesz 1999), FL, GA, LA (Q). {Investigate} [= Q; = *Chamaesyce hypericifolia* (Linnaeus) Millspaugh – K, S] {not yet keyed}

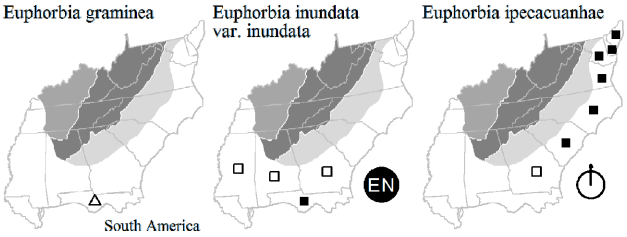
Euphorbia inundata Torrey ex Chapman *var.* ***inundata***, Flatwood Spurge. Wet pine flatwoods, savannas, seepage slopes. Ne. FL and se. GA (Bridges & Orzell 2002); Panhandle FL west to s. MS. Var. garrettii Bridges & Orzell is endemic to c. and s. FL peninsula. [= WH, X; < *Eu. inundata* – K, Q; < *Galarhoeus inundatus* (Torrey ex Chapman) Small – S] {not yet keyed}

Euphorbia ophthalmica Persoon. GA and PA (Kartesz 1999), widespread in FL (WH), but not in North America (Q). [= Q; = *Chamaesyce ophthalmica* (Persoon) Burch – K; ? *Chamaesyce gemella* (Lagasca y Segura) Small] {not yet keyed}

Euphorbia serpyllifolia Persoon *var.* ***serpyllifolia***. Cp (FL): disturbed areas; rare, native of the Great Plains. Also in GA, PA, and DE (Kartesz 1999). In NC, GA, SC (Q) {investigate} [= Q: = *Chamaesyce serpyllifolia* (Persoon) Small ssp. *serpyllifolia* – K; < *Chamaesyce serpyllifolia* – WH] {not yet keyed}

Euphorbia telephioides Chapman. Cp (FL): pine flatwoods; rare. Endemic to FL Panhandle (Bay, Franklin, and Gulf counties). [= K, WH; = *Galarhoeus telephioides* (Chapman) Small – S] {not yet keyed; add to synonymy}

Euphorbia tetrapora Engelmann. GA and AL west to TX. [= K, Q] {not yet keyed}



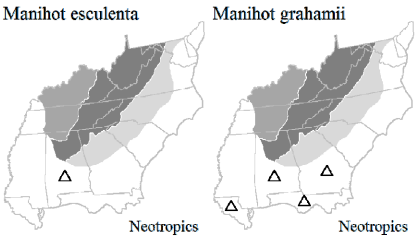
Manihot P. Miller 1754 (Cassava)

A genus of about 100 species, trees, shrubs, and herbs, of tropical and subtropical America. References: Govaerts, Frodin, & Radcliffe-Smith (2000)=Z.

1 Leaf segments 5-7, with entire margins; calyx of male flowers < 10 mm long; fruit wing-angled.....***M. esculenta***
1 Leaf segments 9-13, with undulate lobes towards the tip; calyx of male flowers 12-15 mm long; fruit not winged ..... ***M. grahamii***

* ***Manihot esculenta*** Crantz, Manioc, Tapioca. Disturbed areas; native of tropical America. Naturalized on the Gulf Coast, as in AL and s. FL. [= K, WH, Z; = *Jatropha manihot* Linnaeus – S]

* ***Manihot grahamii*** Hooker, Hardy Tapioca, Graham's Cassava. Suburban forests, vacant lots, other disturbed areas, uncommonly grown as an ornamental, rarely naturalizing; native of tropical America. Introduced in sw. GA (Jones & Coile 1988; Carter, Baker, & Morris 2009), FL Panhandle, peninsular FL, west to LA. [= K, WH, Z]



Mercurialis Linnaeus 1753 (Mercury)

A genus of about 8 species, herbs, of the Old World. References: Govaerts, Frodin, & Radcliffe-Smith (2000)=Z.

* ***Mercurialis annua*** Linnaeus, Annual Mercury, Boys-and-girls. Disturbed areas, waif on ballast; native of Mediterranean Europe. This species has been reported as a rare "ballast weed" from Charleston, SC and Mobile, AL(Wiggins 1932); some of the occurrences presumably represent non-persistent waifs. [= C, F, G, K, S, Z] {not yet keyed}

Ricinus Linnaeus 1753 (Castor-bean)

A monotypic genus, a shrub or tree, native to Africa and w. Asia, now pantropical. References: Govaerts, Frodin, & Radcliffe-Smith (2000)=Z.

* ***Ricinus communis*** Linnaeus, Castor-bean, Castor-oil Plant, Palma Christi. Waste places, gardens; native of the tropics, probably Africa. July-October. The seeds are dangerously poisonous, formerly the source of an oil used as a purgative and machine lubricant. In FL and further south in the tropics, *R. communis* is a small to medium tree. [= RAB, C, F, G, K, S, WH, Z]

Sapium P. Browne (Milktree)

A genus of 21 species, trees and shrubs, of the Neotropics. The most recent monographers of *Sapium* and related genera (Kruijt 1996; Esser 2002) separate *Triadica* from *Sapium* sensu stricto. This conclusion is corroborated by molecular phylogenetic analysis (Wurdack, Hoffmann, & Chase 2005). References: Kruijt (1996)=Z; Govaerts, Frodin, & Radcliffe-Smith (2000)=Y. [also see *Triadica*]

* ***Sapium haematospermum*** Müller of Aargau, Milk-tree. Disturbed areas; native of n. South America. Known in our area only from Escambia County, FL, where not recently seen. [= Y, Z; ? *S. caribaeum* Urban – K; ? *S. glandulosum* (Linnaeus) Morong – S, WH]

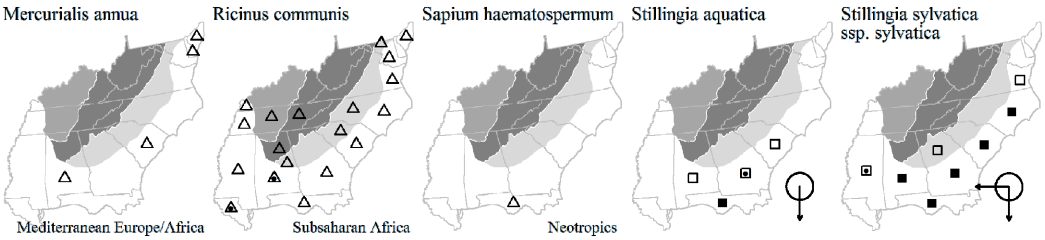
Stillingia Garden ex Linnaeus 1767 (Queen's-delight)

A genus of about 30 species, herbs, shrubs, and small trees, of tropical to subtropical regions of America, Madagascar, and se. Asia. References: Govaerts, Frodin, & Radcliffe-Smith (2000)=Z.

1 Stems woody, single; leaves < 1 cm wide; [of pineland ponds and other aquatic habitats] ..... ***S. aquatica***
1 Stems herbaceous, several from a crown; leaves > 1 cm wide; [of dry habitats]..... ***S. sylvatica*** *ssp.* ***sylvatica***

Stillingia aquatica Chapman, Corkwood, Water Toothleaf. Ponds in pine flatwoods. May-September. Se. SC south to s. FL, west to sw. AL. [= RAB, K, S, WH, Z]

Stillingia sylvatica Garden ex Linnaeus *ssp.* ***sylvatica***, Queen's-delight. Sandhills, dryish coastal plain woodlands. May-July; June-September. Se. VA south to s. FL, west to TX and NM, north in the interior to KS. Ssp. *tenuis* (Small) D.J. Rogers is in s. FL. [= K, Z; < *S. sylvatica* – RAB, C, G, WH; > *S. sylvatica* var. *sylvatica* – F; > *S. sylvatica* – S; > *S. spathulata* (Müller of Aargau) Small – S]



Tragia Linnaeus 1753 (Noseburn)

A genus of about 100-170 species, of tropical to warm temperate regions of the Old and New Worlds. References: Miller & Webster (1967)=Z; Govaerts, Frodin, & Radcliffe-Smith (2000)=Y.

1 Plant vining and trailing; larger leaf blades on a plant > 5 cm wide and > 8 cm long, deeply cordate at the base ..... ***T. cordata***
1 Plant not vining, erect; larger leaf blades on a plant < 3.5 cm wide and < 8 cm long, cuneate, rounded, truncate, or shallowly cordate at the base.
2 Leaf base cuneate at base; leaf blade 3-20× as long as wide ..... ***T. urens***
2 Leaf base cordate, subcordate, truncate, or broadly rounded at base; leaf blade 1-3× as long as wide.
3 Petioles 1-4 mm long; leaves rounded to acute at the tip; stamens 2 (-3) ..... ***T. smallii***
3 Petioles 3-17 mm long; leaves acute to acuminate at the tip; stamens 3 ..... ***T. urticifolia***

Tragia cordata Michaux, Heartleaf Noseburn. Rocky calcareous woodlands, calcareous prairies. C. KY, s. IN to s. MO, south through c. TN, rarely to e. TN (Meigs County, in the Ridge and Valley Province) (Chester, Wofford, & Kral 1997), n. AL (Jackson Co.) (D. Spaulding pers. comm.) to sc. and sw. GA, Panhandle FL, and e. TX. [= C, K, WH, Z; = *T. macrocarpa* Willdenow – S]

Tragia smallii Shinners, Gulf Coast Noseburn. Sandhills. Sw. GA south to c. peninsular FL, west to e. TX. Reports of *T. betonicifolia* from GA are based on misapplication of that name to material representing *T. smallii*. [= K, WH, Z; = *T. betonicaefolia* Nuttall – S, misapplied; = *T. betonicifolia* Nuttall, misapplied]

Tragia urens Linnaeus, Southeastern Noseburn, Wavyleaf Noseburn. Sandhills, sandy woodlands, other woodlands. May-October. Se. VA south to s. FL and west to TX, mostly on the Coastal Plain, but ranging into the mountains southward. [= RAB, C, F, G, K, S, W, WH, Z; = *T. linearifolia* Elliott – S]

Tragia urticifolia Michaux, Nettleleaf Noseburn. Dry woodlands and rock outcrops, particularly over mafic or calcareous rocks. May-October. Sc. VA west to MO, KS, and CO, south to c. peninsular FL, Panhandle FL, and AZ. [= RAB, F, G, K, W, WH; = *T. urticaefolia* – S, orthographic variant]

Triadica Loureiro 1790 (Chinese Tallow-tree)

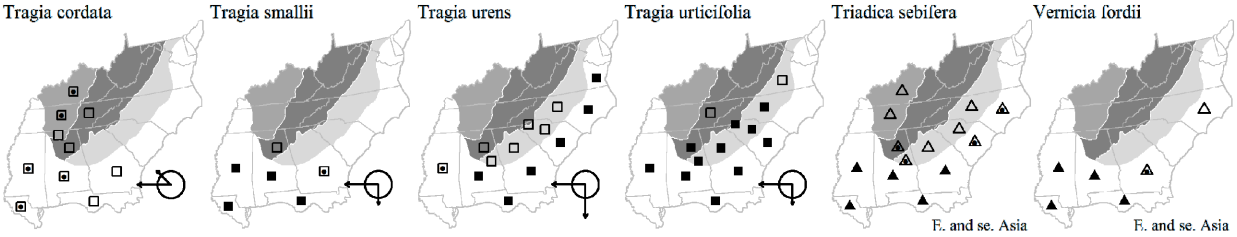
A genus of 1-3 species, native to tropical and subtropical Asia. The most recent monographers of *Sapium* and related genera (Kruijt 1996; Esser 2002) place our naturalized species in the genus *Triadica*, native to Asia; *Sapium* (excluding *Triadica*) is a genus of 21 species restricted to the neotropics. This conclusion is corroborated by molecular phylogenetic analysis (Wurdack, Hoffmann, & Chase 2005). References: Kruijt (1996)=Z; Esser (2002)=Y; Govaerts, Frodin, & Radcliffe-Smith (2000)=X.

* ***Triadica sebifera*** (Linnaeus) Small, Chinese Tallow-tree, Popcorn Tree. Marsh edges, shell deposits, disturbed areas; native of e. Asia. May-June; August-November. With *Euphorbia* and *Cnidoscolus*, one of our few Euphorbiaceous genera with milky sap. *Triadica sebifera* has become locally common from Colleton County, SC southward through the tidewater area of GA, and promises to become a serious weed tree (as it is in parts of LA, TX, and FL). [= K, S, X, Y, Z; = *Sapium sebiferum* (Linnaeus) Roxburgh – RAB, GW, WH]

Vernicia Loureiro 1790 (Tung-oil Tree)

A genus of 3 species, trees, native of se. Asia. References: Govaerts, Frodin, & Radcliffe-Smith (2000)=Z.

* ***Vernicia fordii*** (Hemsley) Airy-Shaw, Tung-oil Tree, Tung Tree. Planted for the oil and for ornament, rarely naturalizing; native of central and western China. Naturalized on the Gulf Coastal Plain from former plantations; planted and showing a tendency to naturalize in the Coastal Plain of NC (Mount Olive, Wayne Co.). [= K, Z; = *Aleurites fordii* Hemsley – WH]



189. PHYLLANTHACEAE Martinov 1820 (Leaf-flower Family) [in MALPIGHIALES]

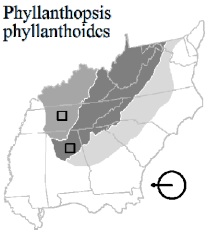
A family of about 60 genera and 1800 species, trees, shrubs, and herbs, mainly tropical. References: Webster (1994); Chase et al. (2002).

1 Woody shrub; stamens 5-6 ..... ***Phyllanthopsis***
1 Annual herb; stamens 3 ..... ***Phyllanthus***

Phyllanthopsis (Scheele) Vorontsova & Petra Hoffman 2008 (Maidenbush)

A genus of 2 species, shrubs, of sc. North America (United States and Mexico). Generic boundaries remain uncertain at this time (Wurdack et al. 2004). References: Vorontsova & Hoffman (2008); Wurdack et al. (2004).

Phyllanthopsis phyllanthoides (Nuttall) Vorontsova & Petra Hoffman, Maidenbush. Barrens, including river-scour barrens, on limestone or other calcareous rock. C. MO, AR, and OK, south to c. TX; disjunct in c. AL and ec. TN. [= *Leptopus phyllanthoides* (Nuttall) G.L. Webster – K; = *Andrachne phyllanthoides* (Nuttall) Coulter – F, G]



Phyllanthus Linnaeus 1753 (Leaf-flower)

A genus of about 1200-1300 species, trees, shrubs, and herbs, of tropical, subtropical and warm temperate regions of the Old and New Worlds. Heterogeneous and perhaps to be divided. References: Levin in FNA (in prep.); Rossignol, Rossignol, & Haicour (1987)=Z; Webster (1970)=Y; Govaerts, Frodin, & Radcliffe-Smith (2000)=X.

1 Plant with "normal" arrangement of branches and leaves (leaves uniformly distributed on the stem and branches, alternate and either distichous or spirally arranged, the ultimate branches not deciduous, flowers produced on ultimate and penultimate orders of branches); [subgenus *Isocladus*].
  2 Leaves arranged distichously; stipules typically auriculate; [section *Loxopodium*].
    3 Stems terete; filaments free; seeds 0.8-1.0 mm long; [widespread in our area] ..... ***P. caroliniensis*** *ssp.* ***caroliniensis***
    3 Stems flattened and winged; filaments connate; seeds 1.3-1.5 mm long; [of e. LA westward] ..... ***P. evanescens***
  2 Leaves arranged spirally; stipules not auriculate; [section *Paraphyllanthus*].
    4 Plant herbaceous, with a single or few stems; seeds 1.7-1.8 mm long; calyx lobes 2.8-3.5 mm long (when in fruit);; [endemic to FL Gulf Coast] ..... ***P. liebmannianus*** *ssp.* ***platylepis***
    4 Plant suffruticose, with many stems clustered from the plant base; seeds 1.1-1.5 mm long; calyx lobes 1.5-2.5 mm long (when in fruit); [of e. LA westward] ..... ***P. polygonoides***
1 Plant with "phyllanthoid" arrangement of branches, leaves, and flowers (leaves lacking on the main stem, the penultimate order of branches with scales arranged spirally, the ultimate order of branches deciduous, bearing normal leaves alternately and distichously, flowers produced only on the ultimate, deciduous branches).
  5 Stamens 5, filaments free; fruiting pedicels capillary, 3-7 mm long; seeds densely papillose; [subgenus *Kirganelia*] ..... ***P. tenellus***
  5 Stamens 3, filaments connate into a column 0.1-0.15 mm long; fruiting pedicels thicker and often also shorter; seeds variously ribbed or striate; [subgenus *Phyllanthus*]

6 Fruiting pedicels 0.5 mm long; seeds with 12-15 transverse ridges and sometimes 1-3 pits; male flowers borne towards the tip of the branchlets, female flowers towards the base; [section *Urinaria*] ..... ***P. urinaria*** *ssp.* ***urinaria***
6 Fruiting pedicels > 0.5 mm long; seeds longitudinally ribbed or striate; female flowers borne towards the tip of the branchlets, male flowers towards the base; [section *Phyllanthus*].
7 Cymules bisexual (each with 1 female and 1 male flower); calyx lobes of male flowers 4 (-5) ..... ***P. abnormis*** *var.* ***abnormis***
7 Cymules unisexual; calyx lobes usually 6 ..... ***P. fraternus***

Phyllanthus abnormis Baill. *var.* ***abnormis***, Drummond's Leaf-flower Cp (FL): dunes; uncommon. All year. Ne. FL south to s. peninsular FL; TX south into Mexico. Another variety occurs along the Rio Grande River in TX. [= FNA, K, X, Y; > *P. garberi* Small – S; < *P. abnormis* – WH]

* *Phyllanthus amarus* Schumacher, Gale-of-wind, Carry-me-seed. Reported by RAB for NC and SC; misidentified and actually represents *P. tenellus* (Webster 1970). {rejected; not keyed or mapped}

*? ***Phyllanthus caroliniensis*** Walter *ssp.* ***caroliniensis***, Carolina Leaf-flower. Cp (DE, FL, GA, NC, SC, VA), Pd (GA, NC, SC, VA), Mt (GA, NC, SC, VA, WV): roadsides, moist woodlands, forests, and fields, often in seasonally wet, muddy places; common (rare in VA and WV Mountains). July-November. PA and IL south to c. peninsular FL and TX, and south to Argentina and Paraguay, the original range not clear, likely introduced in part of the area. Ssp. *saxicola* (Small) G.L. Webster (sometimes treated as a species) is restricted to s. FL, the Bahamas, and Greater Antilles. [= FNA, K, X, Y; < *P. caroliniensis* – RAB, F, G, W, WV; = *P. caroliniensis* var. *caroliniensis* – C; < *P. carolinensis* – GW, orthographic error; = *P. caroliniensis* – S]

Phyllanthus evanescens Brandegee. LA (St. Charles Parish) west to TX. March-November. [= FNA; > *Phyllanthus pudens* L.C. Wheeler – K, X, Y]

* ***Phyllanthus fraternus*** G.L. Webster. Disturbed areas. S. FL, MS, LA. Introduced in SC (Kartesz 1999). {investigate} [= FNA, K, WH, X, Y]

Phyllanthus liebmannianus Müller of Aargau *ssp.* ***platylepis*** (Small) G.L. Webster. Cp (FL): wet hammocks; rare. Late March-late June. Endemic to the "Big Bend" area of the FL Gulf Coast (Dixie, Levy, and Taylor counties). Apparently closely related to *P. liebmannianus* ssp. *liebmannianus* of the western Gulf Coast (Tamaulipas south to Yucatan and Belize). [= FNA, K, WH, X, Y; = ***Phyllanthus platylepis*** Small – S]

Phyllanthus niruri Linnaeus. Reports of *P. niruri* Linnaeus from NC and SC (Ahles, Bell, & Radford 1958) have proved to be *P. tenellus* (Webster 1970). {rejected; not keyed or mapped}

Phyllanthus pentaphyllus Wright, Fivepetal Leaf-flower. Unlikely to be correctly labeled from Darlington County, SC (as also indicated by RAB), is here excluded.

Phyllanthus polygonoides Nuttall ex Sprengel. Grasslands, calcareous glades. April-October. E. LA west to NM, south into Mexico. [= FNA, K, X, Y]

* ***Phyllanthus tenellus*** Roxburgh, Mascarene Island Leaf-flower. Cp (DE, FL, GA, NC, SC), Pd (GA, NC): disturbed areas, in and around greenhouses; uncommon (rare north of FL), native of the Mascarene Islands. This species appeared in FL in the 1920's, s. GA in the 1940's, SC in the 1950's, NC in the 1960's, and TN in the 1970's (Kral 1981). Reported from a single collection from VA, as a "contaminant in a container plant" (Virginia Botanical Associates 2007). [= FNA, GW, K, WH, Y; *? P. amarus* – RAB, misapplied (misidentified); > *P. tenellus* var. *tenellus* – X]

* ***Phyllanthus urinaria*** Linnaeus *ssp.* ***urinaria***, Chamber Bitter. Cp (FL, GA, NC, SC, VA): gardens and roadsides, apparently preferring nitrogen-rich soils; uncommon (rare north of FL), native of tropical Southeast Asia, now scattered in the tropics and subtropics of both hemispheres. March-November. This species appeared in the 1940's to 1960's in FL, GA, AL, LA, TX, and NC, and in the 1970's in TN (Kral (1981). [= FNA, X, Z; < *P. urinaria* – GW, K, WH, Y]

190. ELATINACEAE Dumortier 1829 (Waterwort Family) [in MALPIGHIALES]

A family of 2 genera and about 35 species, herbs. References: Tucker (1986).

Elatine Linnaeus 1753 (Waterwort)

A genus of about 10-25 species, aquatic, tropical and temperate. References: Tucker (1986).

1 Seeds mostly straight, the areoles elliptic, the rounded ends not dovetailing into adjacent rows, the longitudinal ridges thus appearing straight and distinct; seeds basal-axile, extending lengthwise through the capsule, not overlapping; leaves 1-5 mm long; flowers mostly 2-merous ..... ***E. minima***
1 Seeds mostly curved, the areoles 6-sided, the angular ends dovetailing into the adjacent rows, the longitudinal ridges thus appearing broken or irregular; seeds axile, attached along an elevated placenta at different levels, therefore overlapping; leaves 1-15 mm long; flowers mostly 3-merous.
2 Leaves obovate to broadly spatulate, rounded at the the tip, 3-8 mm long, the larger 1.5-5 mm wide; seeds with 20-30 pits in each row ..... ***E. americana***
2 Leaves linear-lanceolate to narrowly spatulate, emarginate to truncate to rounded at the tip, 1-15 mm long, the larger 0.5-3 mm wide; seeds with 9-25 pits in each row.
3 Leaves 1.5-4 mm long, 0.7-1.8 mm wide; seeds with 9-15 pits per row ..... ***E. brachysperma***
3 Leaves 2.8-15 mm long, 0.5-3 mm wide; seeds with 16-25 pits per row ..... ***E. rubella***

Elatine americana (Pursh) Arnott, American Waterwort. Cp (DE, VA), Mt (NC, SC): tidal flats, lakes; rare. July-October. Widespread in ne. United States, s. to NC and MO. The only known site for this species in NC is an artificial lake; it is uncertain

whether it should be considered native or introduced. [= F, K, S; < *E. triandra* Schkuhr – RAB, W; = *E. triandra* var. *americana* (Pursh) Fassett – C, G, GW]

Elatine brachysperma A. Gray, Shortseed Waterwort. Pd (GA): {habitat not known}; rare. It has been reported for nc. GA (Jones & Coile 1988). [= F, K; = *E. triandra* Schkuhr var. *brachysperma* (A. Gray) Fassett – C, G]

Elatine minima (Nuttall) Fischer & C.A. Meyer, Tiny Waterwort. Cp (DE, VA), Pd (NC, SC): tidal flats, lakes, mud flats; rare. July-October. First found in NC in 1990, *E. minima* is widespread in ne. United States, south to VA, NC, and SC (Horn, pers. comm. 2004). The only known site for this species in NC is the spillway of an artificial lake (Lake Butner, Granville County); it is uncertain whether it should be considered native or exotic in NC. It may have been introduced by waterfowl or humans. [= C, F, G, K]

Elatine rubella Rydberg, Red Waterwort. Pd (SC): ponds; rare. This species occurs in AL (Fayette County) as well as north of our area (Haynes 1998). Hill & Horn (1997) reported *E. triandra* for SC, but the specimen is *E. rubella* Rydberg (Horn, pers. comm. 2004). [= K; = *E. triandra* Schkuhr – F, misapplied; = *E. triandra* var. *triandra* – C, G, misapplied]

196. CHRYSOBALANACEAE R. Brown 1818 (Coco-plum Family) [in MALPIGHIALES]

A family of about 18 genera and 530 species, trees and shrubs, of tropical and subtropical areas, especially tropical America. References: Prance & Sothers (2003); Prance (1970).

Licania Aublet (Gopher-apple)

A genus of about 218 species, trees and shrubs, mainly of tropical America, but with a few species in Africa and Asia. References: Prance (1970)=X; Prance (1972)=Y; Prance & Sothers (2003)=Z.

Licania michauxii Prance, Gopher-apple, Ground-oak. Cp (GA, SC): sandhills, dry sandy pinelands; common (uncommon in GA, rare in SC). May-June; September-October. Se. SC south to s. FL, west to LA, becoming abundant and ubiquitous in dry sandy habitats in the southern part of its range. *L. michauxii* is one of 49 species of subgenus *Moquilea*, section *Moquilea*, which is distributed from se. North America through Central America and the West Indies to South America; our species may be most closely related to *L. retifolia* Blake, a small tree of sw. Mexico and El Salvador (Prance 1970; Prance & Sothers 2003). A rare upright shrub form (to over 15 dm tall) has been found in Brevard County, FL, suggesting that *L. michauxii* evolved from a taller and more upright ancestor (Ward & Taylor 1999). [= K, X, Y, Z; = *Chrysobalanus oblongifolius* Michaux – RAB; > *Geobalanus oblongifolius* (Michaux) Small – S; > *Geobalanus pallidus* Small – S]

199. PASSIFLORACEAE A.L. de Jussieu ex Kunth 1817 (Passionflower Family) [in MALPIGHIALES]

A family of about 27 genera and 935 species, vines, shrubs, trees, and herbs, of tropical and warm temperate regions, especially America and Africa. Here circumscribed to include Turneraceae, following Angiosperm Phylogeny Group (2009). References: Feuillet & MacDougal in Kubitzki, Bayer, & Stevens (2007); Arbo in Kubitzki, Bayer, & Stevens (2007).

1 {} ..... ***Passiflora***
1 {} ..... ***Piriqueta***

Passiflora Linnaeus 1753 (Passionflower)

A genus of about 525 species, vines, shrubs, and trees, largely of tropical America, with a few species in warm temperate America and Asia. References: Ulmer & MacDougal (2004)=Z; Vanderplank (2000)=Y; Feuillet & MacDougal in Kubitzki, Bayer, & Stevens (2007).

Identification notes: *Passiflora* flowers are structurally striking. There are 5 sepals and either 0 or 5 petals; a **corona** of numerous linear structures is present, arranged in 1-several series. The ovary, 3 styles, and 5 stamens are basally adnate and elevated on an **androgynophore**. Most species have **glands** on the leaves which function as extrafloral nectaries; these can be seen as paired glands on the leaf petiole (in all our species except *P lutea*), and some species also have **laminar glands** on the leaf blade, near the margin.

1 Sepals 25-35 mm long, green on the outer surface, white on the inner surface; petals 30-40 mm long, lavender, violet, or mauve; berry 40-70 mm long; corona in 2-3 series, the longer 15-30 mm long; [subgenus *Passiflora*; supersection *Passiflora*] ..... ***P. incarnata***
1 Sepals 5-20 mm long, green, pale yellow or white; petals 5-11 mm long, greenish yellow to white (or absent in *P. gracilis* and *P. pallida*); berry 6-40 mm long; [subgenus *Decaloba*].
  2 Petiole lacking paired glands; leaf blade lacking laminar glands; berry 7-12 mm long; [subgenus *Decaloba*; supersection *Decaloba*].
    3 Calyx, petioles, and stems glabrous; [WV, OH, and OK south to AL and TX] ..... ***P. lutea*** *var.* ***glabriflora***
    3 Calyx, petioles, and stems pilose; [PA and TN south to FL and AL] ..... ***P. lutea*** *var.* ***lutea***
  2 Petiole with paired glands, variously positioned near the junction of the petiole and leaf blade, or towards the base of the petiole; leaf blade usually with at least a few laminar glands; berry **either** 6-15 mm long **or** 25-40 mm long.
    4 Sepals 5-10 mm long; petals absent; corona in 2 series the outer 3-7 mm long; berry 6-10 (-15) mm long; [native, of ne. FL southwards]; [subgenus *Decaloba*, supersection *Sieca*] ..... ***P. pallida***

4 Sepals 10-20 mm long; petals **either** 4-11 mm long **or** absent; corona in 1-2 series, the longer 5-11 mm long; berry 20-40 mm long; [alien]; [subgenus *Decaloba*, supersection *Bryonioides*].
5 Petals absent; sepals 10-14 mm long, 2-4 mm wide; corona in 2 series, the outer (longer) 6-9 mm long, the inner ca. 1 mm long; berry 20-30 mm long, scarlet when ripe; leaves 3-lobed, entire, with petiolar glands towards the base of the petiole ..... ***[P. gracilis]***
5 Petals present, 43-11 mm long; sepals 13-20 mm long, 5-8 mm wide; corona in 1 series, 5-11 mm long; berry 30-40 mm long, purple or black when ripe; leaves 3 (-5)-lobed, serrate, with petiolar glands in the upper half of the petiole ..... ***P. morifolia***

Passiflora incarnata Linnaeus, Maypops. Cp (DE, FL, GA, NC, SC, VA), Pd (GA, NC, SC, VA), Mt (GA, NC, SC, VA, WV): roadsides, fencerows, thickets, fields; common (uncommon in DE). May-July (-later); July-October. DE, MD, sw. PA, OH, and OK, south to s. FL and TX. Certainly one of our most interesting and beautiful flowers. [= RAB, C, F, G, K, S, W, WH, WV, Z]

Passiflora lutea Linnaeus *var.* ***glabriflora*** Fernald, Midwestern Yellow Passionflower. Mt (WV): woodlands, thickets; rare. June-September; August-October. WV and OH west to OK, south to AL and TX. [= C, F, G, WV; < *P. lutea* – RAB, K, S, W, WH, Y, Z]

Passiflora lutea Linnaeus *var.* ***lutea***, Eastern Yellow Passionflower. Cp (DE, FL, GA, NC, SC, VA), Pd (GA, NC, SC, VA), Mt (GA, NC, SC, VA, WV): woodlands, forests, thickets, maritime forests; common. June-September; August-October. PA, WV, and TN south to c. peninsular FL and AL. [= C, F, G, WV; < *P. lutea* – RAB, K, S, W, WH, Z]

* ***Passiflora morifolia*** Masters. Pd (SC): thickets; rare, native of South America. May-July; July-October. [= RAB, K, Z; > *P. morifolia* – Y; > *P. warmingii* Masters – S, Y]

Passiflora pallida Linnaeus, West Indian Corkystem Passionflower. Cp (FL): hammocks, shell middens; rare. Ne. FL (Dixie and Duval counties) south to s. FL; West Indies; Yucatan. Ulmer & MacDougal (2004) state that the Florida and West Indian component of what has been broadly treated as *P. suberosa* warrants specific status. [= S; < *P. suberosa* Linnaeus – K, WH, Y, Z]

* *Passiflora gracilis* Jacquin ex Link, Annual Passionflower. Native of Mexico, Central America, and n. South America. Reported for SC (Kartesz 1999). {investigate – not in SC Plant Atlas} [= K, Y, Z]

Piriqueta Aublet 1775

A genus of about 20-50 species, herbs and shrubs, of tropical and subtropical America, with a single species in s. Africa. References: Arbo (1990, 1995)=Z; Maskas & Cruzan (2000).

Piriqueta caroliniana (Walter) Urban *var.* ***caroliniana***. Cp (FL, GA, SC): longleaf pine sandhills, sandy soils of roadsides, woodland edges, and disturbed areas; uncommon. May-September. SC south to s. FL; Cuba and Hispaniola; and in Central and n. South America. Arbo (1990; 1995) treats *P. caroliniana* as a subspecies of *P. cistoides*, but the morphological distinctions seem strong and the two taxa have widely overlapping distributions in the Neotropics. Maskas & Cruzan (2000) discuss variation and evolutionary taxa in this complex in the southeastern United States and the Bahamas. [< *P. caroliniana* – RAB; < *P. cistoides* (Linnaeus) Grisebach ssp. *caroliniana* (Walter) M.M. Arbo – K, WH, Z; = *P. caroliniana* – S]

* ***Piriqueta cistoides*** (Linnaeus) Grisebach. Reported for GA (Kartesz 1999), but the documentation is untraceable. [= *P. cistoides* ssp. *cistoides* – K, Z] {not keyed; rejected pending better documentation}

201. SALICACEAE de Mirbel 1815 (Willow Family) [in MALPIGHIALES]

A family of 55 genera and about 1010 species, trees, shrubs, and subshrubs, nearly cosmopolitan. Now circumscribed to include the Flacourtiaceae. References: Argus, Eckenwalder, & Kiger in FNA (2010).

1 Leaf blades 0.8-2 (-3)× as long as wide; stamens 5-80; buds covered by several, overlapping scales; flowering catkins arching or drooping ..... ***Populus***
1 Leaf blades (2-) 3-30× as long as wide; stamens 1-9; buds covered by a single scale; flowering catkins usually erect or ascending ..... ***Salix***

Populus Linnaeus 1753 (Poplar, Aspen, Cottonwood)

A genus of about 35 species, trees, largely north temperate. References: Eckenwalder in FNA (2010); Eckenwalder (1977)=Z; Eckenwalder (1984)=Y; Eckenwalder (1996); Hamzeh & Dayanandan (2004).

1 Winter buds not viscid; stamens 5-20.
2 Stamens 12-20; scales of the catkins deeply fimbriate; petioles terete; [section *Leucoides*] ..... ***P. heterophylla***
2 Stamens 5-12; scales of the catkins dentate or with only 3-7 linear-trianglar lobes; petioles strongly flattened laterally (90 degrees to the plane of the leaf blade), especially near the junction with the blade; [section *Populus*].
3 Petioles strongly flattened laterally; leaves glabrous when mature (pubescent when young in *P. grandidentata*); [native trees].
4 Leaf margins coarsely crenate- or undulate-toothed, with fewer than 12 (-15) teeth per side, the sinuses of the larger teeth 1.5-6 mm deep; leaves puberulent beneath when young (glabrate in age); buds gray-pubescent ..... ***P. grandidentata***
4 Leaf margins finely crenulate-serrulate, with (12-) 15-35 (-45) teeth per side, the sinuses 0.5-1.0 mm deep; leaves glabrous; buds glossy brown ..... ***P. tremuloides***
3 Petioles terete or nearly so; leaves densely pubescent (*P. alba*) or glabrescent (*P. ×canescens*); [exotic trees].

5 Leaves of vigorous shoots palmately 3-5 (-7)-lobed (and also toothed); leaves densely white-tomentose beneath when young and mature ..... ***P. alba***
5 Leaves of vigorous shoots merely toothed; leaves glabrescent when mature ..... ***P. ×canescens***
1 Winter buds viscid (sticky and shiny as if recently varnished); stamens (15-) 20-80.
6 Petiole terete or dorsally flattened (in the plane of the leaf blade), and often also channeled above; leaf blades dark green above, glaucous white beneath; leaf margin not translucent, finely serrate with teeth < 1 mm deep; [section *Tacamahaca*].
7 Petioles 7-10 cm long; leaves ovate, broader below the midpoint; leaf base rounded to subcordate; twigs terete or slightly angled in cross-section ..... ***P. balsamifera***
7 Petioles < 2 cm long; leaves obovate, broader past the midpoint; leaf base cuneate to rounded; twigs strongly angled in cross-section ..... ***P. simonii***
6 Petiole laterally flattened (90 degrees to the plane of the leaf blade), especially near the junction with the blade; leaf blades light green above, often paler beneath but not distinctly whitened; leaf margin translucent, finely to coarsely serrate with teeth > 1 mm deep.
8 First-year branches reddish-brown; leaves noticeably paler beneath; flattened portion of petiole < 2× as deep as wide; early leaves with > 20 teeth per side, the largest < 2.5 mm deep; [probable intersectional hybrid of section *Aegeiros* and section *Tacamahaca*]..... ***P. ×jackii***
8 First-year branches yellow- to orange- brown; leaves nearly the same color above and below; flattened portion of petiole > 2× as deep as wide; early leaves usually with < 20 teeth per side, the largest < 2.5 mm deep; [section *Aegeiros*].
9 Stigmas 3-4; stamens (30-) 40-80; [native tree, common]..... ***P. deltoides*** *ssp.* ***deltoides***
9 Stigmas 2-3; stamens (15-) 20-30; [alien trees, rare out of cultivation].
10 Floral disk 2-4 mm wide; stigmas 2-3; ovules and seeds 6-14 (-20) per placenta..... ***P. ×canadensis***
10 Floral disk 1-2 mm wide; stigmas 2; ovules and seeds 4-8 per placenta ..... ***P. nigra***

* ***Populus alba*** Linnaeus, Silver Poplar, White Poplar. Mt (GA, NC, SC, VA, WV), Pd (DE, GA, NC, SC, VA), Cp (DE, FL, GA, NC, SC, VA): disturbed areas, suburban woodlands; common (uncommon in GA, NC, SC, VA, rare in DE and FL), native of Europe. March-April. [= RAB, C, F, FNA, G, K, S, W, WH, WV]

Populus balsamifera Linnaeus, Balsam Poplar, Hackmatack, Tacamahac. Cp* (DE*, VA*), Pd* (VA*), Mt* (VA*, WV): floodplains, disturbed areas; rare. NL (Labrador) and AK south to PA, WV, OH, IN, IL, IA, SD, CO, ID, and OR; scattered further south by introduction. Ranges south to s. PA (Rhoads & Klein 1993), e. and c. KY (Clark et al. 2005), and to VA (according to Kartesz 1999). Also reported for n. GA (Jones & Coile 1988) and provisionally for SC (Kartesz 1999). Many of the attributions of this species to states in our area are based on misidentifications. [= C, FNA, G, WV; = *P. balsamifera* ssp. *balsamifera* – K; > *P. balsamifera* var. *balsamifera* – F; > *P. balsamifera* var. *magnifica* Victorin – F; > *P. balsamifera* var. *subcordata* Hylander; > *P. balsamifera* var. *michauxii* (Dode) Henry]

* ***Populus ×canadensis*** Moench (pro sp.) [*P. deltoides* × *nigra*], Hybrid Black Poplar. Pd (GA, VA), Mt (VA, WV), {NC}: disturbed areas; rare. Reported for a county in c. GA (Jones & Coile 1988) and for NC and VA (Kartesz 1999). [= C, FNA, K]

* ***Populus ×canescens*** (Aiton) Sm. (pro sp.) [*P. alba* × *tremula*], Gray Poplar. Mt (GA, NC, VA, WV), Pd (GA, NC, VA), Cp (NC), {SC}: roadsides, disturbed areas; uncommon (rare in WV), native of Europe. March-April. Occurs at scattered locations in TN, n. GA (Jones & Coile 1988), se. PA (Rhoads & Klein 1993), and NC, SC, and VA (Kartesz 1999). See Poindexter (2006). [= C, FNA, K; = *P. canescens* (Aiton) Sm. – F, G]

Populus deltoides Bartram ex Marshall *var.* ***deltoides***, Eastern Cottonwood. Pd (GA, NC, SC, VA), Cp (DE*, FL, GA, NC, SC, VA), Mt (GA, VA): riverbanks, bottomland forests (not found along blackwater streams); common (uncommon in DE and FL). March-April. Var. *deltoides* ranges from QC west to MN, south to n. peninsular FL, Panhandle FL, and TX. Var. *occidentalis* Rydberg [ssp. *monilifera* (Aiton) Eckenwalder] is more western, primarily of the Great Plains. [= C, GW; < *P. deltoides* – RAB, G, W, WH, WV; > *P. deltoides* var. *deltoides* F; > *P. deltoides* var. *missouriensis* (A. Henry) A. Henry – F; = *P. deltoides* ssp. *deltoides* – FNA, K, Z; = *P. balsamifera* Linnaeus – S, misapplied]

Populus grandidentata Michaux, Bigtooth Aspen. Mt (NC, VA, WV), Pd (DE, VA), Cp (DE, VA): dry, rocky, upland forests; common (rare in NC). April-May. NS west to MN, south to w. NC, sc. TN, and n. MO. [= RAB, C, F, FNA, G, K, S, W, WV]

Populus heterophylla Linnaeus, Swamp Cottonwood. Cp (DE, FL, GA, NC, SC, VA), Pd (NC, VA): blackwater and brownwater swamp forests; common (rare in Piedmont). March-April. CT west to MI, south to Panhandle FL and LA, scattered and irregular in distribution, absent from the Appalachians. [= RAB, C, FNA, G, GW, K, S, WH]

* ***Populus ×jackii*** Sargent [probably *P. balsamifera* × *deltoides*], Balm-of-Gilead. Mt (NC, VA, WV), Pd (VA), Cp (DE): bottomlands, riverbanks, streambanks; uncommon (rare or locally abundant in DE, NC, and VA), spread from cultivation. April. This cultivar is of uncertain origin, considered by some to be a hybrid *P. balsamifera* × *deltoides*, by others to be an atypical pistillate clone of *P. balsamifera* Linnaeus. The cultivar '*gileadensis'* is distinguished from the typical form by the petioles densely and stiffly pubescent (vs. petioles glabrous). *P. ×jackii* is locally abundant along the New River in Watauga, Ashe, and Alleghany counties, NC and downstream into VA. [= C, FNA, K, Y; = *P. candicans* Aiton – RAB, G, S, misapplied; > *P. ×gileadensis* Rouleau – F, W, WV]

* ***Populus nigra*** Linnaeus, Black Poplar, Lombardy Poplar. Pd (GA, VA), Cp (GA, VA): disturbed suburban areas; rare, native of s. Europe. Cultivated in many forms, including the columnar "Lombardy Poplar;" short-lived and only weakly spreading to disturbed areas in the vicinity of plantings. [= C, F, FNA, G, K; > *P. italica* (Du Roi) Moench – S; > *P. nigra* var. *italica* Du Roi – WV]

* ***Populus simonii*** Carrière, Chinese Poplar, Simon's Poplar. Mt (NC): riverbanks; rare, native of China. Naturalized in the Mountains of NC. [= FNA]

Populus tremuloides Michaux, Quaking Aspen. Mt (NC*?, VA, WV), Pd (DE*, VA): heath balds, rocky woodlands, exposed rock oucrops, clearings, floodplains; uncommon (rare in DE, NC, and VA). April-May. NL (Labrador) west to AK,

south to NJ, n. VA, nw. NC (where perhaps not native), WV, MO, and (in the Rockies) to TX and Mexico. [= C, FNA, G, K, S, W, WV; > *P. tremuloides* var. *tremuloides* – F]

Populus* ×*smithii Boivin [*P. grandidentata* × *tremuloides*]. Mt (WV): {habitat}; rare. South to MD and WV. [= C, FNA, K] {not yet keyed}

Salix Linnaeus 1753 (Willow)

A genus of about 400 species, trees, shrubs, and subshrubs, mostly north temperate and boreal. References: Argus in FNA (2010); Argus (1986)=Z; Dorn (1995)=Y; Argus (1997); Chen et al. (2010). Key adapted from Z and FNA.

1 Leaves mostly alternate, but some opposite or subopposite; [subgenus *Vetrix*, section *Helix*] ..... ***S. purpurea***
1 Leaves all alternate.
2 Bud apex sharp-pointed; bud scale margin free and overlapping; leaf blades 2.5-16× as long as wide; [subgenus *Protitea*].
3 Leaf blades (4-) 7-10 (-16)× as long as wide; leaf undersurface glaucous or not; [section *Humboldtianae*].
4 Leaves glaucous beneath; pistils borne on stipes averaging 2 mm long (range 1-5 mm); stipules usually prominent and persistent, to 15 mm long; leaf blades (4-) avg. 7.5 (-13)× as long as wide ..... ***S. caroliniana***
4 Leaves not (or thinly) glaucous beneath; pistils borne on stipes averaging 1 mm long (range 0.5-1.5 mm); stipules usually small and caducous, to 12 mm long; leaf blades (4-) avg. 9 (-16)× as long as wide ..... ***S. nigra***
3 Leaf blades 2.5-5 (-6)× as long as wide; leaf undersurface glaucous.
5 Leaf apex acuminate to caudate; branchlets yellow; [midwestern species east to w. KY]; [section *Humboldtianae*] .... ***S. amygdaloides***
5 Leaf apex acute; branchlets reddish brown or green; [rare plant of sphagnous seepage of GA and FL]; [section *Floridanae*] ..... ***S. floridana***
2 Bud apex blunt; bud scale margin fused; leaf blades 2-30× as long as wide.
6 Leaves green or pale green beneath.
7 Leaves linear, (7-) 11-19 (-30)× as long as wide; leaf margin distinctly glandular-denticulate; stomates present on the upper leaf surface; pistils pubescent to glabrescent; stamens 2, the staminate floral bracts tawny, the aments on leafy branches; [subgenus *Longifoliae*, section *Longifoliae*] ..... ***S. exigua*** *var.* ***sericans***
7 Leaves lanceolate or elliptic-lanceolate, 2-6× as long as wide; leaf margin serrate; stomates usually absent on the upper leaf surface; pistils glabrous; stamens 3, or if 2 (*S. eriocephala*), the staminate floral bracts dark brown, the aments sessile with a few leafy bracts.
8 Stipules not glandular on their margins; pistillate floral bracts present after flowering; petioles not glandular; stamens 2; [subgenus *Vetrix*, section *Cordatae*] ..... ***S. eriocephala*** *var.* ***eriocephala***
8 Stipules glandular on their margins (stipules caducous and often absent in *S. pentandra*); pistillate floral bracts deciduous after flowering; petioles glandular near the junction with the blade; stamens 3-9; [subgenus *Salix*, section *Salicaster*].
9 Stipules persistent and prominently glandular; young leaves and twigs with reddish-brown hairs, glabrescent or glabrous later; leaves long-acuminate; capsules 5-7 mm long ..... ***S. lucida***
9 Stipules caducous, inconspicuously glandular; young leaves and twigs glabrous; leaves short-acuminate; capsules 8-9 mm long ..... ***S. pentandra***
6 Leaves glaucous beneath.
10 Leaf margin entire or crenate (to slightly and irregularly serrate); [subgenus *Vetrix*, section *Cinerella*].
11 Leaves glabrate (sparsely pubescent when young), not revolute ..... ***S. discolor***
11 Leaves permanently pubescent, at least on the lower surface (densely villous or tomentose when young), revolute.
12 Leaf margin entire and undulate; pistillate aments 1-3.5 cm long; pistils borne on stipes mostly < 2 mm long; staminate aments 0.5-2 cm long; shrubs, < 2 m tall.
13 Leaves stipulate; leaf blades (5-) avg. 7 (-13) cm long, (12-) avg. 17 (-35) mm wide; staminate aments 1-2 cm long; pistillate aments 2-3.5 cm long ..... ***S. humilis***
13 Leaves exstipulate; leaf blades (2.5-) avg. 4 (-5) cm long, (5-) avg. 7 (-10) mm wide; staminate aments 0.5-1.1 cm long; pistillate aments 1-2 cm long ..... ***S. occidentalis***
12 Leaf margin crenate or irregularly serrate (rarely nearly entire); pistillate aments 3-8 cm long; pistils borne on stipes mostly > 2 mm long; staminate aments 2-5 cm long; shrubs to small trees, mostly 3-15 m tall.
14 Trees or tall shrubs, to 15 m tall; decorticated wood of 1-4 year old branches smooth or with a few ridges usually < 5 mm long ..... ***S. caprea***
14 Shrubs, 3-7 (12) m tall; decorticated wood of 1-4 year old branches with numerous ridges, many of them longer than 2 cm.
15 Leaves tomentose beneath with a mixture of white and rusty hairs ..... ***S. atrocinerea***
15 Leaves tomentose beneath with white or gray hairs ..... ***S. cinerea***
10 Leaf margin serrulate or serrate.
16 Shrubs to 6 m tall; leaves lacking stomates on the upper surface; [native to our area]; [subgenus *Vetrix*].
17 Stipules prominent, 5-15 mm long; branches flexible; mature leaves glabrous or glabrescent beneath; staminate aments borne on short, leafy branches; [section *Cordatae*] ..... ***S. eriocephala*** *var.* ***eriocephala***
17 Stipules absent or of small glands (rarely to 4 mm long on vigorous shoots); branches brittle; mature leaves short-sericeous beneath; staminate aments sessile, sometimes with a few leafy bracts; [section *Griseae*] ..... ***S. sericea***
16 Trees; leaves with stomates on the upper surface; [introduced in our area]; [subgenus *Salix*].
18 Leaf margin coarsely and irregularly serrate; leaves glabrous beneath; leaf blade 4-7 (-10)× as long as wide; petioles (7-) 10-20 mm long, glabrous; [section *Salix*] ..... ***S. fragilis***
18 Leaf margin minutely and uniformly serrulate; leaves long-sericeous or glabrate beneath; leaf blade 5-13× as long as wide; petioles 3-12 mm long, tomentose or sericeous.
19 Leaves long-sericeous beneath; branches ascending (rarely pendulous); leaves narrowly lanceolate, with length/width ratio of 5-6.5; petioles 3-6 mm long; petioles 3-6 mm long, sericeous; flowering branchlets 1-1.5 cm long; [section *Salix*] ... ***S. alba***
19 Leaves glabrate beneath; branches normally pendulous; leaves very narrowly lanceolate, with length/width ratio of 6.5-13; petioles 7-12 mm long; petioles 7-12 mm long, tomentose; flowering branchlets ca. 0.3 cm long; [section *Subalbae*].

20 Branches yellowish, yellow-green, or yellow-brown ..... ***S. ×sepulchralis***
20 Branches yellow-brown to red-brown, or gray-brown.
21 Pistillate catkins on branchlets that are (0-) 2-4 mm long; ovary beak abruptly tapered to styles; anthers 0.4-0.5 mm long..... ***S. babylonica***
21 Pistillate catkins on branchlets that are 3-14 mm long; ovary beak gradually tapered to styles; anthers 0.5-0.8 long.
22 Petioles glabrous, pilose, or velvety to glabrescent on the upper surface; branches yellow-brown, gray-brown, or red-brown; staminate catkins loosely flowered, stout, nectaries connate connate and shallowly cup-shaped .... ***S. ×pendulina***
22 Petioles short-silky on the upper surface; branches yellow-brown; staminate catkins moderately densely flowered. slender, nectaries distinct ..... ***S. ×sepulchralis***

* ***Salix alba*** Linnaeus, European White Willow. Mt (GA, NC, VA), Pd (DE, GA, NC, VA), Cp (DE, VA): disturbed areas; uncommon (rare in GA, NC, and VA), native of Eurasia. March-April. [= RAB, C, F, FNA, G, K, S, W, Z]

Salix amygdaloides Andersson, Peachleaf Willow. Mt (WV): floodplains and other wet places; rare. April-May. QC west to BC, south to PA, n. WV, w. KY, MO, TX, NM, NV, AZ, and OR. [= C, F, FNA, G, K, Z]

* ***Salix atrocinerea*** Brotero, Common Sallow, Olive-leaf Willow, Large Gray Willow. Mt (NC): disturbed areas; rare, native of western Europe. April. Also reported as naturalized in KY (Clark et al. 2005) and PA (Kartesz 1999). [= FNA, K; = *S. cinerea* Linnaeus ssp. *oleifolia* (Smith) Macreight – Z; < *S. cinerea* – RAB, C, F, G]

* ***Salix babylonica*** Linnaeus, Weeping Willow. Mt (GA, NC, SC, VA, WV), Pd (DE, GA, NC, SC, VA), Cp (DE, FL, GA, NC, SC, VA): disturbed areas; common (uncommon in DE and WV, rare in FL), native of Asia. March-April. Note that many trees identified as *S. babylonica* may actually be one of two commonly cultivated hybrids, *S.* × *pendulina* and *S.* ×*sepulchralis*, with *S. babylonica* as one parent. [= RAB, C, F, FNA, G, K, W, WH, WV, Z]

* ***Salix caprea*** Linnaeus, Goat Willow, Great Sallow. Mt (NC, VA), Pd (DE, VA): disturbed areas; uncommon (rare in NC and VA), native of Eurasia. April. [= C, F, FNA, G, K, Z]

Salix caroliniana Michaux, Carolina Willow, Coastal Plain Willow. Cp (FL, GA, NC, SC, VA), Pd (GA, NC, SC, VA), Mt (GA, NC, SC, VA, WV): riverbanks, sandbars, other wet sites; common (uncommon in Piedmont and Mountains). March-April. Widespread in the Southeast, *S. caroliniana* has a somewhat peculiar range, with three main centers of distribution, the Coastal Plain from VA south to s. FL, the Interior Low Plateau of TN, KY, and n. AL, and the Ozark-Ouachita Highlands of AR and MO. [= RAB, C, F, FNA, G, GW, K, WH, WV, Z; = *S. longipes* Andersson – S]

* ***Salix cinerea*** Linnaeus, Gray Willow. Mt (NC, SC, WV), Pd (GA, NC, SC, VA), Cp (NC): disturbed areas; rare, native of Eurasia. April. [= FNA, K; = *S. cinerea* ssp. *cinerea* – Z; < *S. cinerea* – RAB, C, F, G, WV (circumscription uncertain but apparently including *S. atrocinerea*)]

Salix discolor Muhlenberg, Pussy Willow. Mt (VA, WV), Pd (DE, NC*): calcareous wetlands, disturbed areas; rare, apparently native in DE, VA, and WV, introduced only in NC. March-April. NL (Newfoundland) and AB south to DE, w. VA, WV, KY, MO, SD, and MT. [= C, FNA, K, S, Z; > *S. discolor* var. *discolor* – F, G, WV; > *S. discolor* var. *latifolia* Andersson – F, G, WV; > *S. discolor* var. *prinoides* (Pursh) Andersson – WV]

Salix eriocephala Michaux, Heart-leaved Willow. Mt (GA, VA, WV), Pd (DE, GA, VA), Cp (FL, GA, VA): mesic forests, seepage areas, ditches, alluvial areas; common (rare in FL). April-May. NL (Newfoundland) west to ND, south to w. FL and s. KS (Dorn 1995). [= FNA; < *S. eriocephala* – C, K, W, WH, Z; > *S. rigida* Muhlenberg var. *rigida* – F, G; > *S. rigida* var. *angustata* (Pursh) Fernald – F; > *S. rigida* var. *vestita* (Andersson) Ball – G; = *S. cordata* Muhlenberg – S, misapplied; < *S. rigida* – WV; = *S. eriocephala* ssp. *eriocephala* var. *eriocephala* – Y]

Salix exigua Nuttall *var.* ***sericans*** (Nees) Nesom, Sandbar Willow. Mt (VA, WV), Pd (VA), Cp (DE, VA): sandbars, riverbanks, creekbanks; common (rare in DE and VA). March-mid May and June-August. *S. exigua* occurs throughout North America except most of the Southeast, south to DE, se. VA, w. VA, e. TN, MS, LA, TX, and Mexico; var. *sericans* is the more eastern variety of the complex (Nesom 2002). [< *Salix exigua* – W, Z; > *S. exigua* ssp. *interior* (Rowlee) Cronquist var. *angustissima* (Andersson) Reveal & Broome – C; > *S. interior* Rowlee var. *interior* – F, G; = *S. interior* Rowlee – FNA, GW, K, S, WV]

Salix floridana Chapman, Florida Willow. Cp (FL, GA): sphagnous seepages; rare. March-April. C. GA south to c. peninsular and Panhandle FL. [= FNA, GW, K, S, WH, Z]

* ***Salix fragilis*** Linnaeus, Crack Willow, Brittle Willow. Pd (DE, VA), Mt (WV), Cp (DE): low areas; uncommon (rare in VA), native to Asia Minor, introduced to Europe and thence to here. [= C, F, G, K, S, WV, Z; = *S.* ×*fragilis* Linnaeus – FNA]

Salix humilis Marshall, Upland Willow, Prairie Willow. Mt (GA, NC, VA, WV), Pd (DE, GA, NC, VA), Cp (DE, FL, GA, NC, SC, VA): upland areas, often in open or semi-open sites, in barrens, fens, and grassy balds over mafic rocks (such as amphibolite) up to at least 1800m elevation, also in powerline rights-of-way, woodland borders, and other miscellaneous habitats; uncommon. March-May. NL (Newfoundland) and MB, south to FL and TX. [= C, G, S, WH; < *S. humilis* – RAB, GW (also see *S. occidentalis*); = *S. humilis* var. *humilis* – FNA, K, W, Z; > *S. humilis* var. *humilis* – F, WV; > *S. humilis* var. *hyporhysa* Fernald – F, WV]

* ***Salix lucida*** Muhlenberg, Shining Willow. Mt (VA*?, WV), Pd (DE), Cp (DE): seepages, low areas; rare. May. Uncertainly indigenous to the one known VA population in Roanoke County. [= C, FNA, W, WV, Z; > *S. lucida* var. *lucida* – F, G; = *S. lucida* ssp. *lucida* – K]

Salix nigra Marshall, Black Willow. Pd (GA, NC, SC, VA), Mt (DE, GA, NC, SC, VA, WV), Cp (DE, FL, GA, NC, SC, VA): riverbanks, sandbars, other moist areas; common. March-April. NB, MN, NE, and CO, south to ne. FL, Panhandle FL, LA, and TX. [= RAB, F, FNA, G, GW, K, S, W, WH, WV, Z; ? *S. nigra* var. *nigra* – C]

Salix occidentalis Walter, Dwarf Upland Willow, Sage Willow. Mt (GA, NC, VA, WV), Pd (DE, GA, NC, VA), Cp (DE, GA, NC, SC, VA): upland areas, often over mafic (amphibolite) or ultramafic (olivine) rocks; uncommon (rare in WV). March-May. This species is less widespread than the related *S. humilis,* with a distribution centered in the central Appalachians. ME to

ND, south to GA, LA, and OK. [= C; < *S. humilis* – RAB, GW; = *S. humilis* var. *microphylla* (Andersson) Fernald – F, W, Z; = *S. tristis* Aiton – G, S, WV; = *S. humilis* var. *tristis* (Aiton) Griggs – FNA, K]

* ***Salix ×pendulina*** Wenderoth [***S. babylonica* × *euxina***], Weeping Willow. {DC, GA, MD, NC, VA, WV}: disturbed areas; uncommon, a hybrid introduced from Europe. March-April. [= FNA, K]

* ***Salix pentandra*** Linnaeus, Bay Willow. Mt (NC, VA), Pd (NC): disturbed areas; rare (perhaps not established), native of Eurasia. April. [= C, F, FNA, G, K, Z]

* ***Salix purpurea*** Linnaeus, Basket Willow, Purple Willow, Purple Osier. Mt (NC, VA), Pd (DE, GA, VA), Cp (DE): disturbed areas; uncommon (rare in GA, NC, VA, and WV), native of Europe. April. [= RAB, C, F, FNA, G, K, S, WV, Z]

* ***Salix ×sepulcralis*** Simonkai [***S. alba* × *babylonica***], Weeping Willow. {DC, KY, LA, MD, NC, VA, WV}: disturbed areas: uncommon, a hybrid introduced from Europe. March-April. [= FNA, K]

Salix sericea Marshall, Silky Willow. Mt (GA, NC, SC, VA), Pd (DE, NC, SC, VA), Cp (DE, NC, SC, VA): bogs, peaty swamps, banks of small streams; common (uncommon in DE, GA, NC, SC, and VA). March-April. *S. sericea* is a northeastern species, ranging south to w. NC, ne. GA, e. TN, sc. TN, AL, and AR. [= RAB, C, F, FNA, G, GW, K, S, W, WV, Z]

Salix bebbiana Sargent, Long-beaked Willow, Gray Willow, is widespread and rather common in PA (Rhoads & Klein 1993) and also occurs in MD (Argus 1986). [= C, FNA, K, Z; > *S. bebbiana* var. *bebbiana* – F] {subgenus *Salix*, section *Fulvae*}

Salix cordata Michaux, south to MD, PA (Kartesz 1999). {investigate} [= C, FNA, K; > *S. cordata* var. *cordata* – F] {not yet keyed}

* ***Salix elaeagnos*** Scopoli, Hoary Willow, Rosemary Willow, Diamond Willow. Reported for SC (Kartesz 1999). [= FNA, K] {subgenus *Vetrix*, section *Canae*} {not yet keyed}

* ***Salix matsudana*** Koidzumi, Corkscrew Willow. Pd (VA): disturbed areas; rare, doubtfully naturalized, native of e. Asia. Reported for VA (Fairfax and Fauquier counties). [= K] {not keyed}

Salix petiolaris Sm. Cp (NJ). {research}

* ***Salix triandra*** Linnaeus, Almond-leaf Willow. {DC, VA}. [= FNA] {not yet keyed}

202. VIOLACEAE Batsch 1802 (Violet Family) [in MALPIGHIALES]

A family of about 20 genera and 900 species, herbs, shrubs, and vines, cosmopolitan in distribution. References: McKinney & Russell (2002)=X.

1 Plants caulescent, 3-10 dm tall, the leaves narrowly cuneate to a petiole 0-20 mm long, also long acuminate; petals green ..... ***Hybanthus***

1 Plants acaulescent or caulescent, 0-4 dm tall, if caulescent, the leaves not at the same time cuneate, short-petiolate, and acuminate; petals white, yellow, violet, or blue, the lowermost spurred..... ***Viola***

Hybanthus Jacquin (Green-violet)

A genus of about 70-150 species, shrubs and herbs, of tropical and warm temperate regions of the Old and New Worlds. Likely to be split in the near future, *H. concolor* retained in a much smaller genus *Hybanthus*, with only 2-3 species, and *H. parviflorus* to be placed in the moderately large genus *Pombalia* Vandelli (H.E. Ballard, pers. comm.). References: McKinney & Russell (2002)=X; Wofford et al. (2004).

1 Leaves 9-17 cm long, entire (or with a few obscure teeth); capsule 15-20 mm long; seeds ca. 4 mm long; [native, of nutrient-rich forests] ..... ***H. concolor***

1 Leaves 0.6-3 cm long, finely crenate; capsule 3-4 mm long; seeds ca. 1.5 mm long; [alien, of weedy areas]..... ***H. parviflorus***

Hybanthus concolor (T.F. Forster) Sprengel, Green-violet. Mt (GA, NC, SC, VA, WV), Pd (DE, GA, NC, SC, VA), Cp (GA, VA): very nutrient-rich and mesic forests; common (uncommon in GA, NC, SC, VA, rare in DE). Cleistogamous flowers: April-early May; late May-June. Chasmogamous flowers: Late May-June; August-October. VT and s. ON west to MI and KS, south to SC, GA, and AR. [= RAB, C, F, G, K, W, WV, X; = *Cubelium concolor* (T.F. Forster) Rafinesque ex Britton & A. Brown – S]

* ***Hybanthus parviflorus*** (Mutis ex Linnaeus f.) Baillon. Cp (GA): disturbed area; rare, native of South America. April. First collected in North America in New Jersey in the 19th century; and again in 1998 by Tom Govus at Fort Pulaski National Monument (Chatham County, GA). It is unclear whether this is a recent introduction or an old weed introduced via ship's ballast (Wofford et al. 2004). [= ***Pombalia***]

Viola Linnaeus 1753 (Violet, Johnny-jump-up, Pansy)
(contributed by B.A. Sorrie and A.S. Weakley)

A genus of about 525-600 species, herbs (rarely subshrubs), of temperate regions of the Old and New Worlds. References: Ballard (1992)=Z; Ballard (1994); Gil-ad (1998)=Y; McKinney & Russell (2002)=X; Haines (2001)=V; McKinney (1992); Ballard & Wujek (1994); Russell (1955); Ballard, Sytsma, & Kowal (1999); GW. Key adapted, in part, from Ballard (1992) and Ballard & Wujek (1994).

Identification notes: *Viola* has presented numerous problems in taxonomy, distribution, and identification. Particularly troublesome are the so-called "acaulescent blue violets", including *V. sororia*, *V. sagittata*, *V. palmata*, *V. septemloba*, etc. They may be difficult to identify due to morphological overlap, or trying to key plants without mature leaves; in some instances hybridization may be suspect. Leaf maturity is an

important feature to recognize–the earliest 1-2 leaves produced in most of these taxa are generally ovate-cordate in outline and may not display characteristic lobing, toothing, or pubescence until more mature leaves are produced, 1-2 weeks later. Specimens thus collected early in the flowering period can present the botanist with a perplexing series of plants that do not key cleanly. A second troublesome group contains the small white violets, including *V. blanda*, *V. incognita*, and *V. macloskeyi*. These taxa have been dealt with in various ways, but resist a wholly satisfactory treatment, due to apparent hybridization (Russell, 1954, Amer. J. Bot. 41: 679-85; Russell, 1955, Amer. Midl. Nat. 54: 481-94). However, recent reviews of these 3 species in the Southeast show that *V. blanda* and *V. macloskeyi* are quite distinct, with *V. incognita* less so (but this may be due to paucity of specimens from the area). A third difficult group contains *V. appalachiensis*, *V. conspersa/labrodorica*, and *V. walteri*. They have been treated recently by Ballard (1992, 1994) and McKinney & Russell (2002). Despite the problems present in the genus, the great majority of plants encountered in the field may be successfully keyed out, particularly by botanists working within an area of several counties. Violet species are usually quite faithful to one or a few plant community types, so once learned these habitats can be valuable indicators as to which species to expect. Botanists working in larger regions (state, floristic province), however, must be aware of increased morphological variation and potential hybridization. The works of McKinney & Russell and Ballard provide the most satisfactory understanding of taxa and are followed here, with exceptions based on field and herbarium studies throughout the Southeast US. All species possess brownish or reddish nectar guide striae in the corolla throat; these are ignored in the key. Hairs of the corolla throat and on leaf surfaces are important key characters; several plants should be inspected with a 10× lens before deciding the character state.

1 Plant caulescent (producing aerial stems bearing leaves and flowers).
  2 Corolla yellow, or white with a yellow center (sometimes drying lavender); stipules entire or erose ..... **Key A**
  2 Corolla wholly cream-colored, or cream with a yellow center, or blue-violet, or multicolored (blue or violet with orange or yellow); stipules fringed or deeply lobed..... **Key B**
1 Plant acaulescent (with leaf petioles and flower stalks arising separately from the base of the plant).
  3 Plant producing stolons; corolla white (or blue in *V. odorata*)..... **Key C**
  3 Plant not producing stolons; corolla blue-violet (or yellow in *V. rotundifolia*)..... **Key D**

Key A – Caulescent Violets with yellow or white flowers

1 Corolla white with a yellow center (sometimes drying lavender); stipules long-triangular, attenuate..... ***V. canadensis*** *var.* ***canadensis***
1 Corolla solid yellow; stipules ovate to narrowly ovate.
  2 Leaf blades deeply 3-lobed..... ***V. tripartita***
  2 Leaf blades cordate or hastate.
    3 Leaves at least as wide as long.
      4 Stems 2-several; basal leaves 4 or more; foliage glabrous to glabrate; [widespread in our region] ..... ***V. pensylvanica***
      4 Stems 1; basal leaves 0-2; foliage densely pubescent; [montane in our region] ..... ***V. pubescens***
    3 Leaves distinctly longer than wide.
      5 Leaf blade hastate; base of leaf strongly cordate ..... ***V. hastata***
      5 Leaf blade narrowly ovate; base of leaf blade rounded to broadly cuneate..... ***V. tripartita***

Key B – Caulescent Violets with blue, cream, or multicolored flowers

1 Stipules foliaceous, deeply lobed (the lobes narrow, but not ciliate or fringed; leaves cuneate at base; plants annual, without thickish rootstock; [of weedy habitats].
  2 Corolla pale blue with a cream center; petals 2× as long as the sepals..... ***V. bicolor***
  2 Corolla either cream with a yellow center or multicolored; petals < 2× as long as the sepals.
    3 Corolla cream with a yellow center; petals shorter than the sepals or longer by up to 2 mm ..... ***V. arvensis***
    3 Corolla multicolored (cream to orange with a yellow center, the upper petals at least partly dark blue); petals longer than the sepals by 2 mm or more ..... ***V. tricolor***
1 Stipules herbaceous, fringed or ciliate along the margin; leaves truncate or cordate at the base; plants perennial, with thickish rootstock; [mainly of natural habitats]; [section *Viola*].
  4 Stems immediately becoming prostrate at time of flowering; stems persistent through winter, rooting at the nodes, and generating the following year's plants at their tips (plants thus mat-forming).
    5 Leaf blades with scattered hairs near the margin only; petioles, peduncles and stems glabrous; stipules shallowly lacerate, with marginal processes < ¼ as long as the stipule..... ***V. walteri*** *var.* ***appalachiensis***
    5 Leaf blades moderately to densely puberulent over the entire surface; petioles, peduncles and stems moderately to densely puberulent; stipules deeply laciniate with marginal processes > ½ as long as the stipule ..... ***V. walteri*** *var.* ***walteri***
  4 Stems ascending to erect at time of flowering and fruiting; stems deciduous at end of growing season, not rooting at nodes (plants thus solitary).
    6 Corolla wholly cream-colored..... ***V. striata***
    6 Corolla blue or blue-violet.
      7 Spur of basal petal 4-6 mm long; lateral petals bearded within; corolla uniformly blue ..... ***V. labradorica***
      7 Spur of basal petal 10-15 mm long; lateral petals beardless; corolla lavender, with a purple-black eyespot surrounding the throat..... ***V. rostrata***

Key C – Acaulescent Violets with stolons and white (or rarely blue) flowers

1 Flowers generally blue (sometimes white or blue-and-white variegated); style terminating in a slender hook ca. 1 mm long; capsules hirtellous; [introduced, cultivated, rarely persistent or spreading] ..... ***V. odorata***
1 Flowers white; style broad at the tip, in most species resembling a scoop; capsules glabrous; [native].
  2 Leaf blades > 1.5× as long as broad.

3 Leaf blades lance-ovate, broadly cuneate to subtruncate at the base ..... ***V. primulifolia***
3 Leaf blades linear to lanceolate, narrowly cuneate at the base.
4 Leaf blades lanceolate, < 8× as long as wide; plant glabrous ..... ***V. lanceolata*** *var.* ***lanceolata***
4 Leaf blades linear or narrowly lanceolate, > 10× as long as wide; plant glabrous to pubescent..... ***V. lanceolata*** *var.* ***vittata***
2 Leaf blades < 1.5× as long as broad.
5 Leaf blades completely glabrous (petioles may be villous); [of wet, acidic seepage or swampy woods, often with *Sphagnum*] ..... ***V. macloskeyi*** *var.* ***pallens***
5 Leaf blades pubescent, at least on the upper surface of the basal lobes; [of wet to more mesic situations].
6 Lateral petals glabrous within; petioles and peduncles usually reddish-tinged; leaf apex acute; basal lobes of the leaf often overlapping; pubescence of the upper leaf surface often restricted to the basal lobes; [of mesic, often nutrient-rich forests] ..... ***V. blanda***
6 Lateral petals bearded within; petioles and reduncles green; leaf apex obtuse to rounded; basal lobes of the leaf not overlapping; pubescence of the upper leaf surface usually widespread; [of mesic to wet situations]..... ***V. incognita***

Key D – Acaulescent Violets without stolons, with blue-violet or yellow flowers

1 Corollas yellow; leaf blades rotund, lie nearly flat on ground ..... ***V. rotundifolia***
1 Corollas violet to bluish or purple, leaves various (flat on ground only in some *V. villosa* and *V. hirsutula*).
2 Leaf blades deeply divided throughout, or lobed basally, or deeply toothed basally (beware that in *V. pedata* the earliest 1-2 leaves may be uncut and cordate!, to shallowly lobed).
3 Blades **either** divided, lobed, or deeply toothed only on basal portion, **or** blades incised only in distal half.
4 Orange stamens conspicuously exsert and beak-like; blades incised only in distal half or only apically ..... ***V. pedata*** *var.* ***1***
4 Stamens not visible, not exsert; blades divided, lobed, or deeply toothed only on basal portion.
5 Blade outline oblong-lanceolate to ovate-triangular, much longer than wide.
6 Petioles distinctly shorter than blades; blades densely pubescent, apex blunt, basal teeth undeveloped or with a few coarse teeth on mature leaves ..... ***V. sagittata*** *var.* ***ovata***
6 Petioles equal or longer than blades; blades glabrous or glabrate, apex acute; basal teeth well developed, very coarse to lobe-like..... ***V. sagittata*** *var.* ***sagittata***
5 Blade outline ovate to subrotund, about as wide as long.
7 Plant moderately to densely pubescent, at least on petioles and undersurface of leaves; mature leaves trilobed; [of mesic to dryish woods]..... ***V. palmata***
7 Plant glabrous or glabrate (hairs on leaf margins or atop lobes).
8 Mature leaves trilobed, with 1 (-2) reniform or obovate lobes on each side; spurred petal glabrous; [of small blackwater streamsides and floodplains]..... ***V. esculenta***
8 Mature leaves deeply lobed with 2-3 lanceolate lobes on each side; spurred petal bearded; [of mesic to moist pine savannas and pocosin ecotones] ..... ***V. septemloba***
3 Blades deeply divided throughout into linear or lanceolate segments (or with several narrow lateral segments and a broadly lanceolate central segment), blades about as broad as long, or broader.
9 Lateral petals glabrous within; orange stamens conspicuously exsert and beak-like..... ***V. pedata*** *var.* ***pedata***
9 Lateral petals bearded; stamens not visible, not exsert.
10 Central lobe of leaf blade mostly 1-2.5× the width of the first lateral lobes.
11 Blades pubescent, divisions mastly 7-11; [midwestern, disjunct to shale barrens of western VA] ..... ***V. pedatifida***
11 Blades glabrous or glabrate, divisions 5-11; [**either** of limestone glades **or** of Coastal Plain woodlands].
12 Blade divisions 7-11; [of Coastal Plain, moist to mesic hardwoods along rivers or streams]..... ***V. brittoniana***
12 Blade divisions 5-9; [of inland regions, dry limestone glades or barrens]..... ***[V. egglestonii]***
10 Central lobe of leaf blade mostly 3-4× the width of the first lateral lobes
13 All leaves homophyllous, the early ones not ovate, rotund, or cordate; blades pubescent; [of Piedmont and Mountains]..... ***V. subsinuata***
13 Leaves heterophyllous, the early ones ovate, rotund, or cordate, the mature ones divided; blades pubescent or glabrate; [of various distributions].
14 Blades and petioles moderately to densely pubescent; lowermost lobe directed outward parallel to ground; [primarily of mesic hardwoods, widespread] ..... ***V. palmata***
14 Blades glabrous or glabrate; lowermost (outermost) lobe on each half of blade usually directed downward towards ground; [primarily of pine savannas on Coastal Plain] ..... ***V. septemloba***
2 Leaf blades merely serrate or crenate on margin; ovate to subrotund in outline, cordate or truncate basally.
15 Most or all blades longer than broad, narrowly ovate to long-triangular, tapering to an acute apex.
16 Blades and petioles moderately to densely pubescent; leaves distinctly longer than wide; dry to xeric clearings and banks ..... ***V. sagittata*** *var.* ***ovata***
16 Blades and petioles glabrous or glabrate.
17 Lateral petals bearded with clavate hairs; spurred petal glabrous within; [of swamps, seepages, bogs, and sphagnous streamsides].. ***V. cucullata***
17 Lateral petals with hairs of essentially uniform width; spurred petal bearded within.
18 All leaf teeth uniform; leaf bases cordate; [of mesic woods to moist seepages to streamsides]..... ***V. sororia*** *var.* ***missouriensis***
18 Basal teeth longer than others; leaf bases truncate to subcordate (ignore earliest 1-2 leaves).
19 Leaf outline broadly triangular, not much longer than wide; basal teeth of the leaf numerous,± pectinate..... ***V. brittoniana***
19 Leaf outline narrowly ovate-triangular, much longer than wide; basal teeth of the leaf few, very coarse..... ***V. sagittata*** *var.* ***sagittata***
15 Blades as wide as long or wider, ovate to suborbicular, apex obtuse (to acute).
20 Lateral petals bearded with clavate hairs; foliage glabrous or glabrate.

21 Petals light blue or light blue-violet, with a dark eye (also with dark veins); sepals 8-12 mm long; no plants in population with lobed blades; [mostly Piedmont and Mountains, rare in Coastal Plain] ..... ***V. cucullata***
21 Petals blue-violet with a white eye (also with dark veins); sepals 6-7(-8) mm long; at least some plants in population with trilobed leaves; [mostly Coastal Plain, inhabiting small blackwater floodplains and streamsides] ..... ***V. esculenta***
20 Lateral petals bearded with hairs of uniform width; foliage distinctly pubescent, glabrate, or glabrous.
22 Leaf blades moderately to densely pubescent on one surface or both, and on petioles.
23 Leaf blades equally pubescent on both surfaces.
24 Leaf blades large, apex acute, carried aloft on long petioles, deciduous; peduncles shorter than to equaling petioles ..... ***V. sororia*** *var.* ***sororia***
24 Leaf blades small, apex very blunt or rounded, lie almost flat on ground; evergreen or tardily deciduous; peduncles much longer than petioles ..... ***V. villosa***
23 Leaf blades much more pubescent on one surface than the other.
25 Leaf blades densely pubescent above, sparsely so beneath and on petiole; apex blunt to rounded; in life dark veins prominent on pale upper surface of blade ..... ***V. hirsutula***
25 Leaf blades hairy beneath and on petiole, glabrate above; apex acute; veins same shade as blade surface..... ***V. septentrionalis***
22 Leaf blades glabrous or glabrate, or with hairs confined to just the basal lobes; petioles glabrous or glabrate.
26 Leaf blades with obvious area of hairs confined to upper surface of basal lobes; spurred petal bearded; no plants in population with lobed leaves ..... ***V. sororia*** *var.* ***missouriensis***
26 Leaf blades glabrous or glabrate.
27 At least some plants in population with trilobed leaves; [southern and mainly Coastal Plain, of small blackwater streamsides and floodplains] ..... ***V. esculenta***
27 No plants with lobed leaves; spurred petal glabrous or glabrate, or densely bearded; [collectively widespread].
28 Spurred petal densely bearded; leaf blades reniform; [northern, ranging south to PA and WV, of fens and swamps in alkaline soils] ..... ***V. nephrophylla***
28 Spurred petal glabrous or glabrate; leaf blades ovate to widely triangular; [widespread, of mesic slopes to moist floodplains] ..... ***V. sororia*** *var.* ***sororia***

* ***Viola arvensis*** Murray, European Field-pansy. Cp (DE, GA, LA, MD, NC, SC, VA), Pd (DC, DE, GA, MD, NC, SC, VA), Mt (NC, SC, VA, WV): roadsides, fields; common (rare in WV), native of Europe. March-July. [= RAB, C, F, G, K, S, W, WV, X]

Viola bicolor Pursh, Wild Pansy. Mt (GA, NC, SC, VA, WV), Pd (DE, GA, NC, SC, VA), Cp (DE, FL, GA, NC, SC, VA): pastures, roadsides, lawns, other disturbed habitats; common (uncommon in FL). March-May. MA and NY west to SD and CO, south to Panhandle FL, TX, and AZ. [= K, X; = *V. rafinesquii* Greene – RAB, C, G, S, W, WV; = *V. kitaibeliana* J.A. Schultes var. *rafinesquii* Fernald – F; = *V. rafinesquei*, orthographic variant]

Viola blanda Willdenow, Sweet White Violet. Mt (GA, MD, NC, SC, VA, WV), Pd (DE, MD, NC, VA): moist, rich forests; common (uncommon in Piedmont). NH and QC west to MN and ne. ND, south to DE, MD, w. NC, n. GA, e. TN, OH, IN, IL, and e. IA. [= F, G, S, WV; < *V. blanda* – RAB, C, W, X (also see *V. incognita*); = *V. blanda* var. *blanda* – K, V]

Viola brittoniana Pollard. Cp (DE, MD, NC, SC, VA): low ground, including brackish areas; uncommon. April-May. MA to SC, along the coast. [= V, Y; > *V. brittoniana* Pollard var. *brittoniana* – RAB, G, K; > *V. brittoniana* Pollard var. *pectinata* (Bicknell) Alexander – RAB, G, K; < *V. palmata* var. *palmata* – C; > *V. brittoniana* – F; > *V. pectinata* Bicknell – F; = *V. pedatifida* G. Don ssp. *brittoniana* (Pollard) McKinney – X; = *V. brittoniana* – V, Y]

Viola canadensis Linnaeus *var.* ***canadensis***, Tall White Violet. Mt (GA, MD, NC, SC, VA, WV), Pd (NC, VA): rich cove forests, other rich mesic situations, such as floodplains; common. April-July. NL (Newfoundland) to ON, south to GA, AL, TN, and AR. Other varieties are more western. [= RAB, C, K, V; >< *V. canadensis* var. *rugulosa* (Greene) C.L. Hitchcock – RAB, C, misapplied as to plants in our area; = *V. canadensis* – F, G, S; >< *V. rugulosa* Greene – G, misapplied as to our plants; < *V. canadensis* – W, X]

Viola cucullata Aiton, Blue Marsh Violet, Bog Violet. Mt (GA, MD, NC, SC, VA, WV), Pd (DE, GA, NC, SC, VA), Cp (DE, NC, SC, VA): bogs, seeps, margins of spring branches; common. April-June. NL (Newfoundland) west to MN, south to SC, GA, AL, MS, and MO. [= RAB, C, G, GW, K, S, V, W, X, Y; > *V. cucullata* var. *cucullata* – F; > *V. cucullata* – WV; > *V. obliqua* Hill]

Viola egglestonii Brainerd. Mt (GA): calcareous barrens; rare. In c. and se. TN (Chester, Wofford, & Kral 1997), nw. GA (Jones & Coile 1988), IN, KY, and AL (Kartesz 1999). [= K, Y; < *V. palmata* var. *pedatifida* – C; = *V. egglestoni* – F, G, orthographic variant; = *V. septemloba* LeConte ssp. *egglestonii* (Brainerd) L.E. McKinney – X]

Viola esculenta Elliott ex Greene. Cp (AL, FL, GA, LA, MS, NC, SC, VA), Pd (SC): small blackwater streamsides and floodplains; uncommon (rare in VA, rare in Piedmont). Se. VA south to n. peninsular FL, west to e. TX. [= F, G, GW, S; < *V. septemloba* – RAB; < *V. palmata* var. *palmata* – C; = *V.* ×*esculenta* Elliott ex Greene (pro sp.) (*septemloba* × *triloba*) – K; = *V. palmata* Linnaeus var. *esculenta* Elliott ex D.B. Ward]

Viola hastata Michaux, Spearleaf Violet, Silverleaf Violet, Halberd-leaf Violet. Mt (AL, GA, MD, NC, SC, VA, WV), Pd (GA, MD, NC, SC, VA), Cp (FL): acidic coves, dry-mesic oak forests, bluff forests; common (rare in Coastal Plain). Late March-May. PA and OH south to GA, Panhandle FL, and AL. [= RAB, C, F, G, K, S, W, WV, X]

Viola hirsutula Brainerd. Mt (AL, GA, NC, VA, WV), Pd (AL, DE, GA, NC, SC, VA), Cp (NC): bottomlands and moist slopes; common (rare in NC Coastal Plain). CT, NY, PA, OH, and s. IN, south to Panhandle FL, AL, and MS. [= RAB, F, G, K, S, W, V, WV, X; < *V. villosa* Walter – C]

Viola incognita Brainerd. Mt (NC, VA, WV): moist to wet forests; rare. April-June. NL (Labrador) to MN, south to DE, PA, and WI, and in the Appalachians south to w. NC. [= S, WV; < *V. blanda* – RAB, C, X; > *V. incognita* var. *incognita* – F, G; > *V. incognita* var. *forbesii* Brainerd – F, G; = *V. blanda* Willdenow var. *palustriformis* A. Gray – K, V]

Viola labradorica Schrank, American Dog-violet. Mt (GA, MD, NC, SC, VA, WV), Pd (DE, MD), Cp (FL, GA, VA): moist alluvial woodlands and forests, seepage slopes, marl ravines, hammocks; uncommon (rare in FL, GA, and WV). Late March-May. NL (Labrador) west to AK, south to e. VA, nw. SC, n. GA, c. AL, and OH; disjunct in sw. GA and Panhandle FL.

Ballard (1992) concluded that *V. conspersa* was not distinct from *V. labradorica*. [= K, V, X, Z; > *V. conspersa* Reichenbach – RAB, C, F, G, GW, S, W, WV]

Viola lanceolata Linnaeus *var.* ***lanceolata***, Lanceleaf Violet. Cp (AL, DE, FL, GA, MD, NC, SC, VA), Pd (DE, NC), Mt (VA, WV): wet habitats; common (uncommon in Piedmont and Mountains). March-May. NB west to MN, south to FL and e. TX. [= C, F, V; < *V. lanceolata* – RAB, W, X; = *V. lanceolata* ssp. *lanceolata* – GW, K; = *V. lanceolata* – G, S, WV]

Viola lanceolata Linnaeus *var.* ***vittata*** (Greene) Weatherby & Griscom, Strap-leaf Violet. Cp (GA, NC, SC, VA): wet pinmelands, depressions ponds, other wetlands; common. February-May. Se. VA south to FL, west to e. TX. [= C, F, V; < *V. lanceolata* – RAB, W, X; = *V. lanceolata* ssp. *vittata* (Greene) Russell – GW, K; = *V. vittata* Greene – G, S]

Viola macloskeyi F. Lloyd *var.* ***pallens*** (Banks ex A.P. de Candolle) C.L. Hitchcock, Wild White Violet. Mt (GA, NC, SC, VA, WV), Pd (DE, NC, VA), Cp (DE): brookbanks, seepages; uncommon (rare in DE). NL (Labrador) west to NT, south to GA, AL, MS, MO, SD, CO, UT, NV, and CA. Perhaps better recognized at the specific level, as *V. pallens*, which seems distinct from the narrowly distributed *V. macloskeyi*, of CA, OR and e. NV. Ballard et al. (2001) suggest that Hispaniolan *V. domingensis* Urban is conspecific with *V. macloskeyi sensu lato*. [= RAB, C; = *V. pallens* (Banks ex A.P. de Candolle) Brainerd – F, G, GW, S, WV; > *V. pallens* var. *pallens* – G; > *V. pallens* var. *subreptans* Rousseaux – G; = *V. macloskeyi* ssp. *pallens* (Banks ex A.P. de Candolle) M.S. Baker – K, V, W; < *V. macloskeyi* F. Lloyd – X]

Viola nephrophylla Greene, Northern Bog Violet. Mt (WV): bogs; rare. May. NL (Newfoundland) and YT south to PA, WV, IN, IL, LA, TX, and CA. [= C, F, G, K, V, WV] {add to synonymy}

* ***Viola odorata*** Linnaeus, Sweet Violet, English Violet. Pd (NC, VA), Mt (NC), Cp (LA), {GA}: gardens, lawns, disturbed places, persistent or weakly spreading from horticultural use; rare, native of Europe. [= C, F, G, K, S, V, Z]

Viola palmata Linnaeus, Wood Violet. Mt (AL, GA, MD, NC, SC, VA, WV), Pd (AL, DE, GA, NC, SC, VA), Cp (FL, DE, GA, NC, SC, VA): moist forests; common (uncommon in DE). ME west to WI, south to FL, AL, MS, and LA. [= V, X; > *V. palmata* var. *palmata* – RAB, WV; > *V. palmata* var. *triloba* (Schweinitz) Gingins ex A.P. de Candolle – RAB, WV; < *V. palmata* var. *palmata* – C; > *V. triloba* Schweinitz var. *triloba* – F, G, K; > *V. stoneana* – F, G; >< *V. palmata* – F, G, S, W, in the narrow sense; > *V. chalcosperma* Brainerd – F, S; < *V* ×*palmata* Linnaeus (pro sp.) – K; *?* *V. triloba* Schweinitz – S, W]

Viola pedata Linnaeus *var.* ***pedata***, Bird's-foot Violet. Mt (GA, NC, SC, VA, WV), Pd (GA, NC, SC, VA), Cp (DE, GA, NC, SC, VA): dry rocky or sandy forests, woodlands, glades, and roadbanks; common (uncommon in GA, NC, and SC Coastal Plain, rare in DE). March-May; May-June. NH, NY, MI, WI, MN, and ND south to s. GA, s. AL, s. MS, s. LA, and e. TX. [= *V. pedata* – C, W; < *V. pedata* – RAB, K, S, V; > *V. pedata* var. *pedata* – F, G, WV; > *V. pedata* var. *lineariloba* A.P. de Candolle – F, G, WV; = *V. pedata* var. *pedata* – X; > *V. pedata* var. *ranunculifolia* (Jussieu ex Poiret) Ging. ex A.P. de Candolle – X]

Viola pedata Linnaeus *var.* ***1***, Sandhills Bird's-foot Violet. Cp (NC, SC): sandhills; uncommon. {distribution} [= *V. pedata* var. *ranunculifolia* (Jussieu ex Poiret) Ging. ex A.P. de Candolle – X, probably misapplied; < *V. pedata* – RAB, K, S, V]]

Viola pedatifida G. Don, Crowfoot Violet. Mt (VA): shale barrens; rare. April-May. ON west to AB, south to OH, IN, AR, OK, NM, and AZ; disjunct in w. VA. [= F, G, K; = *V. palmata* Linnaeus var. *pedatifida* (G. Don) Cronquist – C; = *V. pedatifida* G. Don ssp. *pedatifida* – X]

Viola pensylvanica Michaux, Smooth Yellow Forest Violet. Mt (AL, GA, KY, MD, NC, SC, TN, VA, WV), Pd (DE, MD, NC, SC, VA), Cp (DE, NC, SC, VA): mesic forests; common (rare in DE Coastal Plain). March-May. QC west to MB south to DE, MD, w. NC, GA, AL, AR, and OK. [= WV; = *Viola pubescens* Aiton var. *scabriuscula* Schweinitz ex Torrey – K, V, X; = *V. eriocarpa* (Nuttall) Schweinitz var. *leiocarpa* Fernald & Wiegand – RAB; < *V. pubescens* – C, GW, W; > *V. pensylvanica* Michaux var. *pensylvanica* – F; > *V. pensylvanica* var. *leiocarpa* (Fernald & Wiegand) Fernald – F; = *V. eriocarpa* – G, S; = *V. eriocarpon* (Nuttall) Schweinitz var. *leiocarpon* Fernald & Wiegand; > *V. pubescens* Aiton var. *leiocarpon* (Fernald & Wiegand) Seymour]

Viola primulifolia Linnaeus, Primrose-leaf Violet. Cp (DE, GA, NC, SC, VA), Pd (DE, GA, NC, SC, VA), Mt (GA, NC, SC, VA, WV): bogs, wet savannas, pocosins, moist organic soils along small streams; common. March-May. NL (Newfoundland) to ON, south to FL, and west to TX and se. OK. [= RAB, C, GW, S, V, W, WV, X; > *V. primulifolia* var. *primulifolia* – F, G; > *V. primulifolia* var. *acuta* (Bigelow) Torrey & A. Gray – F; > *V. primulifolia* var. *villosa* Eaton – F, G; = *V* ×*primulifolia* Linnaeus (pro sp.) (*lanceolata* × *macloskeyi*) – K]

Viola pubescens Aiton, Hairy Yellow Forest Violet. Mt (MD, NC, TN, VA, WV), Pd (DE, MD), Cp (DE): rich deciduous forests; common in WV Mountains, common in DE Piedmont (rare in DE Coastal Plain). March-May. ME and s. QC west to SD, south to DE, NC, TN, MO, and NE. [= G, S, WV; = *V. pubescens* var. *pubescens* – K, V, X; = *V. eriocarpa* (Nuttall) Schweinitz var. *eriocarpa* – RAB; < *V. pubescens* – C, GW, W; > *V. pubescens* var. *pubescens* – F; > *V. pubescens* var. *peckii* House – F; *V. eriocarpon* (Nuttall) Schweinitz var. *eriocarpon*]

Viola rostrata Pursh, Long-spurred Violet. Mt (GA, NC, SC, VA, WV), Pd (VA): mesic forests, often under *Tsuga*; common. April-May. NH and QC west to WI, south to GA and AL. [= RAB, F, G, K, S, V, W, WV, X, Z]

Viola rotundifolia Michaux, Round-leaf Yellow Violet, Early Yellow Violet. Mt (GA, NC, SC, VA, WV), Pd (DE): rich coves; common (rare in DE). March-April. ME to s. ON, south to w. NC, n. GA, and e. TN. [= RAB, C, F, G, K, S, V, W, WV, X]

Viola sagittata Aiton *var.* ***ovata*** (Nuttall) Torrey & A. Gray. Mt (NC, WV), Pd (NC), {DE, VA}: dry soils, glades, prairies; uncommon. April. NS west to MN, south to n. FL, AL, LA, and OK. [= K, V, X; = *V. fimbriatula* J.E. Smith – RAB, F, G, S, W, WV, Y; < *V. sagittata* Aiton – C]

Viola sagittata Aiton *var.* ***sagittata***, Arrowhead Violet. Mt (WV), Pd (DE), Cp (DE), {GA, NC, SC, VA}: dry to moist forets and woodlands; common in WV, uncommon in DE. April. MA west to MN, south to Ga and e. TX. [= K, V, X; = *V. sagittata* – RAB, F, S, W, WV, Y; > *V. emarginata* (Nuttall) Le Conte var. *emarginata* – RAB, F, G; > *V. emarginata* var. *acutiloba* Brainerd – RAB, F, G; < *V. sagittata* – C (also see *V. fimbriatula*); ? *V. emarginata* – S]

Viola septemloba Le Conte. Cp (FL, GA, NC, SC): sandy pinelands; rare. Late March-early May. E. NC south to s. FL, west to LA, mainly on the Coastal Plain. [= F, G, GW, K, S, W, Y; < *V. septemloba* – RAB (also see *V. esculenta*); < *V. palmata* var. *palmata* – C; ? *V. septemloba* ssp. *septemloba* – X]

Viola septentrionalis Greene. Mt (NC, TN, VA, WV): moist woods, moist thickets; rare. NL (Newfoundland) to BC south to PA, w. NC (P. McMillan, pers. comm.), e. TN (Chester, Wofford, & Kral 1997), MI, WI, MT, and WA. [= G, K, W, WV, Y; <

V. sororia – C, V; ? *V. septentrionalis* var. *septentrionalis* – F; < *V. sororia* var. *sororia* – X; = *V. sororia* Willdenow var. *septentrionalis* (Greene) XXX {comb. nov.}]

Viola sororia Willdenow *var.* ***missouriensis*** (Greene) L.E. McKinney, Thinleaf Violet, LeConte's Violet. Pd (GA, NC, SC, VA), Cp (GA, NC, SC, VA), Mt (GA, NC, SC, VA, WV): swamp forests, wet bottomlands; common. March-May. ME west to se. MN, south to Panhandle FL and e. TX. Var. *sororia* and var.*missouriensis* are not yet satisfactorally understood. The extremes of these varieties (var. *missouriensis* with blades distinctly longer than wide, and glabrate; var. *sororia* with blades wider than long or equally wide/long, and pubescent) are readily identified. However, too many specimens still cannot be readily keyed. [= X; = ***V. affinis*** Le Conte – RAB, F, G, GW, S, V, W, WV; < *V. sororia* – C; > *V. affinis* Le Conte – K, Y; > *V. missouriensis* Greene – K, Y]

Viola sororia Willdenow *var.* ***sororia***, Dooryard Violet, Confederate Violet, Common Blue Violet. Mt (GA, NC, SC, VA, WV), Pd (DE, GA, NC, SC, VA), Cp (DE, FL, GA, NC, SC, VA): bottomlands, lawns, moist forests; common. February-May. NL (Newfoundland) west to MB, south to s. FL and TX. [= *V. sororia* – W, Y; > *V. palmata* var. *sororia* (Willdenow) Pollard – RAB; > *V. papilionacea* Pursh – RAB, F, S, WV; < *V. sororia* – C, V (also see *V. affinis, V. septentrionalis*); > *V. sororia* – F, G, K, S; > *V. langloisii* Greene – F, K, S; > *V. latiuscula* Greene – F; > *V. papilionacea* var. *papilionacea* – G; > *V. papilionacea* var. *priceana* (Pollard) Alexander – G; > *V. priceana* Pollard – S; ? *V. sororia* var. *sororia* – X]

Viola striata Aiton, Creamy Violet. Mt (GA, NC, SC, VA, WV), Pd (DE, GA, NC, SC, VA), Cp (VA): mesic forests and woodlands, disturbed areas; common (uncommon in DE, uncommon in Coastal Plain). March-June. MA west to WI, south to GA, AR, and e. OK. [= RAB, C, F, G, GW, K, S, V, W, WV, X, Z]

Viola subsinuata Greene. Mt (GA, KY, MD, NC, SC, TN, VA, WV), Pd (DE, GA, MD, NC, SC, VA), Ip (TN): {distribution} [= V, X; < *V. palmata* var. *palmata* – C; *? V. triloba* Schweinitz var. *dilatata* (Elliott) Brainerd – F, G, K]

* ***Viola tricolor*** Linnaeus, Pansy, Johnny-jump-up. Cp (DE, GA, NC, SC, VA), Pd (DE, GA, NC, SC, VA), Mt (GA, NC, SC, VA, WV): lawns, garden borders, railroad rights-of-way, commonly cultivated; common (uncommon in GA, NC, SC, and VA, rare in WV), native of Europe. March-June (and sporadically later). [= RAB, C, F, G, K, V]

Viola tripartita Elliott. Mt (AL, GA, NC, SC, VA, WV), Pd (AL, GA, NC, SC), Cp (AL, FL, GA): moist slopes and bottomlands, especially over mafic or calcareous rocks; common (uncommon in NC, rare in VA). Late March-May. Sw. PA, s. OH south to SC, GA, Panhandle FL, and ne. MS [= C, F, K, WV, X; > *V. tripartita* var. *glaberrima* (A.P. de Candolle) R.M. Harper – RAB, G, S, W; > *V. tripartita* var. *tripartita* – RAB, G, S, W]

Viola villosa Walter, Southern Woolly Violet. Cp (FL, GA, NC, SC), Pd (GA, NC, SC), Mt (GA): pocosin ecotones, other sites with moist soils; uncommon. Late February-early April. MD south to n. peninsular FL, west to TX and OK. Reported for VA by Kartesz (1999), on the basis of Massey (1961); report requiring additional documentation. [= RAB, F, G, K, S, X, Y; < *V. villosa* – C (also see *V. hirsutula*)]

Viola walteri House *var.* ***appalachiensis*** (L.K. Henry) L.E. McKinney, Appalachian Violet. Mt (NC, WV): serpentine barrens, rich cove forests (especially old road beds through coves); uncommon (rare in NC). April-May. PA, MD, and WV south to sw. NC. See Grund & Isaac (2007) and Ballard & Wujek (1994) for discussion of the taxonomy of this species. [= X; = ***V. appalachiensis*** L.K. Henry – K, WV, Z]

Viola walteri House *var.* ***walteri***, Walter's Violet. Mt (GA, NC, SC, VA), Pd (GA, NC, SC), Cp (GA, SC): nutrient-rich woodlands and forests, especially over mafic or calcareous rocks; uncommon (rare in Coastal Plain). March-May. W. VA west to s. OH and AR, south to n. peninsular FL and e. TX. [= X; = *V. walteri* – RAB, F, G, K, S, W, Z]

208. LINACEAE A.P. de Candolle ex Gray 1821 (Flax Family) [in MALPIGHIALES]

A family of about 10-14 genera and 250-350 species, trees, vines, shrubs, and herbs, cosmopolitan. References: Robertson (1971)=Y.

Linum Linnaeus 1753 (Flax)

A genus of about 180 species, herbs, of temperate and subtropical areas. References: Rogers (1984)=Z; Rogers (1963)=Y.

1 Petals blue, red, or pink; capsule 5-10 mm long; [section *Linum*].
  2 Petals red or pink ..... ***L. grandiflorum***
  2 Petals blue.
    3 Inner sepals with minutely ciliate margins; stigmas slender, elongate; capsule 6-10 mm long ..... ***L. usitatissimum***
    3 Inner sepals entire; stigmas capitate; capsule 5-7 mm long.
      4 Flowers homostylous (flowers with stigmas at about the level to slightly above the anthers) ..... ***L. lewisii*** *var.* ***lewisii***
      4 Flowers heterostylous (some flowers with stigmas below the anthers, others with stigmas well above the anthers) ..... ***L. perenne***
1 Petals yellow; capsules 1-4 mm long; [section *Linopsis*].
  5 Inner and outer sepals all very conspicuously glandular-toothed; annual; leaves with 2 brownish glands flanking the attachment to the stem; styles united basally for (0.2-) 0.5-1.2 (-1.8) mm; [section *Linopsis*, subsection *Rigida*].
    6 Sepals 2.3-3.5 mm long, acute; inflorescence consisting of 1 or more elongate and racemiform branches; dried plants dark, purple-dotted ..... ***L. harperi***
    6 Sepals (3.1-) 3.6-5 (-7.3) mm long, acuminate; inflorescence an open panicle; dried plants pale green ..... ***L. sulcatum***
  5 Outer sepals entire (very rarely sparsely glandular-toothed), inner sepals entire or sparsely to conspicuously glandular-toothed; perennial; leaves without brownish glands flanking the attachment to the stem; styles free; [section *Linopsis*, subsection *Linopsis*].
    7 Fruit as long as broad or longer, its apex acute, apiculate, or obtuse, (2-) 2.2-3.2 (-3.3) mm long; leaves mostly 1.3-4.3 mm wide.

8 Leaves (1.2-) 2.3-4.3 (-5.6) mm wide, mostly 25-50 below the inflorescence; septa of the fruit sparsely but conspicuously ciliate; false septa incomplete; fruit apex acute, the exposed portions purple ..... ***L. intercursum***
8 Leaves (1.0-) 1.3-2.0 (-3.2) mm wide, mostly 50-120 below the inflorescence; septa of the fruit glabrous; false septa virtually complete; fruit apex rounded to apiculate, the exposed portions purple or yellow.
9 Fruit pyriform, (2.0-) 2.3-2.8 (-3.0) mm long, 1.7-2.6 mm in diameter, the apex rounded, the exposed portions purple; seeds (1.6-) 1.7-2.0 (2.1) mm long; anthers averaging 0.8 mm long ..... ***L. floridanum*** *var.* ***floridanum***
9 Fruit ovate, (2.8-) 3.0-3.2 (-3.3) mm long, 2.5-3.1 mm in diameter, the apex minutely apiculate, the exposed portions yellow; seeds 2.1-2.4 mm long; anthers averaging 1.2 mm long ..... ***L. floridanum*** *var.* ***chrysocarpum***
7 Fruit broader than long, its apex depressed, flattened, or broadly rounded, (1.3-) 1.5-2.1 (-2.3) mm long; leaves mostly 1.9-9.3 mm wide.
10 Margins of the inner sepals with conspicuous stalked glands; mature fruits of dried specimens usually adhering to the plant ..... ***L. medium*** *var.* ***texanum***
10 Margins of the inner sepals glandless, or with a few inconspicuous, sessile glands; mature fruits of dried specimens usually shattering and falling freely.
11 Inflorescence paniculate, the lower inflorescence branches not elongate, their tips not nearly reaching the tips of the upper inflorescence branches; branchlets striate-ridged; leaves mostly opposite (usually to beyond the midpoint from the base of the plant to the first inflorescence branch) ..... ***L. striatum***
11 Inflorescence corymbose, some (at least) of the lower branches of the inflorescence elongate, their tips nearly equaling the tips of the upper inflorescence branches; branchlets terete or nearly so; leaves mostly alternate (usually the opposite leaves of the lower stem not extending beyond the midpoint from the base of the plant to the first inflorescence branch) ..... ***L. virginianum***

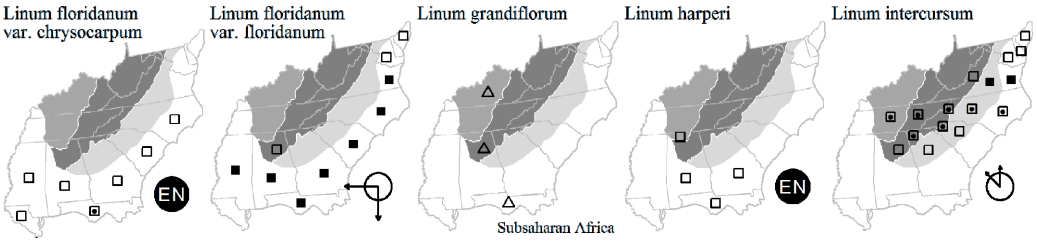
Linum floridanum (Planchon) Trelease *var.* ***chrysocarpum*** Rogers, Yellow-fruited Yellow Flax. Wet savannas. June-October. Se. NC south to s. FL and west to s. MS. [= K, Y, Z; < *L. virginianum* var. *floridanum* Planchon – RAB; < *L. floridanum* – GW, WH; < *Cathartolinum floridanum* (Planchon) Small – S]

Linum floridanum (Planchon) Trelease *var.* ***floridanum***, Florida Yellow Flax. Savannas, sandhill seeps. June-October. E. NC south to s. FL and west to LA, also in the West Indies, essentially limited to the Coastal Plain. [= K, Y, Z; < *L. virginianum* var. *floridanum* Planchon – RAB (also see *L. floridanum* var. *chrysocarpum* and *L. intercursum*); < *L. floridanum* – C, F, G, GW, WH; < *Cathartolinum floridanum* (Planchon) Small – S; > *Cathartolinum macrosepalum* Small – S]

* ***Linum grandiflorum*** Desfontaines, Red Flax. Disturbed areas; native of Africa. [= F, K, WH; = *Adenolinum grandiflorum* (Desfontaines) W.A. Weber]

Linum harperi Small, Harper's Grooved Flax. Dry pinelands. This is a rare taxon of longleaf pine woodlands or savannas in w. FL, sw. GA, and c. AL. It is probably distinct from *L. sulcatum* at the species level, needing additional study. [= *L. sulcatum* Riddell var. *harperi* (Small) Rogers – K, Y, Z; = *Cathartolinum harperi* (Small) Small – S; < *L. sulcatum* – WH]

Linum intercursum Bicknell, Bicknell's Yellow Flax. Dry to moist places. June-October. MA south to c. TN, nw. GA, and c. AL; from MA to MD, nearly restricted to the Coastal Plain, in VA, NC, SC, GA, AL, and se. TN, however it is primarily on the Piedmont and Mountains. It also occurs disjunctively in n. IN near the Great Lakes. [= C, F, G, K, W, Y, Z; < *L. virginianum* var. *floridanum* (Planchon) – RAB; = *Cathartolinum intercursum* (Bicknell) Small – S]



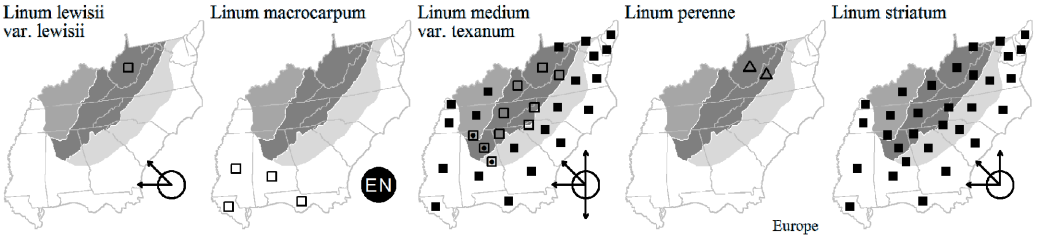
Linum lewisii Pursh *var.* ***lewisii***, Prairie Flax. Calcareous glades and barrens. A western blue-flowered species, ranging from NU west to AK, south to MI, LA, TX, NM, AZ, and CA; disjunct at Smoke Hole Caverns, WV, and several adjacent counties. [= K; < *L. perenne* – C, apparently misapplied to WV material; < *L. lewisii* – F; < *L. perenne* Linnaeus var. *lewisii* (Pursh) Eaton & J. Wright – G; < *Adenolinum lewisii* (Pursh) A. & D. Löve]

Linum macrocarpum C.M. Rogers, Spring Hill Flax. Pitcher plant bogs, wet savannas. FL Panhandle west through s. AL and s. MS to se. LA. [= K, WH] {not yet keyed; add synonymy}

Linum medium (Planchon) Britton *var.* ***texanum*** (Planchon) Fernald, Texas Yellow Flax. Dry to moist places. Var. *texanum* ranges from s. ME, MI, and n. IL south to s. FL and TX, and in the West Indies. Var. *medium* is limited to area around the Great Lakes. [= C, F, GW, K, W, WH, WV, Y, Z; < *L. virginianum* var. *medium* Planchon – RAB; < *L. medium* – G; < *Cathartolinum medium* (Planchon) Small – S; = *L. medium* ssp. *texanum* (Planchon) A. Haines]

* ***Linum perenne*** Linnaeus, Perennial Flax. Disturbed areas; native of Europe. Cultivated and "rarely naturalized along roadsides" in scattered locations in PA (Rhoads & Klein 1993) and reported tentatively for VA (Kartesz 1999). [= K; < *L. perenne* – C (also see *L. lewisii* var. *lewisii*)]

Linum striatum Walter, Ridgestem Yellow Flax. Bogs, seepages, other wet places, often growing in *Sphagnum*. June-October. MA, PA, MI, and IL south to Panhandle FL, LA, and e. TX. [= RAB, C, G, GW, K, W, WH, Y, Z; > *L. striatum* var. *striatum* – F; = *Cathartolinum striatum* (Walter) Small – S]



Linum sulcatum Riddell, Grooved Yellow Flax. Dry calcareous places in the mountains of VA (where also somewhat weedy in adjacent disturbed areas), diabase barrens in the Piedmont of NC. May-August. Primarily a species of the Great Plains of s. MB, ND, and MN south through SD, IA, WI, NE, MO, IL, KS, and MO to OK, *L. sulcatum* occurs farther east as a rare disjunct on glades or barrens over rocks such as limestone or diabase. [= RAB, C, F, G, W, WV; = *Linum sulcatum* Riddell var. *sulcatum* – K, Y, Z; = *Cathartolinum sulcatum* (Riddell) Small – S; = *Mesynium sulcatum* (Riddell) A. & D. Löve]

* ***Linum usitatissimum*** Linnaeus, Common Flax. Disturbed places; native of Europe. This is the flax of commerce, used both for its fiber, the source of flax, and the oil expressed from its seeds (linseed oil). [= RAB, C, F, G, K, S, WH, WV, Z]

Linum virginianum Linnaeus, Virginia Yellow Flax. Dry or moist places. June-October. MA, NY, ON, MI, and IL south to SC, GA, AL, and MO. [= C, F, G, GW, K, W, WV; = *L. virginianum* var. *virginianum* – RAB; = *Cathartolinum virginianum* (Linnaeus) Reichenbach – S]

Linum westii C.M. Rogers, West's Flax. Bogs, margins of flatwoods ponds. Ne. FL; Panhandle FL. [= K, WH] {not yet keyed; add synonymy}

213. PODOSTEMACEAE Richard ex C. Agardh 1822 (Riverweed Family) [in MALPIGHIALES]

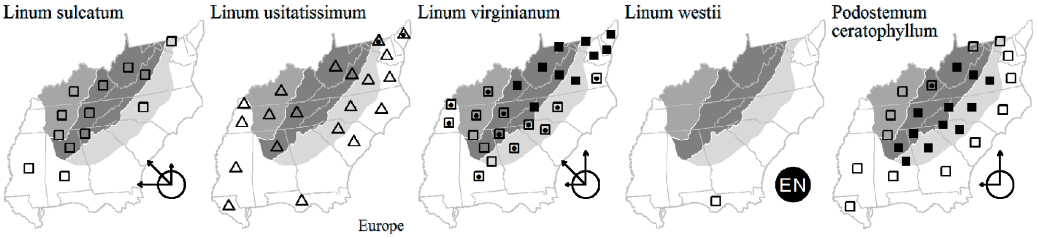
A family of about 47-49 genera and 280 species, aquatic herbs, of tropical, subtropical, and rarely temperate regions of the New World and Old World. References: Graham & Wood (1975); Cook & Rutishauser in Kubitzki, Bayer, & Stevens (2007).

Podostemum Michaux 1803 (Riverweed)

A genus of about 7-17 species, reduced aquatic herbs, of tropical to temperate America. References: Graham & Wood (1975)=Z; Philbrick & Crow (1983); Cook & Rutishauser in Kubitzki, Bayer, & Stevens (2007).

Identification notes: *Podostemum* is a curious plant, seeming more like an alga than a vascular plant in color, texture, mode of attachment to substrate (by a fleshy disk), and irregular thalloid branching.

Podostemum ceratophyllum Michaux, Threadfoot, Riverweed. Attached to rocks and dams in rapidly or slowly flowing water. May-July. NS, ME, and QC south to sw. GA, s. AL, s. MS, se. LA (Florida parishes), AR, and w. TN; disjunct in the Ozark-Ouachita Highlands of w. AR and se. OK; Dominican Republic; Honduras. [= RAB, C, F, G, K, W, WV, Z; = *Podostemon ceratophyllum* - GW, orthographic variant; > *Podostemon ceratophyllum* – S, orthographic variant; > *Podostemon abrotanoides* Nuttall – S]



214. HYPERICACEAE A.L. de Jussieu 1789 (St. John's-wort Family) [in MALPIGHIALES]

A family of 7-9 genera and 480-560 species, herbs, shrubs, and trees, nearly cosmopolitan. It appears from molecular analysis that recognition of the Hypericaceae may (after all) be warranted. *Hypericum* is in a clade with *Podostemum* and *Bonnetia*, sister to a clade including Clusiaceae s.s. (Savolainen et al. 2000), and unless the morphologically very different Podostemaceae is to be included in a broad Clusiaceae, Hypericaceae and Podostemaceae must be recognized. References: Adams (1973)=Z; Godfrey (1988)=Y; Wood & Adams (1976); Stevens in Kubitzki, Bayer, & Stevens (2007).

Hypericum Linnaeus 1753 (St. John's-wort)

A genus of 370-420 species, trees, shrubs, and herbs, primarily temperate. *Hypericum* in our area is a large, complex, and interesting genus, with a number of unresolved questions remaining. The species treated in Key B have often been treated in the segregate genus *Ascyrum*. Evidence from a variety of disciplines now suggests that they should be included in *Hypericum* (Adams & Robson 1961; Calie, Schilling, & Webb 1983; Robson 1996). References: Adams (1973)=Z; Godfrey (1988)=Y;

Robson (1977, 1981, 1990, 1996, 2001, 2002, 2006)=X; Adams (1962)=V; Allison (2011)=Q; Adams (1957); Webb (1980); Robson & Adams (1968); Adams & Robson (1961); Calie, Schilling, & Webb (1983); Culwell (1970); Stevens in Kubitzki, Bayer, & Stevens (2007). Key based in part on Adams (1973), Godfrey (1988), C, and GW.

1 Petals pale pink; stamens fascicled, in 3 fascicles of 3 stamens each; staminodia (hypogynous glands) present, alternating with the fascicles of stamens; perianth 5-merous; ["*Triadenum*"]..... **Key H**
1 Petals yellow; stamens fascicled or not, if fascicled then not into 3 fascicles of 3 stamens each; staminodia (hypogynous glands) lacking; perianth 4-5-merous.
2 Leaves with an articulation at the very base, this appearing as a narrow line, groove, or abrupt change of color and texture which extends across the petiole; shrub; [section *Myriandra*].
3 Leaves needle-like, 0.5-1.5 (-2) mm wide, the margins essentially parallel (*H. galioides* keyed here and below); [subsection *Centrosperma*]..... **Key A1 or A2**
3 Leaves, at least the largest on the plant, not needle-like, wider than 2 mm, the margins not parallel, the widest point often beyond the middle.
4 Petals 4; sepals 4 (rarely 2); plant 5-100 cm tall; leaves 2-40 mm long; [subsection *Ascyrum*]..... **Key B**
4 Petals 5; sepals 5; plant 50-250 cm tall; leaves (10-) 20-70 mm long; [subsections *Centrosperma* and *Brathydium*] ..... **Key C**
2 Leaves without an articulation at the very base, the petiole merging gradually into the stem with no break, groove, or abrupt change in color or texture; herb, decumbent shrub, or shrub.
6 Leaves ascending or appressed, 1-nerved, < 1 mm wide; inflorescence a compound raceme; annual herbs; [section *Brathys*]..... **Key D**
6 Leaves spreading or ascending, generally multi-nerved, > 1 mm wide; inflorescence a dichasial cyme; herbs or shrubs.
7 Capsule 3 (-4) locular; stamens connate at the base into 3 or 5 fascicles; leaves with black glandular dots as well as translucent glandular dots when backlit (except in *H. perforatum*); sepals and/or petals marked with black glandular dots or lines; perennial herbs; [section *Hypericum*]..... **Key E**
7 Capsule 1-locular; stamens separate or connate at the base, but not grouped into fascicles; leaves with translucent glandular dots, without black glandular dots (when backlit); sepals and petals with translucent glandular lines or dots only, not marked with black glandular dots or lines.
8 Shrubs, decumbent shrubs, or suffruticose herbs; [section *Myriandra*, subsections *Pseudobrathydium* and *Suturosperma*]..... **Key F**
8 Herbs; [section *Trigynobrathys*, and section *Myriandra* subsection *Suturosperma*]..... **Key G**

Key A1 – shrubby St. John's-worts with needle-like leaves and flowers with 5 petals and 5 sepals [section *Myriandra*, subsection *Centrosperma*]

1 Longest leaves 5-16 mm.
2 Capsules 3-6 mm long; seeds reddish-amber or brown, the alveoli not in distinct longtudinal rows, the seed lacking longitudinal ridges except for the two marginal sutures; primary branches with two ridged or winged angles running the length of the internodes, extending from the leaf midribs (but not the margins) at the base of the paired leaves; leaf surface glossy; [of alfisols and ultisols of wet pine savannas, seepage bogs] ..... ***H. brachyphyllum***
2 Capsules 6-9 mm long; seeds dark red to black, the alveoli in distinct longitudinal rows, with raised ridges often evident between the rows; primary branches with six ridged or winged angles running the length of the internodes, extending from the midribs and margins at the base of the paired leaves; leaf surface dull; [of seasonally dry spodosol pine flatwoods] ..... ***H. tenuifolium***
1 Longest leaves 13-30 mm.
3 Plant a low shrub <5 dm tall, more-or-less decumbent, forming dense clumps; inflorescence elongate (flowers at up to 5 nodes); flowers 10-12 mm diameter; [of dry to mesic soils of lower piedmont and inner coastal plain of sc. VA-NC-SC-GA-AL; disjunct to rock outcrops of s GA]..... ***H. lloydii***
3 Plant an erect shrub 0.5-4 m tall, with single main stem branched above; inflorescence elongate (3-7 nodes) or short (1-3 nodes in *H. fasciculatum* and *H. chapmanii*); flowers 13-26 mm diameter; [of wet soils of the Coastal Plain].
4 Undersurface of most leaves easily seen on both sides of midrib, veins obvious on undersurface, leaves narrowly oblanceolate to oblinear, 1.5-5 (-7) mm wide; inflorescence elongate (3-7 nodes) ..... ***H. galioides***
4 Undersurface usually not seen except for midrib (leaf margins nearly touch midrib its whole length), if undersurface visible then no veins visible, leaves linear, needle-like, 0.5-1.5 mm wide; inflorescence elongate or short.
5 Plant short, <1 m tall; stem <1 cm wide at base; plant unbranched or few-branched, wand-like with narrow crown; [endemic to FL Panhandle]..... ***H. exile***
5 Plant tall, normally >0.8 m; stem 1-several cm wide at base; crown broader with many ascending to spreading branches.
6 Young branches, leaves, and sepals strongly glaucous; bark of upper stem and branches silvery gray and smooth; mature plant 2-4 m tall with ascending branches imparting tree-like or vase-like aspect; [restricted to shores of sinkhole ponds in Bay and Washington Counties, FL] ..... ***H. lissophloeus***
6 Young branches, leaves, and sepals not glaucous; bark of upper stem and branches not silvery gray and smooth (except some *H. chapmanii*); mature plants variously shaped.
7 Inflorescence elongate (3-7 nodes); stem bark tight, thin, not exfoliating or exfoliating in narrow strips, not revealing buff or pale cinnamon color; if leaf undersurface is exposed it is distinctly paler than upper surface; [usually associated with flowing water (blackwater streams and impoundments)]..... ***H. nitidum***
7 Inflorescence short (1-3 nodes); stem bark corky-thickened to spongy, exfoliating in broad strips or sheets revealing buff or pale cinnamon color; if leaf undersurface is exposed it is about the same color as upper surface; [usually associated with static water (Carolina bays, impoundments, beaver ponds, borrow pits, flatwoods depressions, cypress-gum ponds)].
8 Mature plant 2-3 (-4) m tall; branches ascending and imparting a tree-like or vase-like aspect (younger plants may be bushy); youngest internodes terete; [of flatwoods depressions and cypress-gum ponds and stringers of FL Panhandle only] ... . ***H. chapmanii***
8 Mature plant 0.8-1.5 (-2) m tall; branches spreading and imparting a bushy or gumdrop aspect; youngest internodes with distinct winged ridge on either side; [of Carolina bays, impoundments, beaver ponds, borrow pits, widespread] .... ***H. fasciculatum***

Key A2 – shrubby St. John's-worts with needle-like leaves and flowers with 5 petals and 5 sepals [section *Myriandra*, subsection *Centrosperma*]

1 Plants < 0.6 m tall, erect, decumbent, or matted and with ascending/erect branches.
2 Longest leaves 5-13 mm; flowers 13-15 mm diameter.
3 Capsules 3-6 mm long; seeds reddish-amber or brown, the alveoli not in distinct longtudinal rows, the seed lacking longitudinal ridges except for the two marginal sutures; primary branches with two ridged or winged angles running the length of the internodes, extending from the leaf midribs (but not the margins) at the base of the paired leaves; leaf surface glossy; [of alfisols and ultisols of wet pine savannas, seepage bogs] ..... ***H. brachyphyllum***
3 Capsules 6-9 mm long; seeds dark red to black, the alveoli in distinct longitudinal rows, with raised ridges often evident between the rows; primary branches with six ridged or winged angles running the length of the internodes, extending from the midribs and margins at the base of the paired leaves; leaf surface dull; [of seasonally dry spodosol pine flatwoods] ..... ***H. tenuifolium***
2 Longest leaves 11-25 mm; flowers 9-17 mm diameter.
4 Plant unbranched or few-branched, wand-like with narrow crown; [restricted to FL Panhandle flatwoods] ..... ***H. exile***
4 Plant densely branched, bushy with broad crown; [plants of dry to mesic soils of lower piedmont and inner coastal plain of se. VA-NC-SC-GA-AL, disjunct to rock outcrops of s GA] ..... ***H. lloydii***
1 Plants > 0.6 m tall, plants erect.
5 Longest leaves 6-13 mm, linear, needle-like, permanently tightly revolute with usually only the midrib showing on underside; flowers 13-15 mm diameter; [s GA-s FL-w LA] ..... ***H. brachyphyllum***
5 Longest leaves (12-)15-30 mm, linear and needle-like or narrowly oblanceolate to oblinear (*H. galioides*), permanently tightly revolute with usually only the midrib showing on underside OR margins revolute during drying but leaving considerable exposed undersurface (*H. galioides*); flowers 13-26 mm diameter.
6 Leaves narrowly oblanceolate to oblinear, 1.5-5 (-7) mm wide, margins revolute during drying but leaving considerable exposed undersurface, veins obvious on undersurface; flowers 13-15 mm diameter in elongate inflorescences of 3-7 nodes ..... ***H. galioides***
6 Leaves linear, needle-like, 0.5-1.5 mm wide, permanently tightly revolute with usually only the midrib showing on underside, if undersurface visible there are no veins; flowers 14-26 mm diameter, inflorescences elongate or short.
7 Plant short, < 1 m tall; stem < 1 cm wide at base; plant unbranched or few-branched, wand-like with narrow crown; [restricted to FL Panhandle] ..... ***H. exile***
7 Plant tall, normally > 0.8 m; stem 1-several cm wide at base; crown broader with many ascending to spreading branches; [collectively more widespread].
8 Plant 2-4 m tall, with tree-like or vase-like aspect; [restricted to FL Panhandle].
9 Young branches, leaves, and sepals not glaucous; bark of upper stem and branches normally not silvery gray, variously roughened; inflorescence short (1-3 nodes); [flatwoods depressions and cypress-gum ponds of FL Panhandle] ..... ***H. chapmanii***
9 Young branches, leaves, and sepals strongly glaucous; bark of upper stem and branches silvery gray and smooth; inflorescence elongate (3-7 nodes); [restricted to shores of sinkhole ponds in Bay and Washington Counties, FL] ..... ***H. lissophloeus***
8 Plant to 1.5 m tall, with broad bushy or gumdrop aspect; [collectively more widespread].
10 Inflorescence short (1-3 nodes); bark corky-thickened, exfoliating in sheets and wide strips exposing buff or pale cinnamon color; if leaf undersurface is exposed it is about the same color as upper surface; [usually in static waters of Carolina bays, impoundments, beaver ponds, borrow pits] ..... ***H. fasciculatum***
10 Inflorescence elongate (3-7 nodes); bark tight, thin (not corky thickened), not exfoliating in sheets or wide strips; if leaf undersurface is exposed it is distinctly paler than upper surface; [in moving water of blackwater streams and impoundments] ..... ***H. nitidum***

Key B – shrubby St. John's-worts with 4 petals and 4 (rarely 2) sepals [section *Myriandra*, subsection *Ascyrum*]

1 Styles and carpels 3 (rarely 4); leaves (5-) 7-20 mm wide, rounded, subcordate, or cordate-clasping at the base; plant an erect shrub.
2 Leaves rounded or subcordate at the base; [widespread in our area] ..... ***H. crux-andreae***
2 Leaves cordate-clasping at the base; [of e. GA southward] ..... ***H. tetrapetalum***
1 Styles and carpels 2 (3 in *H. microsepalum*); leaves 1-7 mm wide, mostly cuneate (or if rounded the leaves < 8 mm long and 3 mm wide); erect or decumbent shrub.
3 Sepals nearly equal in size; styles 3; [s. GA south to n. FL] ..... ***H. microsepalum***
3 Sepals markedly unequal, one opposite pair large and enclosing the capsule; styles 2; [collectively widespread].
4 Pedicels 6-13 mm long, soon reflexed; subtending bractlets located near the last pair of leaves; decumbent shrub, to 2 dm tall ..... ***H. suffruticosum***
4 Pedicels 1-5 mm long, erect; subtending bractlets located midway between the base of the flower and the last pair of leaves; erect or decumbent shrub, mostly 1-15 dm tall.
5 Erect shrub, usually with a single stem, freely branched well above ground level (or from ground level if injured, as by fire, but then the multiple branches still erect rather than decumbent), to 1 m or more tall; leaves usually variable in size and shape, widest near the middle ..... ***H. hypericoides***
5 Decumbent, matted shrub, with several prostrate stems arising from a primary rootstock near ground level, each with numerous erect branchlets, rarely over 3 dm tall; leaves usually relatively uniform in size and shape, widest above the middle ..... ***H. stragulum***

Key C – shrubby St. John's-worts with broader leaves (mostly lanceolate or oblanceolate) and flowers with 5 petals and 5 sepals

1 Leaves cordate-clasping at the base, ovate; [of s. SC southward]; [section *Myriandra*, subsection *Brathydium*] ..... ***H. myrtifolium***

1 Leaves cuneate at the base, oblanceolate, oblong, elliptic, or narrowly elliptic; [collectively widespread]; [section *Myriandra*, subsection *Centrosperma*].
2 Leaves mostly narrowly oblanceolate, the larger 2-3 cm long, 2-5 (-7) mm wide, mostly 5-10× as long as wide; seeds 0.4-0.8 mm long, dark brown ..... ***H. galioides***
2 Leaves mostly oblong, elliptic, narrowly elliptic, or broadly oblanceolate, the larger (2-) 3-7 cm long, 5-15 mm wide, mostly 2.5-5× as long as wide; seeds 0.8-1.3 mm long, amber to medium brown.
3 Flowers solitary, terminal (or in 3-flowered terminal cymes); petals 10-20 mm long; sepals 7-15 mm long; shrubs to 1 m tall ..... ***H. frondosum***
3 Flowers (1-) 3-many in terminal cymes; petals 5-10 mm long; sepals 1.5-8 mm long; shrubs to 3 m tall.
4 Flowers (1-) 3-7 per inflorescence; capsules (6-) 7-14 mm long; larger leaves (4-) 7-14 mm wide ..... ***H. prolificum***
4 Flowers 7-many per inflorescence; capsules (3-) 4.5-6 mm long; larger leaves 1-7 (-11) mm wide.
5 Leaves (1.8-) 2.8-8.3 (-11) mm wide, the widest on a plant always over 4 mm wide; [widespread]..... ***H. densiflorum***
5 Leaves 1.0-3.7 (-4.1) mm wide; [of the Ridge and Valley of nw. GA, c. and nw. AL, and e. TN] ..... ***H. interior***

Key D – herbaceous St. John's-worts with leaves ascending or appressed, 1-nerved, < 1 mm wide and with a diffuse, racemose inflorescence

1 Leaves linear-subulate, (5-) 8-20 mm long; capsules 1-1.75× as long as the sepals; seeds coarsely rugose-areolate ..... ***H. drummondii***
1 Leaves scale-like, 1-5 mm long; capsules ca. 2-3× as long as the sepals; seeds minutely and inconspicuously reticulate ..... ***H. gentianoides***

Key E – herbaceous St. John's-worts with broad leaves, 3 (-4) locular capsules, stamens connate at base into 3 or 5 fascicles, leaves with black dots as well as translucent glands (except in *H. perforatum*), and sepals and/or petals marked with black dots or lines

1 Smaller stems strongly wing-angled; seeds 1.0-1.3 mm long; leaves of the main stem (8-) 11-20 (-26) mm long, those of the lateral branches typically much smaller; leaves punctate primarily with translucent glands; [alien, usually in disturbed habitats]; [section *Hypericum*] ..... ***H. perforatum***
1 Smaller stems not wing-angled; seeds 0.6-1.1 mm long; leaves of the main stem (11-) 21-48 (-64) mm long, those of the lateral branches nearly to quite as large; leaves punctate with black glands; [native, in a variety of habitats]; [section *Graveolentia*].
2 Petals (3.0-) 4.3-12.2 (-14.0) mm long; sepals 1.5-6 mm long, conspicuously punctate with black glands (sometimes also black-lined); capsules (2.5-) 3.0-5.4 (-6.0) mm long; [collectively widespread, occurring in the Coastal Plain, Piedmont, and Mountains of NC, SC, and VA].
3 Sepals 3-6 mm long; styles (2.5-) 5.4-7.4 (-9.0) mm long; petals (6.0-) 9.2-12.2 (-14.0) mm long; leaf apices acute..... ***H. pseudomaculatum***
3 Sepals 1.5-4.0 mm long; styles (1.0-) 1.4-2.4 (-3.0) mm long; petals (3.0-) 4.3-5.9 (-9.0) mm long; leaf apices obtuse to slightly retuse... ***H. punctatum***
2 Petals 6-18 mm long; sepals 4-10 mm long, with or without black lines (sometimes also black-punctate); capsules (3.0-) 4.0-7.7 (-10.0) mm long; [endemic to moderate to high elevations of w. NC, sw. VA, and e. TN].
4 Styles (3.0-) 5.6-10.0 (-12.0) mm long; sepals without black lines; petals (5.0-) 11.5-16.1 (-18.0) mm long, without black lines and with round black glands only along the petal margin; longest stamens (8.0-) 10.7-16.3 (-22.0) mm long; cymes relatively few-flowered, (2-) 5-14 (-22) flowers per plant ..... ***H. graveolens***
4 Styles (1.5-) 1.9-2.9 (-5.0) mm long; sepals with black lines; petals (6.0-) 7.0-9.2 (-11.0) mm long, with black lines and round black glands scattered over the surface of the petal; longest stamens (4.0-) 6.1-8.5 (-10.0) mm long; cymes relatively many-flowered, (5-) 13-61 (124) flowers per plant ..... ***H. mitchellianum***

Key F – shrubby and subshrubby St. John's-worts

1 Plant a matted, decumbent shrub, 0.5-3 (rarely to 5) dm tall; leaves 1.5-2.5× as long as wide, without axillary fascicles of leaves; flowers solitary or in small simple cymes; [endemic to rock outcrops at moderate to high elevations in the Mountains of sw. NC, nw. SC, and ne. GA]; [section *Myriandra*, subsection *Pseudobrathydium*]..... ***H. buckleyi***
1 Plant an erect suffrutescent herb, 1.5-10 dm tall; leaves 1.5-5× as long as wide, with or without axillary fascicles of leaves; flowers in compound cymes; [mostly of the Coastal Plain and Piedmont, very rarely in the Mountains and then at low elevations]; [section *Myriandra*, subsection *Suturosperma]*.
2 Larger leaves 4-10 mm wide, 3-5× as long as wide; axillary leaf fascicles present in main leaf axils; seeds pale brown, faintly reticulate, 0.4-0.5 mm long..... ***H. cistifolium***
2 Larger leaves 10-30 mm wide, 1.5-3× as long as wide; axillary leaf fascicles absent; seeds dark brown, strongly reticulate, 1.5-2 mm long.
3 Flowers in simple 3-flowered cymes or in compound cymes with up to 8 flowers; sepals 3 mm long, oblong, obtuse apically; capsules ovoid, 8-10 mm long (excluding the styles) and 5-7 mm broad; seeds 1.8-2.0 mm long, cylindric, sometimes slightly falcate, dull brown when mature ..... ***H. apocynifolium***
3 Flowers usually in many-flowered cymes terminating branches; sepals 1.5-2.0 mm long, usually triangular-acute; capsules ovoid to subglobose, 4-5 mm long (excluding the styles) and 4-5 mm broad; seeds 1.5-1.8 mm long, usually falcate-cylindric, dark purplish-brown and lustrous when mature ..... ***H. nudiflorum***

Key G – herbaceous St. John's-worts with broad leaves, 1-locular capsules, stamens separate or connate at base, but not grouped into fascicles, leaves with translucent dots, without black dots, sepals and petals with translucent lines or dots only, not marked with black dots or lines

1 Stems and leaves pubescent; [section *Trigynobrathys*] ..... ***H. setosum***

1 Stems and leaves glabrous.
2 Styles united, persistent as a single straight beak on the capsule; [section *Myriandra*, subsection *Suturosperma*].
3 Leaves 3-6 cm long, 4-6× as long as wide, the margins revolute; [plants (in our area) of low elevations in the Coastal Plain]..... ***H. adpressum***
3 Leaves 1-3 (-4) cm long, 2-3× as long as wide, the margins not revolute; [plants (in our area) of high elevations in the Mountains] ..... ***H. ellipticum***
2 Styles separate, more or less divergent, not persistent as a beak on the capsule; [section *Trigynobrathys*].
4 Styles 2-4 mm long; stamens 50-80.
5 Punctate glands absent on the stem (rarely very few on the internodes of the inflorescence); punctate glands of the leaves small, round, distributed on the lower leaf surface, becoming sparse toward the base of the leaf and toward the midrib; midstem leaves mostly broadest at or beyond the middle..... ***H. virgatum***
5 Punctate glands frequent on the stem; punctate glands of the leaves and stem large, oval, distributed evenly and densely on the lower leaf surface, also dense on the upper leaf surface in *H. denticulatum* and *H. harperi* (absent on upper leaf surface in *H. species 1*); midstem leaves usually broadest at or below the middle.
6 Upper surface of the leaf with no punctate glands; inflorescence branches typically with 3-12 pairs of bracteal leaves about 1/2 as large as the foliage leaves; [of shallow soil mats on granitic domes in the Piedmont of NC]..... ***H. radfordiorum***
6 Upper surface of the leaf with abundant punctate glands; inflorescence branches with at most a few pairs of very small bracts; [of Coastal Plain wetlands, very rarely disjunct inland and then in wetlands].
7 Leaves 5-20 (-24) mm long, 5-15 mm wide, 1.5-3× as long as wide, ovate to obovate to narrowly elliptic, mostly appressed to the stem, mostly shorter than the internodes; sepals 4.0-8.0 mm long, 2.0-4.0 mm wide, acute; lower stem not spongy-thickened with aerenchymatous tissue; [of moist pinelands of the Coastal Plain, very rarely disjunct inland to bog habitats in the Piedmont and Mountains] ..... ***H. denticulatum***
7 Leaves 10-35 (-40) mm long, 3-8 (-12) mm wide, 3-10× as long as wide, lanceolate to linear-lanceolate, mostly ascending to spreading, often equaling the internodes; sepals 3.0-5.0 mm long, 0.8-2.5 mm wide, acute to acuminate; lanceolate to linear-lanceolate; upper portion of stem with numerous axillary branches; lower stem usually spongy-thickened with aerenchymatous tissue; [of upland depression ponds of the Coastal Plain, growing where seasonally inundated] ..... ***H. harperi***
4 Styles 0.5-1.5 mm long; stamens 5-22.
8 Leaves lanceolate to linear, 6-30 mm long, 0.5-3 mm wide, the leaf base attenuate to cuneate..... ***H. canadense***
8 Leaves ovate to elliptic, 3-35 mm long, 2-15 mm wide, the leaf base rounded to cordate-clasping.
9 Sepals broadest near the base; inflorescence with few or no normally sized leaves, these only low in the inflorescence, giving the inflorescence a naked appearance; [of Coastal Plain pinelands]..... ***H. gymnanthum***
9 Sepals broadest near the middle; inflorescence with many normally sized leaves and leaflike bracts, giving the inflorescence a leafy appearance; [collectively widespread].
10 Ultimate bracts of the inflorescence elliptic, much like the leaves; leaves not paler beneath; sepals obtuse, much shorter than the capsule; capsule 3-5 mm long ..... ***H. boreale***
10 Ultimate bracts of the inflorescence linear, differing conspicuously from the leaves; leaves paler beneath; sepals acute, about equaling the capsule; capsule 2-3.5 mm long.
11 Inflorescence branches from the upper 1-6 nodes of the stem, the further branching repeatedly monochasial; stem with apical internode well developed, usually longer than the internode below; sepals broader above the middle, more-or-less imbricate; [of the Coastal Plain]..... ***H. mutilum*** *var.* ***latisepalum***
11 Inflorescence branches from the upper 2-10 nodes of the stem, the further branching mostly dichasial; stem with apical internode shorter than the the internode below or even essentially absent; sepals broader below the middle, not imbricate (rarely broader above the middle and imbricate); [widespread] ..... ***H. mutilum*** *var.* ***mutilum***

Key H – "*Triadenum*"

1 Leaves narrowed to the cuneate or broadly cuneate (rarely truncate) base.
2 Lower leaves sessile; sepals 5-7 mm long, acute (to obtuse); leaves lacking translucent or dark glands or punctae; styles 0.5-1.5 mm long (best seen in fruit) ..... ***H. tubulosum***
2 Lower leaves petiolate; sepals 3-5 mm long, obtuse; leaves with translucent glands and dark punctae; styles 1.5-3 mm long (best seen in fruit) ..... ***H. walteri***
1 Leaves clasping, cordate, or subcordate at the base.
3 Sepals 2.5-5 mm long at maturity, obtuse to acute; styles 0.5-1 (-1.5) mm long (best seen in fruit)..... ***H. fraseri***
3 Sepals 5-8 mm long at maturity, acute to acuminate; styles 1.8-3 mm long (best seen in fruit)..... ***H. virginicum***

Hypericum adpressum Rafinesque ex Barton, Bog St.-John's-wort, Creeping St.-John's-wort. Boggy depressions. July-August. E. MA south to sw. GA in the Coastal Plain; disjunct inland in e. WV (Greenbrier County), IN, IL, and sc. TN. See discussion on its habitats and rarity in Sorrie (1998b). [= RAB, C, F, G, GW, K, S, V, WV, X, Z]

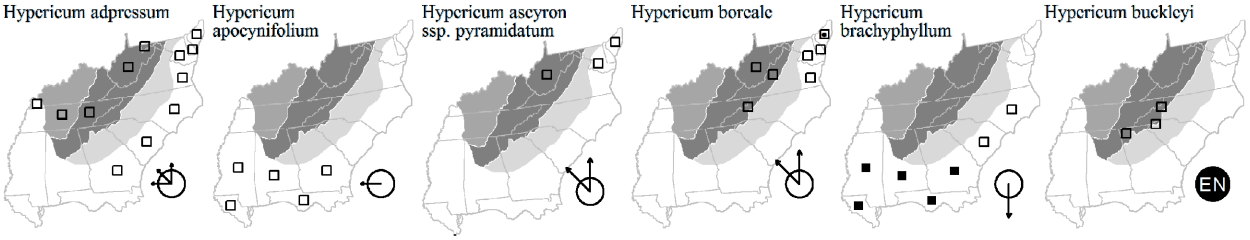
Hypericum apocynifolium Small. Mesic bluffs and ravines, ridges and natural levees in floodplains. C. GA, s. GA, and Panhandle FL west to se. AR and e. TX. [= S, V, X, Y; < *H. nudiflorum* – GW, K, WH, Z]

Hypericum ascyron Linnaeus *ssp.* ***pyramidatum*** (Aiton) N. Robson, American Great St.-John's-wort. {habitat}. June-August. The species is of e. North America and e. Asia; the North American ssp. *pyramidatum* occurs from QC west to MN, south to s. PA (Rhoads & Klein 1993), MD (Robson 2000), and WV (Harmon, Ford-Werntz, & Grafton 2006). [= X; < *H. ascyron* Linnaeus – K; = *H. pyramidatum* Aiton – C, F, G] {not yet keyed} {section *Roscyna*}

Hypericum boreale (Britton) Bicknell, Dwarf St.-John's-wort, Northern St.-John's-wort. Sinkhole ponds in the Mountains, interdune ponds in the outer Coastal Plain, boggy places. NL (Newfoundland) and QC west to w. ON, south to VA, nw. NC (?), OH, IN, and n. IL. Hybrids with *H. canadense* have been called *H.* ×*dissimulatum* Bicknell (pro sp.). [= C, F, G, K, WV; = *H. mutilum* Linnaeus ssp. *boreale* (Britton) J.M. Gillett – X]

Hypericum brachyphyllum (Spach) Steudel. Ponds and wet pinelands. Se. NC south to s. FL, west to s. MS. Material from se. NC was at one point thought to perhaps represent a new taxon. [= GW, K, V, WH, X, Y, Z; < *H. aspalathoides* – S]

Hypericum buckleyi M.A. Curtis, Granite Dome St.-John's-wort. Thin soil in seasonal seepage around rock outcrops, particularly granitic exfoliation domes. June-August. Sw. NC south to nw. SC and ne. GA, a Southern Appalachian endemic. Wilbur (1995) showed that Curtis's spelling of the epithet, "*buckleii*", should be maintained; however, changes in the International Code of Botanical Nomenclature have reversed this (Robson 1996). [= RAB, GW, S, W, V, X, Z; = *H. buckleii* – K, orthographic variant]



Hypericum canadense Linnaeus, Canada St. John's-wort Cp (DE, FL, GA, NC, SC, VA), Mt (NC, SC, VA, WV), Pd (DE, NC, VA); bogs, pine savannas, ditches; common (rare in NC and VA Piedmont, rare in VA Mountains, rare in FL). July-September. NL (Newfoundland) and QC west to MN, south to s. GA, ne. FL, Panhandle FL, and MS; also in Holland and Ireland, where considered by some to be native. Hybrids with *H. mutilum* and/or *H. boreale* have been called *H.* ×*dissimulatum* Bicknell (pro sp.). [= RAB, C, G, GW, K, S, W, WH, WV, X, Z; > *H. canadense* var. *canadense* – F; > *H. canadense* var. *galiiforme* Fernald – F]

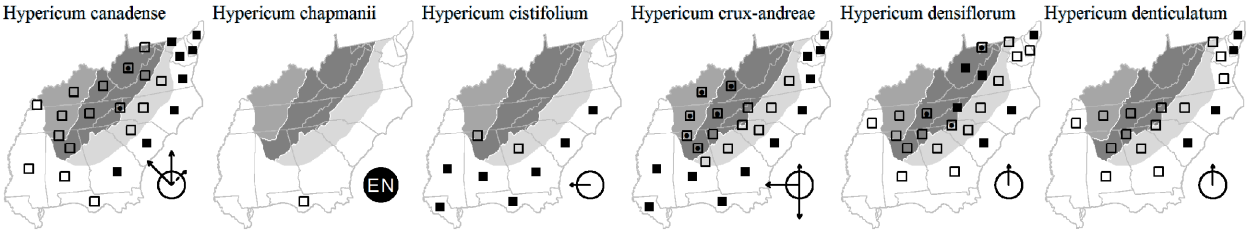
Hypericum chapmanii W.P. Adams, Apalachicola St. John's-wort, Tree St. John's-wort. Margins of pond-cypress ponds, pond-cypress stringers, often growing with *Cyrilla parviflora* and *Nyssa ursina*. Endemic to Panhandle FL (9 counties). [= GW, K, V, WH, X, Y, Z; < *H. fasciculatum* – S; = *H. arborescens* Chapman]

Hypericum cistifolium Lamarck. Pine savannas, wet pine flatwoods. June-August. E. NC south to s. FL, west to e. TX. [= RAB, GW, K, V, WH, X, Y, Z; > *H. cistifolium* – S, in a narrower sense; > *H. opacum* Torrey & A. Gray – S]

Hypericum crux-andreae (Linnaeus) Crantz, St. Andrew's Cross, St. Peter's-wort. Dry forests and woodlands, pine flatwoods. June-October. NY (Long Island) and NJ south to s. FL, west to e. TX, primarily on the Coastal Plain, but scattered inland to w. NC and n. GA, also north in the interior to c. TN, s. KY, c. AR, and se. OK. [= GW, K, W, WH, X, Y; = *H. stans* (Michaux ex Willdenow) W.P. Adams & Robson – RAB, C, V, Z; = *Ascyrum stans* Michaux ex Willdenow – F, G; > *Ascyrum stans* – S; > *Ascyrum cuneifolium* Chapman – S]

Hypericum densiflorum Pursh, Mountain Bushy St. John's-wort. Bogs, streambanks, dry to moist forests, rock outcrops, moist forests, pine savannas. June-September. Sw. PA south to n. GA and c. AL in and near the Mountains; NJ south to SC in the Coastal Plain; s. GA west to TX in the Coastal Plain. The related *H. lobocarpum* Gattinger is more western, extending east to TN; the basis for attribution of *H. lobocarpum* to "Blue Ridge, N.C." by Small (1933) is unknown. [< *H. densiflorum* – RAB, C, GW, K, W, WV, X, Z (also see *H. interior*); < *H. densiflorum* var. *densiflorum* – F, G (also see *H. interior*); > *H. densiflorum* Small – S; > *H. glomeratum* Small – S]

Hypericum denticulatum Walter, Coppery St.-John's-wort. Savannas, wet pine flatwoods, adjacent ditches, borrow scrapes, blackwater stream shores. July-September. S. NJ south to e. GA (McIntosh County) (Sorrie 1998b) on the Coastal Plain; disjunct inland in c. and w. NC, sc. TN, and in s. AL. See discussion under *H. virgatum*. [= K, Q, S; = *H. denticulatum* var. *denticulatum* – RAB, C, F, G, Z; < *H. denticulatum* – GW (also see *H. virgatum*); = *H. denticulatum* ssp. *denticulatum* – X]



Hypericum dolabriforme Ventenat, Glade St.-John's-wort. Limestone glades and barrens. In nw. GA (Jones & Coile 1988) and e. TN (Chester, Wofford, & Kral 1997); this species should be sought in sw. VA. [= C, F, G, K, S, V, X, Z] {not yet keyed}

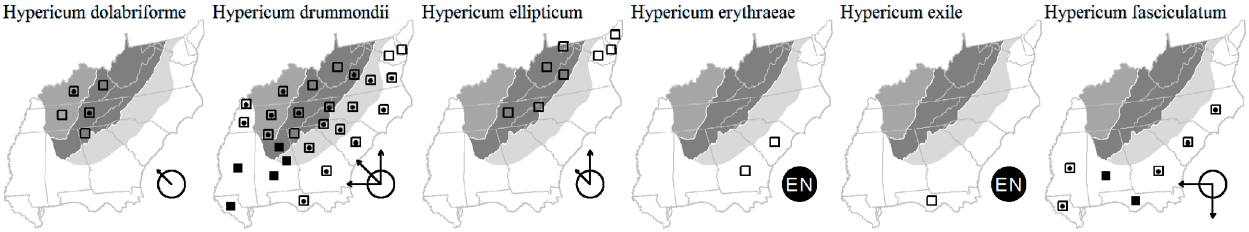
Hypericum drummondii (Greville & Hooker) Torrey & A. Gray, Nits-and-lice, Drummond's St.-John's-wort. Dry woodlands, woodland borders, fields. July-September. MD west to OH, IL, and se. KS, south to Panhandle FL and c. TX. [= RAB, C, F, G, GW, K, W, WH, WV, X, Z; = *Sarothra drummondii* Greville & Hooker – S]

Hypericum ellipticum Hooker, Pale St.-John's-wort. Swamp forests, wet places along streams. July-August. NL (Newfoundland) and NS west to w. ON, south to NY, DE, MI, and MN, and in the mountains to WV, NC (?), and ne. TN (Johnson County) (Chester, Wofford, & Kral 1997), and NC (?). The documentation for C's attribution of *H. ellipticum* to NC is unknown. [= C, F, G, K, V, WV, X]

Hypericum erythreae (Spach) Steudel, Georgia St.-John's-wort, Sparse-leaved St.-John's-wort, Grit St.-John's-wort. Seepage bogs, roadside ditches. Apparently nearly endemic to the Altamaha Grit region of the GA Coastal Plain, extending to Beaufort County, SC (Allison, in press). [= Q] {not yet keyed}

Hypericum exile W.P. Adams. Pine flatwoods. Endemic to Panhandle FL (Bay, Franklin, Gulf, Liberty, and Washington counties). There seems nothing in particular to recommend Robson's reduction of *H. exile* to a subspecies of *H. nitidum*. [= GW, K, V, WH, Y, Z; = *H. nitidum* Lamarck ssp. *exile* (W.P. Adams) N. Robson – X]

Hypericum fasciculatum Lamarck, Peelbark St.-John's-wort. Wet pine savannas, beaver ponds, upland depression ponds. May-September. E. NC south to s. FL, west to s. MS. [= RAB, GW, K, V, WH, X, Y, Z; < *H. fasciculatum* – S (also see *H. nitidum* and *H. chapmanii*)]



Hypericum fraseri Spach, Fraser's Marsh St.-John's-wort. Bogs, peaty wetlands. July-August. NL (Newfoundland) and QC west to MN, south to NY, PA, w. VA, ne. TN, w. NC, OH, n. IN, and NE. Closely related to *T. virginicum* and reduced to a variety of (or included in) that species by some authors. [= ***Triadenum fraseri*** (Spach) Gleason – C, G, K; = *Hypericum virginicum* Linnaeus var. *fraseri* (Spach) Fernald – F, WV; < *T. virginicum* – W, Z]

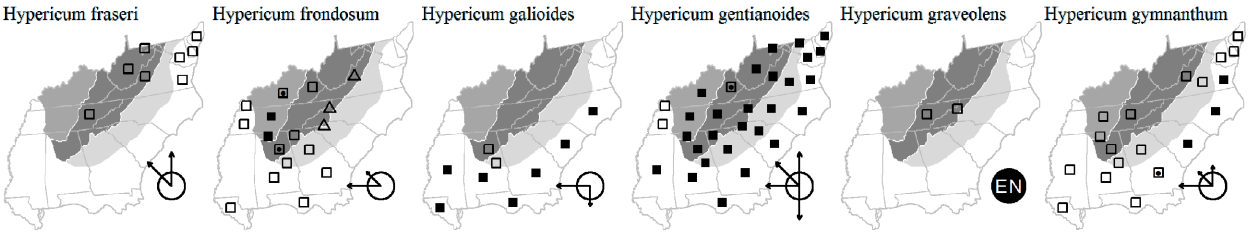
Hypericum frondosum Michaux. Rock outcrops and rocky woodland. Late May-July. This species is native and widespread as far east as e. TN (Chester, Wofford, & Kral 1997), GA, and FL. [= C, F, G, K, V, W, WH, Y, Z; > *H. aureum* Bartram – S; > *H. splendens* Small – S]

Hypericum galioides Lamarck. Wet pine savannas, wet pine flatwoods, pools, edges of bottomlands. June-August. E. NC south to c. peninsular FL, west to se. TX. [= RAB, GW, K, V, X, Y, Z; > *H. ambiguum* Elliott – S; > *H. galioides* – S]

Hypericum gentianoides (Linnaeus) Britton, Sterns, & Poggenburg, Pineweed, Orange-grass. Fields, rock outcrops, woodland borders, eroding areas, pond margins, flatwoods. July-October. ME and ON west to MN, south to s. FL and TX. [= RAB, C, F, G, K, W, WH, WV, X, Z; = *Sarothra gentianoides* Linnaeus – S]

Hypericum graveolens Buckley, Mountain St.-John's-wort. Grassy balds, grassy openings, forests, at high elevations (1200 m or more). July-August. Nw. NC and ne. TN south to sw. NC, a Southern Appalachian endemic. This and the related *H. mitchellianum* (another narrow endemic to the Southern Appalachians) hybridize, forming local hybrid populations with intermediate characteristics (Culwell 1970). [= RAB, GW, K, S, W, X, Z]

Hypericum gymnanthum Engelmann & A. Gray, Clasping-leaf St.-John's-wort. Pine savannas, wet pine flatwoods, sinkhole ponds (Augusta and Rockingham counties, VA), other wet to moist habitats. June-September. S. NJ south to ne. FL, Panhandle FL, west to c. TX, and scattered inland in PA, WV, sc. TN, OH, IN, IL, MO, and e. KS; also disjunct in Guatemala (introduced?). [= RAB, C, F, G, GW, K, S, WH, X, Z]



Hypericum harperi R. Keller, Harper's St.-John's-wort. Clay-based Carolina bays, other upland depression ponds, with *Taxodium ascendens*. July-September. E. and c. SC south to sw. GA and e. Panhandle FL. *H. harperi* should be sought in sc. and se. NC, where it may well occur. This species has generally been considered a part of *H. denticulatum* or *H. virgatum*, but Webb (1980) makes a convincing argument for its recognition, including the ecological differentiation and absence of intermediates or hybrids when growing in proximity to *H. denticulatum*. See *H. virgatum* for additional discussion. [= Q, WH, X; < *H. denticulatum* var. *acutifolium* – RAB, Z; < *H. denticulatum* – GW; < *H. harperi* – K; < *H. acutifolium* – S]

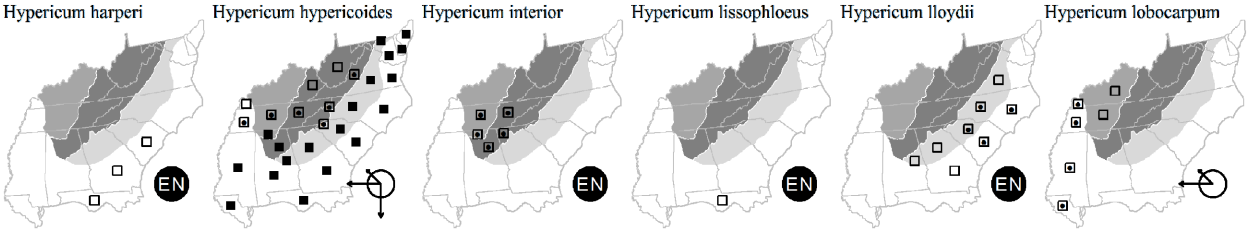
Hypericum hypericoides (Linnaeus) Crantz, St. Andrew's Cross. Dry forests and woodlands. May-August. NJ, w. VA, c. KY, se. MO, and c. OK, south to s. FL and e. TX; also in the West Indies, Mexico, and Central America. [= RAB, C, GW, V, W, WH, Y, Z; > *Ascyrum hypericoides* Linnaeus var. *hypericoides* – F, G; > *Ascyrum hypericoides* Linnaeus var. *oblongifolium* (Spach) Fernald – F, G; = *H. hypericoides* ssp. *hypericoides* – K, X; > *Ascyrum hypericoides* Linnaeus – S; > *Ascyrum linifolium* Spach – S]

Hypericum interior Small, Interior Bushy St. John's-wort. Rocky forests, riverbanks. E. and c. TN, nw. GA south to c. AL. Perhaps best treated as a variety of *H. densiflorum*. [= S; < *H. densiflorum* Pursh – K, V, X, Z; *? H. revolutum* R. Keller]

Hypericum lissophloeus W.P. Adams. Margins of sinkhole ponds. Endemic to Panhandle FL (Bay and Washington counties). [= GW, K, V, WH, X, Y, Z]

Hypericum lloydii (Svenson) W.P. Adams, Lloyd's St.-John's-wort. Dry woodlands, sandhills, edges of granitic flatrocks, edges of Altamaha Grit outcrops, roadbanks. June-September. Sc. VA (Sorrie & LeBlond 2008) south to c. AL. [= RAB, K, V, X, Z; = *Hypericum galioides* Lamarck var. *lloydii* Svenson]

Hypericum lobocarpum Gattinger. Streambanks, river bottoms, pinelands. C. TN (Chester, Wofford, & Kral 1997) and MS west to s. IL, se. OK, e. TX; credited to SC by Robson (1996), based on specimens debated and dismissed by Adams (1973). Late May-September. [= C, K, S, V, X, Z; = *H. densiflorum* var. *lobocarpum* (Gattinger) Svenson – F, G; < *H. densiflorum* – GW] {not yet keyed}



Hypericum majus (A. Gray) Britton. Wet meadows and shores. South to nw. PA (Rhoads & Klein 1993), NJ, DE, and OH (Kartesz 1999). [= C, F, G, K, X] {not yet keyed}

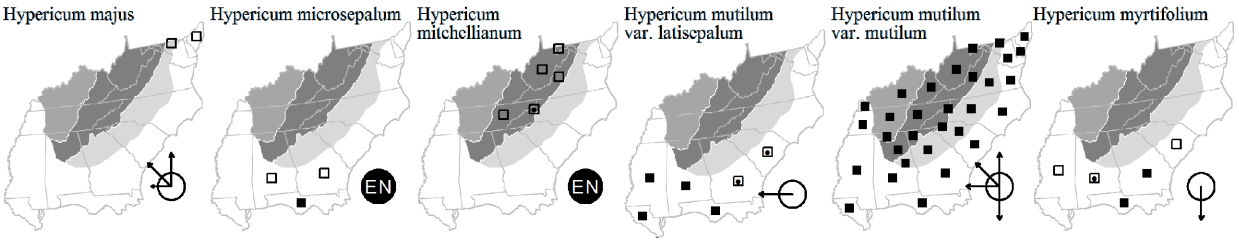
Hypericum microsepalum (Torrey & A. Gray) A. Gray ex S. Watson. Moist to wet pine flatwoods. S. GA south to Panhandle FL. [= GW, K, V, WH, X, Y, Z; = *Crookea microsepala* (Torrey & A. Gray) Small – S]

Hypericum mitchellianum Rydberg, Blue Ridge St.-John's-wort. Grassy balds, grassy openings, forests, seepages, at moderate to high elevations (generally at 1000-1900 m or more). July-August. W. VA, e. WV, and e. TN south to sw. NC, a Southern Appalachian endemic. Robson (2006) interprets this as a hybrid of *H. graveolens* and *H. punctatum* but offers no evidence other than its general morphological intermediacy. [= RAB, C, F, G, GW, K, S, W, WV, Z; = *H.* ×*mitchellianum* Rydberg, pro sp. – X]

Hypericum mutilum Linnaeus *var.* ***latisepalum*** Fernald, Southern Dwarf St.-John's-wort. Marshes and other wet habitats. June-October. Se. SC south to peninsular FL, west to TX (and, according to F, north to s. NJ). Hybrids with *H. canadense* have been called *H.* ×*dissimulatum* Bicknell (pro sp.). [= F; < *H. mutilum* – RAB, G, GW, K, S, W, WH, Z; = *H. mutilum* ssp. *latisepalum* (Fernald) N. Robson – X]

Hypericum mutilum Linnaeus *var.* ***mutilum***, Common Dwarf St.-John's-wort Bogs, marshes, other wet habitats. June-October. NL (Newfoundland) and QC west to MB, south to s. FL and c. TX; scattered (probably as an adventive) farther west in North America, in Central and South America, and Europe. Hybrids with *H. canadense* have been called *H.* ×*dissimulatum* Bicknell (pro sp.). [= F; < *H. mutilum* – RAB, C, G, GW, K, S, W, WH, WV, Z; = *H. mutilum* ssp. *mutilum* – X]

Hypericum myrtifolium Lamarck, Myrtle-leaf St.-John's-wort. Ponds. Small (1933) reports this species from SC; this distribution is now documented by a specimen from Jasper Co., SC (P. McMillan, pers. comm.). Se. SC south to s. FL, west to se. MS, a Southeastern Coastal Plain endemic. [= GW, K, S, V, WH, X, Y, Z]



Hypericum nitidum Lamarck. Usually in flowing water of blackwater streams. June-August. C. SC south to Panhandle FL, west to sw. AL. [= RAB, GW, K, V, WH, Y, Z; = *H. nitidum* ssp. *nitidum* – X]

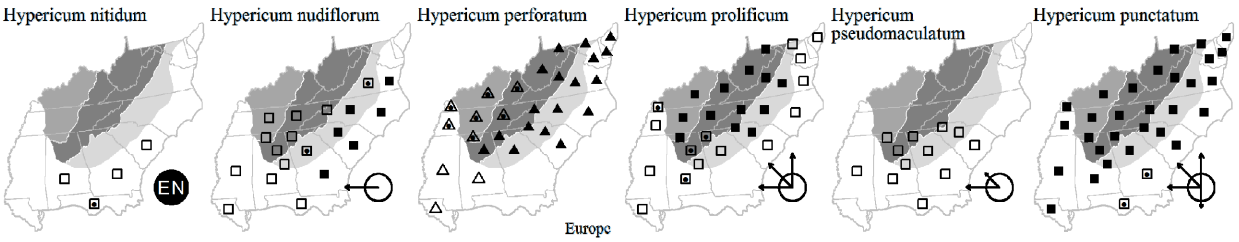
Hypericum nudiflorum Michaux ex Willdenow. Streambanks, moist forests. June-July. Se. VA south to Panhandle FL, west to e. TX, s. AR, and se. OK; disjunct in Cumberland Plateau of TN. [= RAB, C, F, G, S, W, WH, V, X, Y; < *H. nudiflorum* – GW, K, Z (also see *H. apocynifolium*)]

* ***Hypericum perforatum*** Linnaeus, European St. John's-wort. Fields, pastures, roadsides, woodland borders; native of Europe. June-September. See Duncan (1985) for documentation for GA. [= RAB, C, F, G, K, S, W, WV, Z; = *H. perforatum* ssp. *perforatum* – X]

Hypericum prolificum Linnaeus, Shrubby St-John's-wort. Bogs, seepages, rocky forests, rock outcrops. June-October. NY west to s. MI and MN, south to GA and LA. [= RAB, C, G, K, W, S, V, WV, X, Z; = *H. spathulatum* (Spach) Steudel – F]

Hypericum pseudomaculatum Bush. Wet, moist, or dry forests. June-September. SC south to Panhandle FL, west to TX, north in the interior to e. TN, c. IL, s. MO, and c. OK. {records east of the Ozarks need to be studied more carefully} [= RAB, C, G, K, S, X, Z; = *H. punctatum* Lamarck var. *pseudomaculatum* (Bush) Fernald – F; < *H. punctatum* Lamarck – WH]

Hypericum punctatum Lamarck, Spotted St.-John's-wort. Fields, woodland borders. June-September. QC west to MN, south to c. peninsular FL and TX. [= RAB, C, G, K, W, WV, X, Z; = *H. punctatum* var. *punctatum* – F; > *H. punctatum* – S; > *H. subpetiolatum* Bicknell ex Small – S; < *H. punctatum* – WH]



Hypericum radfordiorum Weakley ex J.R. Allison, Radfords' St. John's-wort, Brushy Mountain St. John's-wort. Shallow circumneutral soil mats of granitic domes in the Brushy Mountains. Apparently endemic to the Brushy Mountains of Alexander and Wilkes counties, NC. This taxon, included in *H. denticulatum* var. *acutifolium* by Webb (1980), differs from typical *H. virgatum* in being profusely branched from the medial and upper nodes (rather than being little if at all branched, and then only from the uppermost nodes), in having leaves with acuminate (rather than acute to obtuse) apices, and electrophoretically (Webb 1980). Additionally, these plants have numerous bracteal leaves along the inflorescence branches (vs. few or none), the punctate glands of the foliage are large and oval, resembling those of *H. denticulatum* (vs. small and round), and the punctate glands are distributed on the lower leaf surface and stem (vs. lower leaf surface only). It may be notable that these same outcrops are phytogeographically interesting, with other disjunct and weakly differentiated races (see *Allium cuthbertii*). [= ; < *H. denticulatum* (included in concept of *H. denticulatum* (= *H. denticulatum* var. *acutifolium*, *H. denticulatum* ssp. *acutifolium*) by most earlier authors]

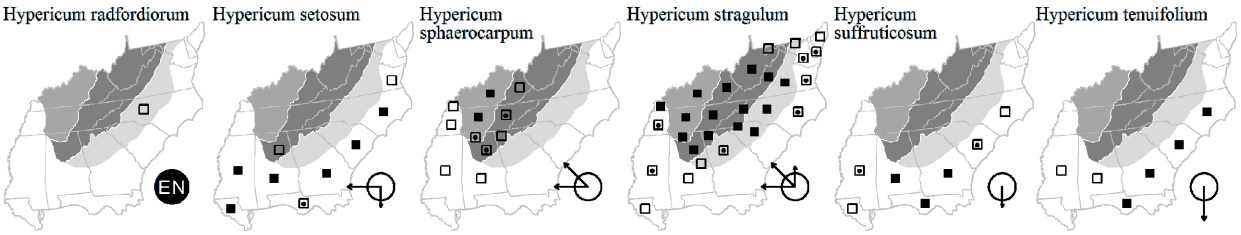
Hypericum setosum Linnaeus, Hairy St. John's-wort. Pine savannas, wet pine flatwoods, boggy areas, adjacent ditches, fireplow lines, and scrapes. May-September. Se. VA south to c. peninsular FL, west to se. TX. [= RAB, C, F, G, GW, K, S, WH, X, Z]

Hypericum sphaerocarpum Michaux, Barrens St.-John's-wort. Limestone barrens. East to GA (GAHP 2003), e. and c. TN (Chester, Wofford, & Kral 1997), sw. PA (Rhoads & Klein 1993). [= C, F, G, K, V, X, Z; > *H. turgidum* Small – S; > *H. sphaerocarpum* var. *turgidum* (Small) Svenson] {not yet keyed}

Hypericum stragulum W.P. Adams & Robson, Low St. John's-wort, Straggling St. John's-wort. Dry rocky or sandy woodlands. May-August. MA (Nantucket Island), NY (Long Island), west to s. PA, s. OH, s. IN, s. IL, c. MO, se. KS, and c. OK, south to ne. NC, c. SC, c. GA, n. AL, n. MS, n. LA, and c. TX. [= C, V, W, Z; = *H. stragalum* – RAB, misspelling; = *Ascyrum hypericoides* Linnaeus var. *multicaule* (Michaux ex Willdenow) Fernald – F, G, WV; = *H. hypericoides* (Linnaeus) Crantz ssp. *multicaule* (Michaux ex Willdenow) Robson – K, X]

Hypericum suffruticosum W.P. Adams & Robson, Pineland St.-John's-wort. Pine savannas and flatwoods. April-June. Se. NC south to c. peninsular FL, west to se. LA. [= RAB, K, V, WH, X, Y, Z; = *Ascyrum pumilum* Michaux – S]

Hypericum tenuifolium Pursh, Sandhill St.-John's-wort. Pine flatwoods, pine savannas, sandhills. June-September. Se. NC south to s. peninsular FL; Panhandle FL and se. AL. Robson (1996) indicates that the older name *H. tenuifolium* Pursh has now been adequately shown to apply to this taxon. [= X; = *H. reductum* (Svenson) W.P. Adams – RAB, GW, K, V, WH, Y, Z; < *H. aspalathoides* Willdenow – S (also including *H. brachyphyllum*)]



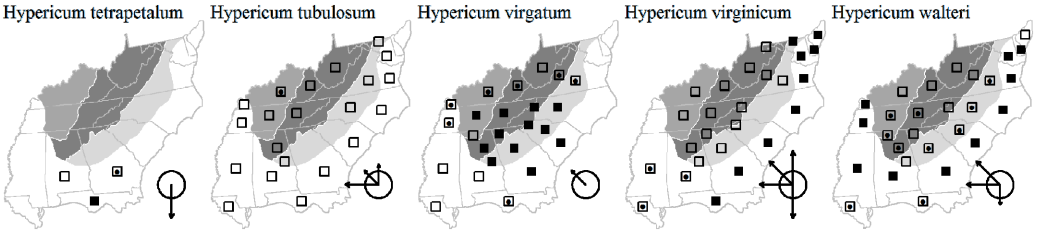
Hypericum tetrapetalum Lamarck. Wet pinelands and in depressional wetlands (open or dominated by *Taxodium ascendens*). E. GA (within a few counties of se. SC), south to s. FL, west to Panhandle FL. [= GW, K, V, WH, X, Y; = *Ascyrum tetrapetalum* (Lamarck) Vail – S]

Hypericum tubulosum Walter, Southern Marsh St.-John's-wort. Bogs, peaty wetlands, drawdown sloughs along rivers, drawdown shorelines along man-made reservoirs. August-September. Se. VA south to Panhandle FL, west to LA, and north in the interior to se. and c. TN, s. IL and s. OH. [= RAB; = ***Triadenum tubulosum*** (Walter) Gleason – C, G, GW, K, WH, Z; = *Hypericum tubulosum* Walter – RAB; = *Hypericum tubulosum* Walter var. *tubulosum* – F; = *T. longifolium* Small – S]

Hypericum virgatum Lamarck, Strict St. John's-wort. Woodlands, rock outcrops, woodland borders. Late June-September. MD west to s. OH, s. IN, and s. IL, south to c. NC, c. SC, sw. GA, Panhandle FL, s. MS, and se. LA. Though treated by most recent authors as a variety of *H. denticulatum*, *H. virgatum* is better considered as a distinct species. Webb (1980) recognized *H. harperi* as a separate species (it had previously been considered a part of *H. virgatum*), and continued to recognize this taxon as a variety of *H. denticulatum*. However, based on the nature of the punctate glands, size of seeds, inland distribution, etc., it appears that *H. virgatum* is more distantly related to *H. denticulatum* and *H. harperi* than they are to one another; recognition at the species level is warranted for *H. virgatum*. As pointed out by Webb, *H. denticulatum* is primarily tetraploid (n = 24), while *H. virgatum* and *H. harperi* are (as far as is known) strictly diploid. Additionally, the aberrant populations from granitic outcrops in the Brushy Mountains of Alexander and Wilkes counties, NC referred by Webb (1980) to this taxon are distinct, and more closely allied to *H. denticulatum* and *H. harperi*; see *Hypericum radfordiorum* for additional discussion. [= K, Q; < *H. denticulatum* Walter var. *acutifolium* (Elliott) Blake – RAB, C, F, G, W, Z (also see *H. harperi*); > *H. denticulatum* var. *recognitum* Fernald & Schubert – RAB, F, WV; < *H. denticulatum* – GW, WH; < *H. acutifolium* Elliott – S (also see *H. harperi*); = *H. denticulatum* ssp. *acutifolium* (Elliott) N. Robson – X]

Hypericum virginicum Linnaeus, Common Marsh St.-John's-wort. Bogs, peaty wetlands. July-September. NS west to OH and s. ON, south to s. FL and MS, mostly on the Coastal Plain but scattered inland. [= RAB; = ***Triadenum virginicum*** (Linnaeus) Rafinesque – C, G, GW, K, S, WH; = *Hypericum virginicum* Linnaeus – RAB; = *Hypericum virginicum* var. *virginicum* – F, WV; < *T. virginicum* – W, Z (also see *T. fraseri*)]

Hypericum walteri J.G. Gmelin, Walter's Marsh St.-John's-wort. Swamp forests and marshes. August-September. MD south to n. peninsular FL, west to e. TX, and north in the interior to s. MO, s. IL, and OH. [= RAB; = ***Triadenum walteri*** (J.G. Gmelin) Gleason – C, G, GW, K, W, WH, Z; = *Hypericum tubulosum* Walter var. *walteri* (J.G. Gmelin) Lott – F, WV; = *T. petiolatum* (Walter) Britton – S]



215. GERANIACEAE A.L. de Jussieu 1789 (Geranium Family) [in GERANIALES]

A family of about 5-11 genera and 700-835 species, herbs and shrubs, mostly temperate. References: Albers & Van der Walt in Kubitzki, Bayer, & Stevens (2007).

1 Leaves pinnately cleft or compound; fertile stamens 5, staminodia 5 ..... ***Erodium***
1 Leaves palmately cleft or compound; fertile stamens 10 (except in *G. pusillum*, and note that anthers are readily deciduous in all species) ..... ***Geranium***

Erodium L'Héritier in Aiton 1789 (Stork's-bill, Filaree)

A genus of about 60-80 species, herbs, mainly Old World. References: Albers & Van der Walt in Kubitzki, Bayer, & Stevens (2007).

1 Leaves simple, deeply lobed but not divided ..... ***E. texanum***
1 Leaves compound, with 3 or more leaflets.
  2 Primary leaflets sessile or nearly so, sometimes connected by blade tissue; blades of the primary leaflets divided nearly or quite to the base; apical pits of mericarp lacking sessile glands ..... ***E. cicutarium***
  2 Primary leaflets petiolulate; blades of the primary leaflets divided <0.75× to the base; apical pits of mericarp with sessile glands ..... ***E. moschatum*** *var.* ***moschatum***

* ***Erodium cicutarium*** (Linnaeus) L'Héritier, Heron's-bill, Common Stork's-bill, Redstem Filaree, Alfileria, Pin-clover. Mt (GA, NC, SC, VA, WV), Pd (DE, GA, NC, SC, VA), Cp (DE, FL, GA, NC, SC, VA): disturbed areas, fields, lawns; common (uncommon in DE and WV, rare in FL), native of Europe. March-June; April-July. [= RAB, C, F, G, S, W, WH; > *E. cicutarium* ssp. *cicutarium* – K]

* ***Erodium moschatum*** (Linnaeus) L'Héritier *var.* ***moschatum***, Whitestem Filaree. Cp (DE, SC): disturbed areas, waste area near wool-combing mill; rare, native of Mediterranean Europe. April-September. Naturalized south to DE and PA; also in SC Coastal Plain. [= F, K; < *E. moschatum* – C, G, S]

* ***Erodium texanum*** A. Gray, Texas Stork's-bill. Cp (SC): waste areas near wool-combing mill; rare, perhaps merely a waif, native of sc. and sw. United States. [= K]

Geranium Linnaeus 1753 (Geranium, Crane's-bill)

A genus of about 300-430 species, herbs, mainly temperate. House plants called 'geranium' are members of the genus *Pelargonium*. References: Aedo, Aldasoro, & Navarro (1998); Yeo (1984); Albers & Van der Walt in Kubitzki, Bayer, & Stevens (2007).

1 Petals 12-18 mm long; perennial, from a stout rhizome; anthers > 2 mm long; [subgenus *Geranium*, section *Geranium*] ..... ***G. maculatum***
1 Petals 2-13 mm long; annual or biennial, from a taproot; anthers < 1 mm long.
  2 Leaves compound, at least the terminal segment (and often also the two lateral segments) petiolulate, not connected to the lateral segments by leaf tissue; petals 9-13 (-15) mm long; [rare in our area, restricted to Mountains of VA]; [subgenus *Robertium*, section *Robertium*] ..... ***G. robertianum***
  2 Leaves dissected, but not compound, all segments interconnected by leaf tissue; petals 2-10 mm long; [collectively common and widespread in our area].
    3 Sepals blunt or acute, or terminating in a minute callus tip; [subgenus *Robertium*, section *Batrachioidea*].
      4 Mericarps glabrous, reticulately ridged; stem pubescence an admixture of long eglandular hairs (1.0-1.7 mm long) and short (< 0.5 mm long) gland-tipped and eglandular hairs; stamens (all 10) fertile (note that anthers may fall readily) ..... ***G. molle***
      4 Mericarps appressed pubescent, not ridged; stem pubescence of short (< 0.3 mm long), gland-tipped and eglandular hairs; stamens partly sterile (the inner 5 fertile, the outer 5 lacking anthers) ..... ***G. pusillum***
    3 Sepals awned or subulate, the subulate awn 0.7-3 mm long.
      5 Mature pedicels < 1.5× as long as the calyx.
        6 Mericarps with spreading hairs about 0.5 mm long, these often gland-tipped; [subgenus *Geranium*, section *Dissecta*] ..... ***G. dissectum***
        6 Mericarps with long appressed hairs about 1 mm long, these not gland-tipped; [subgenus *Geranium*, section *Geranium*].
          7 Inflorescence diffusely corymbiform (because of long upper internodes), mostly 4-12-flowered; pubescence of stem mostly < 0.5 mm long ..... ***G. carolinianum*** *var.* ***carolinianum***

7 Inflorescence a compact corymb (because of notably short upper internodes), mostly 5-25-flowered; pubescence of stem mostly >0.75 mm long.....***G. carolinianum*** *var.* ***confertiflorum***

5 Mature pedicels >2× as long as the calyx; [subgenus *Geranium*, section *Geranium*].

8 Pedicels spreading pubescent, the hairs not glandular; mature stylar beak 0.5-1.5 mm long

9 Peduncles bearing a single flower; seed reticulate.....***[G. sibiricum]***

9 Peduncles mostly with 2 flowers; seed nearly smooth to very finely reticulate.....***G. thunbergii***

8 Pedicels either retrorse-strigose or glandular-villous; mature stylar beak 3-5 mm long.

10 Pedicels glandular-villous.....***G. bicknellii***

10 Pedicels retrorsely strigose.....***G. columbinum***

Geranium bicknellii Britton, Northern Cranebill, Bicknell's Crane's-bill. Mt (WV): open woods and clearings; uncommon. July-September. NL (Newfoundland) and AK south to PA, WV, c. TN, IN, IL, MO, CO, UT, and CA. [= C, G, K, W; > *G. bicknellii* var. *bicknellii* – F]

Geranium carolinianum Linnaeus *var.* ***carolinianum***, Southern Carolina Crane's-bill. Cp (FL, GA, NC, SC, VA), Pd (GA, NC, SC, VA), Mt (GA, NC, SC, VA, WV), {DE}: fields, roadsides, lawns, pastures, gardens, disturbed areas; common. March-June (and sometimes later). MA, MI, WY, and BC south to FL and CA. [= C, F, G; < *G. carolinianum* – RAB, S, W, WH, WV; < *G. carolinianum* var. *carolinianum* – K]

Geranium carolinianum Linnaeus *var.* ***confertiflorum*** Fernald, Northern Carolina Crane's-bill. Mt (NC, VA), Pd (VA), {DE}: fields, roadsides, lawns, gardens, disturbed areas; common. March-June (and sometimes later). ME and MN, south to DE and MO, and in the mountains to w. NC and e. TN. [= C, F, G; < *G. carolinianum* – RAB, S, W; < *G. carolinianum* var. *carolinianum* – K]

* ***Geranium columbinum*** Linnaeus, Long-stalk Crane's-bill. Mt (DE, GA, NC, VA), Pd (DE, VA), Cp (VA): roadsides, pastures, disturbed areas; common (uncommon in DE, uncommon in VA Piedmont, rare in VA Coastal Plain), native of Europe. May-July. [= RAB, C, F, G, K, S, W, WV]

* ***Geranium dissectum*** Linnaeus, Cutleaf Crane's-bill. Cp (GA, NC, VA), Pd (NC, SC, VA), Mt (GA, NC, SC, VA, WV): roadsides, pastures, disturbed areas; common (rare in VA and WV), native of Europe. April-June. [= RAB, C, F, G, K, S, W, WV]

Geranium maculatum Linnaeus, Wild Geranium. Mt (GA, NC, SC, VA, WV), Pd (DE, GA, NC, SC, VA), Cp (DE, FL, GA, NC, SC, VA): cove forests, bottomland forests, other mesic, base-rich forests; common (uncommon in DE Coastal Plain, rare in FL, GA, NC, SC, and VA Coastal Plain). April-June. ME west to MB, south to SC, GA, FL Panhandle (Gadsden County) (Kunzer et al. 2009) and ne. OK. Sometimes cultivated. [= RAB, C, F, G, K, S, W, WV]

* ***Geranium molle*** Linnaeus, Dove's-foot Crane's-bill. Pd (GA, NC, SC, VA), Mt (NC, SC, VA, WV), Cp (DE, VA): roadsides, pastures, disturbed areas; common (uncommon in DE and WV), native of Europe and w. Asia. April-July. [= RAB, C, F, G, K, S, W, WV]

* ***Geranium pusillum*** Linnaeus, Small-flowered Crane's-bill. Mt (NC, VA, WV), Pd (SC, VA), Cp (DE, VA): roadsides, pastures, disturbed areas; common (uncommon in VA and WV, rare in DE), native of Europe. May-June. [= RAB, C, G, K, S, W, WV]

Geranium robertianum Linnaeus, Herb Robert. Mt (VA, WV), Pd (DE): rocky woodlands, especially over calcareous rocks; uncommon (rare in VA and WV). June-October. Circumpolar, ranging south in North America to w. VA, nc. TN (Chester, Wofford, & Kral 1997), OH, IN, and IL. Considered by C and G to be introduced in North America, but apparently native. [= C, F, G, K, W, WV]

* ***Geranium thunbergii*** Siebold & Zuccarini ex Lindley & Paxton. Mt (NC), Pd (DE, VA): lawn along Blue Ridge Parkway; rare, native of e. Asia. Reported for NC by Nesom (2000) on the basis of a 1936 specimen. [= K; ? *G. ibericum* Cavanilles – C, apparently misapplied; = *G. nepalense* Sweet var. *thunbergii* (Siebold & Zuccarini ex Lindley & Paxton) Kudo – F, G]

* ***Geranium ibericum*** Cavanilles, Iberian Crane's-bill. Mt (NC): rare, spread from horticultural use, native of Europe. Recently found in Great Smoky Mountains National Park, in both NC and TN (K. Langdon, pers. comm.). [= F, K; ? *G. nepalense* – C] {not yet keyed}

* ***Geranium sanguineum*** Linnaeus, Blood-red Crane's-bill. Mt (NC): roadbank, rare, probably persistent or spread from cultivation. [= C, F, G, K] {not yet keyed; add to synonymy}

* *Geranium sibiricum* Linnaeus, native to Asia, is naturalized south to s. PA (Rhoads & Klein 1993) and is likely to occur in at least the northern part of our area. [= C, F, K]

219. LYTHRACEAE J. St.-Hilaire 1805 (Loosestrife Family) [in MYRTALES]

A family of about 27-35 genera and about 600 species, herbs, shrubs, and trees, primarily tropical (a few warm temperate). References: Graham (1975)=Z; Graham in Kubitzki, Bayer, & Stevens (2007). Keys adapted, in large part, from Z. [including *PUNICACEAE* and *TRAPACEAE*]

1 Plant woody or suffrutescent, a shrub or a small tree 1-10 m tall; petals present, showy, 8-20 mm long.

2 Aquatic shrubs with arching suffrutescent or woody stems; leaves opposite or whorled; [native].....***Decodon***

2 Terrestrial shrubs or small trees with erect woody stems; leaves alternate to subopposite; [aliens cultivated and sometimes persistent].

3 Flowers in many-flowered terminal or axillary panicles; fruit a loculicidal capsule.....***Lagerstroemia***

3 Flowers solitary or several in terminal or axillary clusters; fruit a leathery berry (pomegranate).....***[Punica]***

1 Plant not woody, an herb 0.1-1.2 m tall; petals absent or present, inconspiscuous or showy, 1-10 mm long.

4 Fruit with 2-4 prominent spines; leaves coarsely toothed.....***Trapa***

4 Fruit not spinose; leaves entire.

5 Stems pubescent.

6 Floral tube (hypanthium) swollen obliquely at its base; capsule dehiscing longitudinally along the upper surface ..... ***Cuphea***
6 Floral tube (hypanthium) symmetrical; capsule dehiscing septicidally at the apex ..... ***Lythrum***
5 Stems glabrous.
7 Floral tube cylindric to turbinate, about 2× as long as wide ..... ***Lythrum***
7 Floral tube campanulate to globose, about 1× long as wide.
8 Flowers or fruits (1-) 3-10 in the leaf axils (at least some axils with 2 or more flowers or fruits on a given plant)..... ***Ammannia***
8 Flowers or fruits solitary in the leaf axils (never > 1 per axil).
9 Capsule indehiscent; petals 0; sepals 4, broadly triangular, lacking intersepalary appendages; seeds spatulate or oblanceolate, about 1 mm long, minutely granular on one face and smooth on the other..... ***Didiplis***
9 Capsule dehiscing septicidally; petals 4; sepals 4 (-6), triangular, with intersepalary appendages of size about equal to the calyx lobes; seeds hemispheric, about 0.3 mm long, the surface very finely reticulate..... ***Rotala***

Ammannia Linnaeus 1753 (Toothcup)

A genus of about 80 species, herbs, cosmopolitan. The circumscription of the genus here includes *Nesaea* and *Hionanthera*, following Graham, Diazgranados, & Barber (2011) and Graham (2007). References: Graham (1985)=Y; Graham (1975)=Z; Graham in Kubitzki, Bayer, & Stevens (2007). Key based in part on Y.

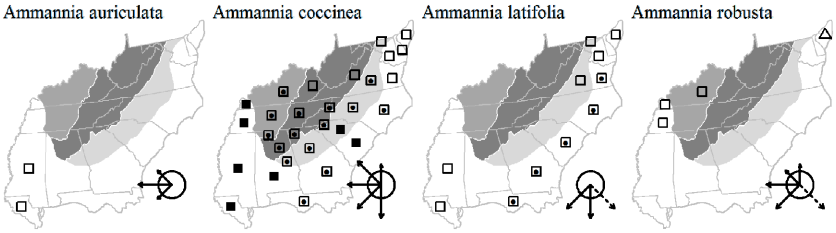
1 Style included (when in fruit), thick, 0.5-1.0 mm long (much shorter than the ovary); calyx lobes obtuse, often with the apices minutely mucronate; petals 0, 1, or 4, pale pink to white, to 1 mm long and 1 mm wide ..... ***A. latifolia***
1 Style exserted (when in fruit), filiform, 1.5-3.0 mm long (equal to or longer than the ovary); calyx lobes triangular, with acute apices; petals 4 (-5), deep rose-purple or pale lavender, ca. 2 mm long and 2 mm wide.
2 Inflorescence usually a short- or long-pedunculate cyme (sometimes reduced); flowers usually > 3 per axil; petals deep rose-purple; fruits 3.5-5 mm in diameter..... ***A. coccinea***
2 Inflorescence sessile; flowers usually 1-3 per axil; petals pale lavender; anthers yellow; fruits 4-6 mm in diameter ..... ***A. robusta***

Ammania auriculata Willdenow, Eared Redstem. Swamps, ditches, other wetlands. May-July. MS, LA, SD, NM, and AZ, south to TX and Mexico. [= GW, K2, Y, Z] {not yet keyed}

Ammannia coccinea Rottbøll. Marshes, ditches, exposed muddy river shores and banks, wet pine flatwoods, other wet places. July-October. NJ, OH, IN, IL, IA, and SD south to s. FL and TX; disjunct in CA; south through Mexico and Central America to n. South America. [= RAB, C, K1, K2, W, WH, Y; > *A. coccinea* ssp. *purpurea* (Lamarck) Koehne – G; < *A. coccinea* – F, GW, S, Z]

Ammannia latifolia Linnaeus, Pink Redstem. Tidal marshes, wet places, ditches. July-September. NJ south to s. FL and west to TX (mostly on the Coastal Plain), and also in the West Indies, Yucatan, Central America, and South America. All plants in North America north of Florida have flowers with petals; most plants from FL south through the West Indies into Central and South America have flowers without petals. Graham (1985) considered these forms; additional study is warranted. The name *A. koehnei* Britton is available for the petaliferous North American plant should its recognition prove warranted. [= C, GW, K1, K2, W, WH, Y, Z; > *A. teres* Rafinesque – RAB, G; > *A. teres* var. *teres* – F; > *A. teres* var. *exauriculata* (Fernald) Fernald – F; > *A. latifolia* – S; > *A. koehnei* Britton – S]

Ammannia robusta Heer & Regel, Grand Redstem. Marshes, ditches, swamps. OH and BC south to w. KY, w. TN, LA, TX, CA, Mexico, and Belize; West Indies; introduced in NJ and n. South America. [= C, K1, K2, Y; < *A. coccinea* – F, GW, S, Z]



Cuphea P. Browne 1756 (Waxweed)

A genus of about 260 species, herbs, of America, primarily tropical and subtropical. References: Graham (1975)=Z; Graham in Kubitzki, Bayer, & Stevens (2007).

1 Leaves whorled (at least in part); pedicels > 10 mm long; [flatwoods of FL Panhandle] ..... ***C. aspera***
1 Leaves opposite (none whorled); pedicels < 3 mm long; [collectively widespread].
2 Floral tube green, 4.5-6 mm long, glabrous inside; stamens much shorter than the floral tube; petioles to 8 mm long, often very short..... ***C. carthagenensis***
2 Floral tube purple-green, 6-10 mm long, villous inside; stamens equal to or exceeding the the floral tube; petioles to 20 mm long ..... ***C. viscosissima***

Cuphea aspera Chapman, Apalachicola Waxweed. Flatwoods. Endemic to the FL Panhandle (Franklin, Gulf, and Calhoun counties). [= K, WH, Z; = *Parsonsia lythroides* Small – S]

* ***Cuphea carthagenensis*** (Jacquin) J.F. Macbride, Colombian Waxweed. Marshes, ditches, floodplain forests, wet hammocks, other wet places; native of South America. June-September. [= GW, K, WH, Z; = *C. carthagensis* – RAB (a misspelling); = *Parsonsia balsamona* (Chamisso & Schlechtendahl) Standley – S]

* *Cuphea procumbens* Gómez Ortega is reported for NC by Small (1933). Graham (1975) considers this Mexican species to be represented in se. United States only by "garden escapes that do not persist." [= K, Z; = *Parsonsia procumbens* (Gómez Ortega) Heller – S] {not keyed; not mapped}

Cuphea viscosissima Jacquin. Dry or wet places. July-October. NH west to IA and KS, south to c. GA, LA, and e. OK. [= RAB, C, GW, K, W, WV, Z; = *C. petiolata* (Linnaeus) Koehne – F, G; = *Parsonsia petiolata* (Linnaeus) Rusby – S]

Decodon J.F. Gmelin 1791 (Water-oleander, Water-willow)

A monotypic genus, a weak shrub, endemic to e. North America (more widespread in the fossil record). References: Graham (1975)=Z; Graham in Kubitzki, Bayer, & Stevens (2007).

Decodon verticillatus (Linnaeus) Elliott, Water-oleander, Water-willow, Swamp Loosestrife, Peatweed. Natural lakes, limesink ponds, peatlands, peaty swamps, not known in the Piedmont or Mountains of NC or SC, but scattered in the Ridge and Valley of VA. July-September. NS, ON, and MN south to c. peninsular FL and e. TX. The lower stems are spongy in texture. [= RAB, GW, K, S, W, WH, WV, Z; > *D. verticillatus* var. *verticillatus* – C, F, G; > *D. verticillatus* var. *laevigatus* Torrey & Gray – C, F, G]

Didiplis Rafinesque 1833 (Water-purslane)

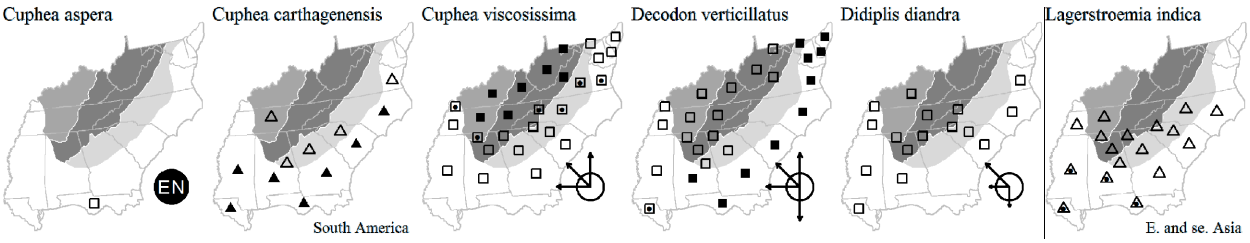
A monotypic genus, an herb, endemic to e. North America. References: Graham (1975)=Z; Graham in Kubitzki, Bayer, & Stevens (2007).

Didiplis diandra (Nuttall ex A.P. de Candolle) Wood, Water-purslane. Stagnant water of pools, streams, and old beaverponds. April-August. Se. VA, IN, and WI south to NC, SC, MS, and LA; disjunct in s. peninsular FL (Wunderlin & Hansen 2008). [= C, G, GW, K, S, WH, Z; = *Peplis diandra* Nuttall ex A.P. de Candolle – RAB, F]

Lagerstroemia Linnaeus 1759 (Crape-myrtle)

A genus of 53-56 species, trees, of tropical se. Asia and Australia. References: Graham (1975)=Z; Graham in Kubitzki, Bayer, & Stevens (2007).

* ***Lagerstroemia indica*** Linnaeus, Crape-myrtle. Commonly cultivated, persistent around old plantings, weakly spreading; native of Asia. June-September. [= C, K, S, WH, Z]



Lythrum Linnaeus 1753 (Loosestrife)

A genus of about 36 species, herbs, cosmopolitan. References: Graham (1975)=Z; Haines (2010)=Y; Graham in Kubitzki, Bayer, & Stevens (2007).

1 Flowers numerous in terminal spike-like thyrses; stamens usually 12; leaves opposite or whorled ..... ***L. salicaria***
1 Flowers solitary or paired in axils; stamens usually (4-) 6; leaves opposite or alternate.
  2 Annual; flowers present in nodes more-or-less throughout the plant; flowers homostylous, all alike, the stamens always included ..... ***L. hyssopifolia***
  2 Perennial by basal stoloniferous outshoots; flowers present only only at upper nodes; flowers heterostylous (either with an exserted style and included stamens, or vice versa)
    3 Leaves opposite throughout, mostly shorter than to as long as the internodes, 1-4 mm wide ..... ***L. lineare***
    3 Leaves opposite below, alternate above, mostly longer than the internodes, 2-14 mm wide.
      4 Floral tube 3-4 mm long; petals 2-3 mm long; calyx appendages about the same length as the calyx lobes; branch leaves abruptly and definitely reduced in size relative to the stem leaves, and widely spaced; [of sw. GA southward] ..... ***L. curtissii***
      4 Floral tube 5-6 mm long; petals 5-6 mm long; calyx appendages about 2× as long as the calyx lobes; branch leaves gradually reduced relative to the stem leaves, dense and overlapping; [collectively widespread in our area].
        5 Leaves ovate to lanceolate, widest at a point 1/6 to 1/2 of the way from the base to the apex, the base rounded to subcordate; stems mostly slender, to 8 dm tall; bracteoles mostly at the base of the pedicel ..... ***L. alatum***

5 Leaves lanceolate to linear-lanceolate, widest at a point 1/3 to 2/3 of the way from the base to the apex, the base cuneate, often narrowly so; stems stout, to 13 dm tall; bracteoles mostly on the upper pedicel, immediately below the floral tube ..... ***L. lanceolatum***

Lythrum alatum Pursh, Northern Winged Loosestrife. Calcareous meadows, marl fens, and disturbed wet calcareous places. June-September. ME, NY, MI, and ND south to sc. VA, e. TN, nw. GA, n. AL, n.. AR, ne. OK, and CO. [= F, S, W, WV; = *L. alatum* var. *alatum* – C, G, GW, K, Z; = *L. alatum* ssp. *alatum* – Y]

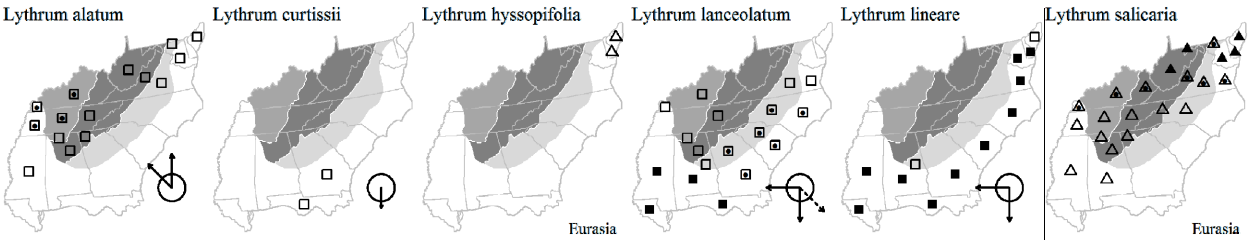
Lythrum curtissii Fernald, Curtiss's Loosestrife. Calcareous swamps, seepage areas. June-early September. Sw. GA south to Panhandle FL, and disjunct in ne. FL; the report from Emanuel County, GA (Jones & Coile 1988) is in error. [= GW, K, S, WH, Z]

*? ***Lythrum hyssopifolia*** Linnaeus, Annual Loosestrife. Salt marshes, other wet soils; probably only adventive from Eurasia, but sometimes interpreted as native from ME to NJ. June-September. [= C, F, G, K]

Lythrum lanceolatum Elliott, Southern Winged Loosestrife. Moist to wet places. May-September. Se. VA, se. NC, SC, GA, AL, MS, n. AR, and OK south to s. FL, s. TX, and in the West Indies. Although Graham (1975) argues that *L. lanceolatum* should be reduced to a variety of *L. alatum*, her evidence can also be interpreted as warranting specific status. [= RAB, F, S; = *L. alatum* Pursh var. *lanceolatum* (Elliott) Torrey & A. Gray ex Rothrock – C, G, GW, K, WH, Z; = *L. alatum* ssp. *lanceolatum* (Elliott) A. Haines – Y]

Lythrum lineare Linnaeus, Narrowleaf Loosestrife, Wand Loosestrife. Nearly fresh, brackish, and saline marshes. July-October. NJ south to s. FL and west to TX. [= RAB, C, F, G, GW, K, S, WH, Z]

* ***Lythrum salicaria*** Linnaeus, Purple Loosestrife. Swamps, marshes, other wet places; native of Eurasia. June-September. An extremely noxious weed in the ne. United States, aggressively colonizing and coming to dominate a wide variety of freshwater wetlands, sometimes to the near exclusion of native vegetation. [= RAB, C, G, K, W, WV, Z; > *L. salicaria* var. *salicaria* – F; > *L. salicaria* var. *gracilior* Turczaninow – F; > *L. salicaria* var. *tomentosum* (P. Miller) A.P. de Candolle – F]



Punica Linnaeus 1753 (Pomegranate)

A genus of 2 species, trees, of Mediterranean Europe and w. Asia. Sometimes treated in the monogeneric family Punicaceae; here included in Lythraceae, following Angiosperm Phylogeny Group (2003, 2009); *Punica* is deeply embedded phylogenetically in Lythraceae (Graham, Diazgranados, & Barber 2011). References: Zohary & Hopf (1994); Graham in Kubitzki, Bayer, & Stevens (2007).

* ***Punica granatum*** Linnaeus, Pomegranate. Suburban areas, cultivated and at least persistent; native of Mediterranean Europe. Reported as cultivated on Hatteras Island (Dare County, NC) (Brown 1959). This species has been cultivated in the Old World at least since the 3rd millenium B.C. [= K, S]

Rotala Linnaeus 1771 (Toothcup)

A genus of about 44 species, wetland herbs, of temperate to tropical areas, closely related to *Didiplis*. References: Graham (1975)=Z; Graham in Kubitzki, Bayer, & Stevens (2007).

1 Leaves linear to oblanceolate, > 3× as long as wide ..... ***R. ramosior***
1 Leaves broadly elliptical to orbicular, < 1.5× as long as wide ..... ***R. rotundifolia***

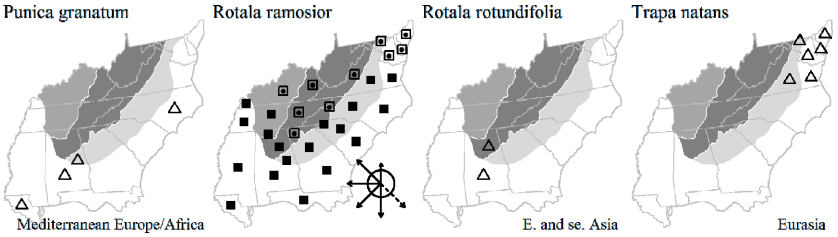
Rotala ramosior (Linnaeus) Koehne, Toothcup. Cp (DE, FL, GA, NC, SC, VA), Pd (DE, GA, NC, SC, VA), Mt (GA, NC, SC, VA): marshes, ditches, exposed drawdown muds and silts; common (uncommon in VA Mountains). June-October. VT, NY, ON, MI, WI, MN, SD, MT, and BC, south to s. FL, TX, AZ, CA, and south through Mexico to Central America and , South America; West Indies. [= RAB, C, GW, K, S, W, WH, Z; > *R. ramosior* var. *ramosior* – F, G; > *R. ramosior* var. *interior* Fernald & Griscom – F, G]

* ***Rotala rotundifolia*** (Buchanan-Hamilton) Koehne, Dwarf Rotala, Roundleaf Toothcup. Disturbed wet areas, perhaps just a waif; native of Asia. March-August. [= K2, WH]

Trapa Linnaeus 1753 (European Water-chestnut)

A genus of 1 highly polymorphic or up to 45 more narrowly defined species, annual aquatic herbs, native of the Old World. Often placed in a monogeneric family, Trapaceae, but *Trapa* is deeply embedded phylogenetically in Lythraceae (Graham, Diazgranados, & Barber 2011). References: Angiosperm Phylogeny Group (2003, 2009); Graham in Kubitzki, Bayer, & Stevens (2007).

* ***Trapa natans*** Linnaeus, European Water-chestnut, Water-caltrop. Cp (DE, VA), Pd (VA): farm ponds and other stagnant or slow-moving water; rare, native of Eurasia and Africa. June-September. [= C, F, G, K]



220. ONAGRACEAE A.L. de Jussieu 1789 (Evening-primrose Family) [in MYRTALES]

A family of about 18 genera and 655 species, herbs, shrubs, and rarely trees, cosmopolitan (especially of temperate and subtropical America). References: Wagner, Hock, & Raven (2007); Munz (1965)=X; Crisci et al. (1990).

1 Flowers 2-merous, the petals white; fruits with uncinate trichomes; leaves opposite, decussate, borne spreading at right angles to the stem, mostly ovate, on petioles mostly 0.5-8 cm long; [subfamily *Onagroideae*; tribe *Circeeae*] ..... ***2. Circaea***
1 Flowers (3-) 4 (-7)-merous, the petals yellow, pink, or white (or absent); fruits lacking uncinate trichomes; leaves alternate (rarely opposite). not decussate, usually ascending or appressed (rarely spreading at right angles to the stem), mostly lanceolate, mostly sessile or subsessile.
2 Fruit indehiscent; seeds 1-6 per capsule, 1.5-3.5 mm long; [subfamily *Onagroideae*; tribe *Onagreae*] ..... ***5. Oenothera***
2 Fruit dehiscent; seeds (10-) 50-many per capsule, 0.3-2 mm long.
3 Seeds with an elongate coma at one end (wind-dispersed); petals pink or white; [subfamily *Onagroideae*; tribe *Epilobieae*].
4 Leaves all alternate; flowers numerous in a terminal raceme (with small bracts); flower buds reflexed, the flowers held horizontally or ascending; petals 10-20 mm long; stigma 4-lobed; plants 10-30 dm tall ..... ***3. Chamerion***
4 Leaves all or at least the lowermost opposite; flowers few, axillary, or in poorly developed, leafy racemes; flower buds not reflexed, the flowers ascending; petals 2-8 mm long (except 10-15 mm long in *E. hirsutum*); stigma capitate (except 4-lobed in *E. hirsutum*); plants 1-20 dm tall ..... ***4. Epilobium***
3 Seeds not comose (gravity-dispersed); petals yellow or absent (rarely white or pink).
5 Calyx tube not extended beyond the summit of the ovary; sepals persistent on the capsule (rarely deciduous); stamens 4, 8, or 10-14; petals yellow or absent; [primarily of wetlands]; [subfamily *Ludwigioideae*] ..... ***1. Ludwigia***
5 Calyx tube extended beyond the summit of the ovary; sepals deciduous; stamens 8; petals yellow (rarely pink or white); [primarily of uplands]; [subfamily *Onagroideae*; tribe *Onagreae*] ..... ***5. Oenothera***

1. Ludwigia Linnaeus 1753 (Seedbox, Water-primrose, Water-purslane)

A genus of about 82 species, herbs and shrubs, cosmopolitan. References: Wagner, Hoch, & Raven (2007)=U; Peng (1989)=Z; Munz (1965)=X; Nesom & Kartesz (2000)=Q; Zardini, Gu, & Raven (1991)=V; Peng (1984, 1986, 1988); Peng & Tobe (1987); Raven (1963); Munz (1938, 1944); Eyde (1977, 1978, 1981); Raven & Tai (1979); Duke (1955). Key based in part on GW, Z, and Q.

Identification notes: Many natural hybrids are known, not necessarily in our area. Hybrids are generally recognizable from their intermediate morphology and usual association with their two parents. However some hybrids resemble one parent much more than the other, and some hybrids are found in populations independent (and even disjunct) from one or both parents. Allopolyploidy may have had a major role in the evolution of this genus, especially section *Microcarpium*, which has a majority of polyploid species.

1 Leaves opposite; plants creeping (rooting at the nodes); [section *Dantia*] ..... **Key A**
1 Leaves alternate; plants erect or ascending (not rooting at the nodes), or creeping (rooting at the nodes).
2 Stamens 8-14; sepals 4-7; petals 4-7; [of various habits, including annual and perennial herbs and shrubs, variously erect, ascending, creeping, or forming floating mats] ..... **Key B**
2 Stamens 4; sepals 4; petals 0-4; [perennial herbs, with erect ascending flowering stems] ..... **Key C**

Key A – *Ludwigia* with opposite leaves

1 Pedicels of flowers and fruits 5-35 mm long.
2 Petals 7-11 mm long; pedicels of capsules 15-35 mm long, longer than the leaves. ..... ***L. arcuata***
2 Petals 4-5 mm long; pedicels of capsules 5-16 mm long, shorter than to equaling the leaves. ..... ***L. brevipes***
1 Pedicels of flowers and fruits 0-3 mm long.
3 Stems, leaves, capsules, and calyx densely hirsute; seeds dark reddish-brown, 0.3-0.4 mm long. ..... ***L. spathulata***
3 Stems, leaves, capsules, and calyx glabrous to sparsely puberulent; seeds tan, 0.4-0.8 mm long.

4 Petals 0; floral tubes and capsules with 4 longitudinal dark green bands; bractlets (borne at or near base of floral tube) absent or present, if present then 0-1 mm long ..... ***L. palustris***
4 Petals 4; floral tubes and capsules lacking green banding; bractlets (borne at or near base of floral tube) present, 2-4 mm long..... ..... ***L. repens***

Key B – *Ludwigia* with alternate leaves, 8-14 stamens, 4-7sepals, and 4-7 petals

1 Sepals 4; stamens 8; seeds in 2-several vertical series in each locule, free of endocarp tissue.
2 Internodes of the stem conspicuously winged on the angles by 2 decurrent wings running down from each leaf base; petals 0.6-1.2 cm long; capsule 1.0-2.0 cm long, 4-angled or 4-winged; [section *Pterocaulon*]..... ***L. decurrens***
2 Internodes of the stem not winged on the angles (or very faintly so); petals 1.0-5.0 cm long; capsule (1.5-) 2-5 cm long, obtusely 4-angled; [section *Macrocarpon*].
3 Petals (1.5-) 3-5 cm long; sepals ca. 10 mm wide at base..... ***L. bonariensis***
3 Petals 1-2 cm long; sepals 3-5 mm wide at base ..... ***L. octovalvis***
1 Sepals 5 (-7); stamens 10 (-14); seeds in 1 vertical series in each locule, loosely embraced or embedded in endocarp tissue.
4 Stems erect; floral tube much longer than the pedicel; seeds loosely embraced by a corky, horseshoe-shaped segment of endocarp; [section *Seminuda*]..... ***L. leptocarpa***
4 Stems (at least the lower portions) decumbent, creeping, or floating in mats (the flowering stems more-or-less erect in *L. grandiflora* and *L. hexapetala*); floral tube much shorter than the pedicel; seeds embedded in the woody endocarp; [section *Oligospermum*].
5 Flowering stems decumbent, floating, or creeping; stem and leaves glabrous or glabrescent; petals mostly 1-1.5 cm long; anthers 1-1.7 mm long..... ***L. peploides*** *var.* ***glabrescens***
5 Flowering stems more-or-less erect; stem and leaves sparsely to densely pubescent with long soft hairs; petals (1.2-) 1.6-3 cm long; anthers 2.5-3.5 mm long.
6 Sepals (6-) 8-11 (-14) mm long; primary leaves 5-8.5 cm long, 7-11 mm wide, usually linear-lanceolate, usually widest below the middle; petals (1.2-) 1.6-2.0 (-2.6) cm long; style 4.7-6.7 (-8.2) mm long; stems densely villous..... ***L. grandiflora*** *ssp.* ***grandiflora***
6 Sepals (8-) 12-19 mm long; primary leaves 5.5-13 cm long, 9-18 mm wide, usually narrowly elliptic to oblanceolate, usually widest above the middle; petals (1.5-) 2.0-2.9 (-3) cm long; style (5.8-) 6-10 mm long; stems sparsely to densely villous (rarely glabrous)..... ..... ***L. grandiflora*** *ssp.* ***hexapetala***

Key C – *Ludwigia* with alternate leaves, 4 stamens, 4 sepals, and 0-4 petals

1 Pedicels 2-15 mm long; capsules subglobose to spheric or cubic, about as long as wide, box-like, 4-angled, dehiscence by an apical pore (later sometimes also irregularly loculicidal); petals present, 4-15 mm long, persistent or caducous; roots fascicled, fusiform, tuberous; plants lacking basal, stoloniform shoots; [section *Ludwigia*].
2 Leaves cuneate at base; pedicels 2-5 mm long; nectary discs at base of style flattish, inconspicuous; [widespread in our area, in a wide variety of habitats] ..... ***L. alternifolia***
2 Leaves rounded or truncate at base; pedicels 4-15 mm long; nectary discs at base of style domed, prominent; [nearly restricted to the Coastal Plain, primarily of pinelands].
3 Styles 6-10 mm long; plants glabrous, glabrescent, or pubescent with very short hairs; sepals strongly reflexed in fruit ..... ***L. virgata***
3 Styles 1.5-3 mm long; plants glabrescent or pubescent with short to long, spreading to shaggy hairs; sepals strongly reflexed, spreading, or ascending in fruit.
4 Sepals narrowly deltoid, broadest at or near the base, 3-4× as long as wide, ascending or spreading in fruit; plants glabrescent to hirtellous with long spreading hairs ..... ***L. hirtella***
4 Sepals ovate, broadest near the middle, ca. 2× as long as wide, strongly reflexed in fruit; plants pubescent with relatively short, appressed to spreading hairs..... ***L. maritima***
1 Pedicels 0-1 (-5) mm long; capsules subglobose, obconic, or obpyramidal, about as long as wide or longer than wide, circular to quadrangular in cross-section, dehiscence irregularly loculicidal; petals absent or present, if present (*L. linearis*, *L. linifolia*) then 0-6 mm long and caducous; roots fibrous or rhizomatous; plants frequently with basal, stoloniform shoots; [section *Microcarpium*].
5 Capsules cylindrical, narrowly obconical, or narrowly obpyramidal, at least 2.5-5× as long as broad; petals present or absent.
6 Primary leaves of the flowering stems narrowly elliptical, 6-12 (-20) mm wide; petals absent..... ***L. glandulosa***
6 Primary leaves of the flowering stems linear, 1.5-5 mm wide; petals present.
7 Sepals (3.3-) 4-7 mm long; lateral and marginal veins obscure on lower leaf surface; seeds reddish brown; capsules cylindric, parallel-sided through most of their length, not grooved; anthers 0.5-1.1 mm long ..... ***L. linifolia***
7 Sepals 2.3-5 (-5.6) mm long; lateral and marginal veins distinct on lower leaf surface; seeds yellowish; capsules elongate obpyramidal, tapering through most or all of their length, with a shallow longitudinal groove on each face; anthers 1.1-2 mm long.
8 Sepals 2.3-4 mm long, acuminate, the surfaces densely and minutely papillose, the papillae 0.02-0.05 mm long and appressed; capsules 5-8.5 (-10) mm long, 2-4 (-5) mm in diameter; pedicels 0-0.4 mm long; seed surface cells elongate parallel to the seed length (as seen at 20× or more); anthers 1.1-1.6 mm long ..... ***L. linearis*** *var.* ***linearis***
8 Sepals 3-5 (-5.6) mm long, elongate-acuminate to cuspidate, the surfaces densely minutely strigillose, the hairs 0.06-0.10 mm long and appressed to ascending; capsules 5-10 (-12) mm long, 3-5.5 mm in diameter; pedicels 0-3.5 (-5) mm long; seed surface cells elongate transverse to the seed length, or irregular (as seen at 20× or more); anthers (1.1-) 1.3-2 mm long .... ***L. linearis*** *var.* ***puberula***
5 Capsules subglobose, obovoid, or broadly obpyramidal, 1-1.5 × as long as broad; petals absent.
9 Flowers in compact, headlike or elongate spikes, the inflorescence lacking well-developed leaves; stems rarely branched; rhizomes often present ..... ***L. suffruticosa***
9 Flowers axillary in the axils of well-developed leaves; stems usually much branched; rhizomes absent.
10 Plants densely pubescent throughout.
11 Sepal apex elongate-acuminate or subcuspidate, reflexed; pubescence of stems and leaves hirtellous (the hairs spreading); seed surface cells suborbicular (as seen at 20× or more); anthers 0.6-0.9 (-1.3 mm long; style 1-2 mm long..... ***L. pilosa***

11 Sepal apex acuminate, ascending; pubescence of stems and leaves strigillose (the hairs appressed) or hirtellous (the hairs spreading); seed surface cells elongate; anthers 0.3-0.8 mm long; style 0.25-1 (-1.25) mm long.
12 Plants hirtellous; capsules oblong-obovoid; sepals greenish on the upper surface; bracteoles (1.5-) 2-4.3 mm long, borne at or near the base of the capsule; seed surface cells elongate transverse to the seed length; anthers 0.3-0.35 mm long; style 0.25-0.5 mm long ..... ***L. ravenii***
12 Plants strigillose; capsules subglobose; sepals yellowish on the upper surface; bracteoles 0.5-1.5 mm long, usually borne on the short pedicel; seed surface cells in patches, some patches with cells elongate parallel to seed length, others with cells transverse to seed length, others with cells diagonal (rather resembling a badly laid-out parque floor); anthers 0.5-0.8 mm long; style 0.55-1 (-1.25) mm long ..... ***L. sphaerocarpa***
10 Plants glabrous or subglabrous throughout.
13 Primary leaves of the flowering stems 4-17 mm long, 1.5-10 mm wide, mostly obovate-spatulate and 1.5-3× as long as wide; capsules 1-1.5 (-2) mm long, containing 10-20 dark reddish-brown seeds; plants typically 1-4 dm tall ..... ***L. microcarpa***
13 Primary leaves of the flowering stems (18-) 30-110 mm long, 2-10 (-20) mm wide, mostly elliptic, lanceolate, oblanceolate, or linear and 4-20× as long as wide; capsules 1.8- 2-7 mm long, containing 40-500 light brown, yellowish, or tan seeds; plants typically 3-10 dm tall.
14 Capsules obpyramidal, the corners narrowly winged with wings 0.3-0.9 mm wide; bracteoles 1.5-4.7 mm long.
15 Stems often distinctly ridged or winged; sepals creamy-white, nearly as long as the capsule; capsule wall bulging out longitudinally between the wings; seed surface cells elongate parallel to the seed length ..... ***L. alata***
15 Stems nearly smooth or slightly ridged; sepals greenish, about 1/2 as long as the capsule; capsule wall flat between the wings; seed surface cells suborbicular ..... ***L. lanceolata***
14 Capsules oblong-ovoid or subglobose, the corners not winged; bracteoles either 0.5-1.5 mm or 3.5-6.5 (-8) mm long.
16 Bracteoles 3.5-6.5 (-8) mm long; sepals green, the apex long-acuminate, reflexed; capsules oblong-obovoid; seed surface cells elongate parallel to the seed length; [known from our area only in the Piedmont of VA] ..... ***L. polycarpa***
16 Bracteoles 0.5-1.5 mm long; sepals yellowish, the apex acuminate, ascending capsules subglobose; seed surface cells in patches, some patches with cells elongate parallel to seed length, others with cells transverse to seed length, others with cells diagonal (rather resembling a badly laid-out parque floor); [of the Coastal Plain of GA, NC, SC, and VA in our area] ..... ***L. sphaerocarpa***

Ludwigia alata Elliott, Winged Seedbox. Cp (GA, NC, SC, VA): interdune ponds, freshwater to slightly brackish (oligohaline) marshes; rare. June-September. Se. VA south to s. FL, west to se. LA; disjunct in Jamaica. This species is a hexaploid (n = 24). One third of the genome of *L. alata* is apparently derived from *L. microcarpa* or its ancestor (Peng 1988). [= RAB, C, F, G, K, U, Z; > *L. alata* – GW (also see *L. lanceolata*); > *L. alata* – S; > *L. simulata* Small – S]

Ludwigia alternifolia Linnaeus, Alternate-leaf Seedbox. Mt (GA, NC, SC, VA), Pd (DE, GA, NC, SC, VA), Cp (DE, GA, NC, SC, VA): ditches, marshes, open wet places, disturbed wet places; common. May-October. MA west to s. ON, s. MI, IA, and KS, south to n. FL and e. TX. [= RAB, G, GW, K, S, U, W; > *L. alternifolia* var. *alternifolia* – C, F, WV; > *L. alternifolia* var. *pubescens* E.J. Palmer & Steyermark – C, F; > *L. alternifolia* var. *linearifolia* Britton – WV]

Ludwigia arcuata Walter. Cp (GA, SC): marshes or submerged in water of natural Coastal Plain ponds; rare. June-September. SC south to s. FL, west to Panhandle FL and s. AL. [= RAB, GW, K, U; = *Ludwigiantha arcuata* (Walter) Small – S]

* ***Ludwigia bonariensis*** (M. Micheli) Hara. Cp (NC, SC, VA): freshwater tidal marshes and adjacent disturbed areas; rare, apparently native of tropical America. June-September. Locally abundant in disturbed edges of freshwater tidal marshes near Wilmington, NC, perhaps introduced on ship's ballast. Material from Wilmington apparently has larger flowers than material of *L. bonariensis* elsewhere; its source and appropriate taxonomic treatment uncertain and needing further study. First reported for SC by Leonard (1971b). [= RAB, GW, K, U; = *Jussiaea neglecta* Small – S]

Ludwigia brevipes (B.H. Long ex Britton, A. Braun, & Small) Eames, Long Beach Seedbox, Coastal Plain Water-purslane. Cp (GA, NC, SC, VA): pondshores, blackwater rivers, interdunal swales, borrow ponds, ditches, impoundments, marshes; rare. July-October. NJ south to e. GA (Jones & Coile 1988), in the Coastal Plain. [= RAB, C, F, G, GW, K, U]

Ludwigia decurrens Walter, Wingstem Water-primrose. Cp (GA, NC, SC, VA), Pd (GA, NC, SC, VA), Mt (GA, NC, SC, VA, WV): swamp forests, ditches; common (rare in VA and WV Mountains). June-October. MD, w. VA, WV, s. IN, s. IL, and MO, south to s. FL and TX; also in tropical America. [= RAB, C, GW, K, U, W; = *Jussiaea decurrens* (Walter) A.P. de Candolle – F, G, S, WV]

Ludwigia glandulosa Walter, Small-flowered Seedbox. Cp (GA, NC, SC, VA), Pd (GA, NC, SC, VA): low forests, marshes, ditches; common (rare in VA). June-September. E. MD south to n. FL, west to e. TX, north in the interior to c. TN, w. KY, s. IN, s. IL, se. MO, c. AR, and se. OK, primarily on the Southeastern Coastal Plain. A related species, treated by Peng as *L. glandulosa* ssp. *brachycarpa* (Torrey & A. Gray) Peng, ranges from sw. LA north and west to s. OK and c. TX. This species is tetraploid (n = 16). [< *L. glandulosa* – RAB, C, F, G, GW, S; = *L. glandulosa* ssp. *glandulosa* – K, U, Z]

* ***Ludwigia grandiflora*** (Michaux) Greuter & Burdet *ssp.* ***grandiflora***, Showy Water-primrose. Cp (GA, SC): ponds, lakes, sluggish waters of ditches or streams; rare. May-September. Se. SC south to FL, west to TX; disjunct in MO, Guatemala, and in s. South America. This taxon is hexaploid (n= 24). See Zardini, Gu, and Raven (1991) and Nesom & Kartesz (2000) for additional information. [= Q; < *L. uruguayensis* (Cambessedes) Hara – RAB, C, GW, K); = *L. grandiflora* (Michaux) Zardini, Gu, & Raven – U, V]

Ludwigia grandiflora (Michaux) Greuter & Burdet *ssp.* ***hexapetala*** (Hooker & Arnott) Nesom & Kartesz, Common Water-primrose. Cp (NC, SC), Pd (GA, NC), Mt* (VA*, WV*): ponds, lakes, sluggish waters of ditches or streams; uncommon (but often locally abundant) (rare in VA and WV). May-September. NC south to FL, west to OK and TX; also in CA, Europe, South America, Mexico; also introduced farther north in North America. This taxon is decaploid (n = 40). See Zardini, Gu, and Raven (1991) and Nesom & Kartesz (2000) for additional information. [= Q; < *L. uruguayensis* (Cambessedes) Hara – RAB, C, GW, K, W; < *Jussiaea uruguayensis* Cambessedes – F, G, WV; ? *Jussiaea michauxiana* Fernald – F; = *L. hexapetala* (Hooker & Arnott) Zardini, Gu, & Raven – U, V]

Ludwigia hirtella Rafinesque, Rafinesque's Seedbox. Cp (DE, GA, NC, SC, VA), Pd (GA), Mt (GA, NC): savannas, rarely in mountain bogs; common (rare in DE and VA). June-September. S. NJ south to Panhandle FL, west to e. TX, north in the interior to KY, c. TN, AR, and se. OK. [= RAB, C, F, G, GW, K, S, U, W]

Ludwigia lanceolata Elliott, Lanceleaf Seedbox. Cp (GA, NC, SC): interdune ponds, open wet areas; rare (NC Rare). August-September. Se. NC south to c. peninsular FL, west to Panhandle FL. This species is tetraploid (n = 16). [= RAB, K, S, U, Z; < *L. alata* – GW]

Ludwigia leptocarpa (Nuttall) Hara, Water-willow. Cp (DE*, GA, NC, SC, VA), Pd (GA, VA), Mt (GA, WV): riverbanks, marshes, and ditches; common (uncommon in VA, rare in DE). June-September. VA south to c. peninsular FL, west to e. TX, north in the interior along the Mississippi and Ohio rivers to se. MO, s. IL, and w. WV; and in tropical America. [= RAB, C, GW, K, U, W; = *Jussiaea leptocarpa* Nuttall – F, G, S, WV]

Ludwigia linearis Walter *var.* ***linearis***, Eastern Narrowleaf Seedbox. Cp (DE, FL, GA, NC, SC, VA), Pd (GA, NC, SC): savannas; common (uncommon in DE). June-September. Var. *linearis* ranges from s. NJ south to c. peninsular FL, west to se. LA, extending inland to the Cumberland Plateau of nc. AL and c. TN. Var. *linearis* is here interpreted to be equivalent to Peng's subglabrous morph. Peng (1989) declines to recognize infraspecific taxa in *L. linearis*, but his discussion makes clear that 2 distinctive entities are present, as characterized by orientation of seed surface cells and characters of leaves, bracteoles, pedicels, sepals, stigmas, and styles (see key). The orientation of seed surface cells, recognized as a distinctive character in other difficult species pairs (such as *L. alata* and *L. lanceolata*) is the most reliable character separating the 2 varieties. This species is diploid (n = 8). [< *L. linearis* – RAB, C, F, G, GW, K, S, U, W, Z]

Ludwigia linearis Walter *var.* ***puberula*** Engelmann & A. Gray, Western Narrowleaf Seedbox. Cp (GA, NC, SC), Pd (GA, SC): savannas, interdunal swales; uncommon. June-September. Var. *puberula* ranges primarily from c. AL west to c. AR, south to e. TX, with intergradational material extending as far north and east as n. FL and e. NC. Var. *puberula* is here interpreted to include Peng's intermediate morph, densely strigillose morph, and completely glabrous morph (Peng 1989). As pointed out by Peng (1989), the glabrous morph is exactly like the densely strigillose morph except for the absence of pubescence. They often grow together, have essentially the same distribution, and may differ only at a single allele. Peng's intermediate morph is heterogeneous; some likely being truly intermediate between (and possibly hybrid derivatives of) the two varieties here recognized, while others clearly belong to var. *puberula* (based on surface cell orientation and floral characteristics) and merely have an amount of pubescence intermediate between the densely strigillose and completely glabrous morphs. [< *L. linearis* – RAB, C, F, G, GW, K, S, U, W, Z]

Ludwigia linifolia Poiret, Flaxleaf Seedbox. Cp (GA, NC, SC), Pd (NC): limesink ponds (dolines) and *Taxodium ascendens* savannas; rare (NC Rare). June-September. Nc. NC south to s. FL, west to s. MS; disjunct in Tabasco, Mexico. This species is diploid (n = 8). [= RAB, GW, K, S, U, Z]

Ludwigia maritima R.M. Harper, Harper's Seedbox. Cp (GA, NC, SC): savannas; common. June-September. E. NC south to s. peninsular FL, west to e. LA. [= RAB, GW, K, S, U]

Ludwigia microcarpa Michaux, Small-fruited Seedbox. Cp (GA, NC, SC), Pd (GA, NC), Mt (GA): in circumneutral or alkaline soils of moist places, over calcareous rock, mafic rock, shell hash, or brackish sands, such as in maritime wet grasslands, savannas and adjacent ditches over coquina limestone ("marl"), and wet clay flats over diabase, often in roadside ditches; uncommon. July-October. Ne. NC south to s. FL, west to se. TX (Brown & Marcus 1998); disjunct inland on calcareous or mafic rocks in nc. NC, n. GA, n. AL, c. TN, and sc. MO; also in the Bahamas, Cuba, and Jamaica. This species is diploid (n = 8). [= RAB, F, GW, K, S, U, W, Z]

Ludwigia octovalvis (Jacquin) Raven. Cp (GA, NC, SC): marshes, disturbed areas; rare. May-September. Se. NC south to s. FL, west to TX; and widespread in tropical America. [= GW, U; > *L. octovalvis* spp. *octovalvis* – K; > *L. octovalvis* ssp. *sessiliflora* (M. Micheli) Raven – K; > *Jussiaea angustifolia* Lamarck – S; > *Jussiaea scabra* Willdenow – S]

Ludwigia palustris (Linnaeus) Elliott, Common Water-purslane. Cp (DE, GA, NC, SC, VA), Pd (DE, GA, NC, SC, VA), Mt (GA, NC, SC, VA, WV): moist to wet disturbed areas; common. May-November. Widespread in North America, Eurasia, and Africa. [= RAB, C, GW, K, U, W; > *L. palustris* var. *americana* (A.P. de Candolle) Fernald & Griscom – F, G, WV; > *L. palustris* var. *nana* Fernald & Griscom – F; = *Isnardia palustris* Linnaeus – S]

*? ***Ludwigia peploides*** (Humboldt, Bompland, & Kunth) Raven *var.* ***glabrescens*** (Kuntze) Shinners. Cp (DE*, GA, NC, VA), Mt (VA, WV), Pd (DE*, GA, SC, VA): pools, ditches, disturbed places; common (uncommon in DE Piedmont, rare in GA, NC, SC, VA, and WV). May-September. PA, VA and NC south and west to FL and AZ, widespread in the West Indies, Central and South America. Doubtfully native in all or part of our area. [= RAB, C; ? *L. peploides* ssp. *peploides* – GW; > *Jussiaea diffusa* Forskl. – S; > *Jussiaea grandiflora* Michaux – S; = *Jussiaea repens* Linnaeus var. *glabrescens* Kuntze – F, misapplied; = *Jussiaea repens* – G, misapplied; = *L. peploides* ssp. *glabrescens* (Kuntze) Raven – K, U; < *L. peploides* – W]

Ludwigia pilosa Walter, Hairy Seedbox. Cp (GA, NC, SC, VA), Pd (NC): ditches, wet places; common (rare in VA). June-October. Se. VA south to n. FL, west to se. TX, restricted to the Coastal Plain except for disjunct occurrences inland in NC, VA, and n. AL. This species is tetraploid (n= 16). [= K, U, W, Z; < *L. pilosa* – RAB, C, F, G, GW, S (also see *L. ravenii*)]

Ludwigia polycarpa Short & Peter. Pd (VA), Mt* (WV*): {habitat}; rare. June-September; July-October. MA, CT, and w. VT west to s. ON, MI, WI, MN, and c. NE, south to c. VA, KY, s. IL, s. MO, and e. KS. This species is tetraploid (n = 16). [= C, F, G, GW, K, S, U, Z]

Ludwigia ravenii Peng, Raven's Seedbox. Cp (NC, SC, VA): savannas, swamps, marshes, wet open places; rare. June-October. Se. VA south to ne. FL (no known records for GA), restricted to the Coastal Plain. For further information, see Peng (1984, 1988, 1989). This species is tetraploid (n = 16). [= K, U, Z; < *L. pilosa* – RAB, C, F, G, GW, S (included within concept of *L. pilosa* by most earlier authors)]

Ludwigia repens Forster, Creeping Seedbox. Cp (GA, NC, SC, VA), Pd (GA), Mt (VA): ditches, pools, and streams; uncommon (rare in VA). June-September. Se. VA south to s. FL, west to TX and n. Mexico, north in the interior to TN, MO,

and OK; also in CA, Bermuda, and the West Indies. Reveal et al. (2003) propose the name *L. repens* for nomenclatural conservation with a conserved type; if this proposal is not accepted, *L. natans* Elliott will become the name of this species. [= RAB, GW, K, U; = *Ludwigia natans* Elliott – F, G; = *Isnardia repens* – S]

Ludwigia spathulata Torrey & A. Gray, Southern Water-purslane. Cp (GA, SC), Pd (GA): sinkhole ponds, cypress-gum ponds, depression meadows, boggy shores; rare. June-October. SC south to Panhandle FL and s. AL. [= RAB, GW, K, U; = *Isnardia spathulata* (Torrey & A. Gray) Small – S]

Ludwigia sphaerocarpa Elliott, Globe-fruited Seedbox. Cp (DE, GA, NC, SC, VA): boggy areas, pools, ditches, river marshes, interdune swales, river and pondshores; common (rare in GA, NC, SC, VA). June-September. E. MA south to n. FL, west to e. TX, primarily on the Coastal Plain, spottily distributed in that range, and also disjunct in w. NY, sc. TN, s. IN, and nw. IN and ne. IL. This species is tetraploid (n = 16). Peng (1989) considers it likely that *L. sphaerocarpa* is of allopolyploid origin, one or both of its parents now extinct. [= RAB, C, GW, K, S, U, Z; > *L. sphaerocarpa* var. *sphaerocarpa* – F, G; > *L. sphaerocarpa* var. *jungens* Fernald & Griscom – F, G]

Ludwigia suffruticosa Walter, Shrubby Seedbox. Cp (GA, NC, SC): periodically to seasonally flooded portions of limesink ponds (dolines) and clay-based Carolina bays; rare north of SC (NC Rare). June-October. Se. NC south to s. peninsular FL, west to Panhandle FL and se AL. This species is tetraploid (n = 16). Peng (1989) reports that "with its whitish creamy sepals, which are very showy in the dense flower aggregates, the cross-pollinating *L. suffruticosa* successfully attracts many insects, mostly bumblebees, honeybees, and wasps." [= RAB, GW, K, S, U, Z; = *L. capitata* Michaux]

Ludwigia virgata Michaux, Savanna Seedbox. Cp (GA, NC, SC, VA): wet savannas; common (rare in VA). June-September. Se. VA south to s. peninsular FL, west to Panhandle FL and se. AL. [= RAB, C, F, GW, K, S, U]

*? ***Ludwigia peruviana*** (Linnaeus) Hara, Primrose-willow. In s. GA (Jones & Coile 1988). Reported for NC (Kartesz 1999). All or part of the Southeastern distribution is as an alien species. {investigate} [= GW, K, U; = *Jussiaea peruviana* Linnaeus – S]

2. Circaea Linnaeus 1753 (Enchanter's-nightshade)

A genus of 8 species (14 taxa), herbs, of temperate and boreal regions of the Northern Hemisphere. References: Boufford (1983)=Z; Boufford (2005)=Y; Munz (1965)=X; Wagner, Hoch, & Raven (2007)=U; Averett & Boufford (1985); Skvortsov (1979). Key based on Z.

Identification notes: Sometimes confused in vegetative condition with *Phryma*; the leaf teeth are quite different.

1 Flowers opening before elongation of the raceme axis, therefore clustered and corymbiform at the apex of the raceme, borne on erect or ascending pedicels; plant 5-25 (-30) cm tall; fruits clavate, 2.0-2.5 mm long, 0.7-1.2 mm thick, 1-locular..... ***C. alpina*** *ssp.* ***alpina***

1 Flowers opening after elongation of the raceme axis, more or less loosely spaced, borne on spreading pedicels; plants (12-) 20-100 cm tall; fruits obovoid to pyriform, 2.8-3.9 (-4.5) mm long, 1.5-3.6 mm thick, 2-locular, or the fruits sterile and aborting shortly after anthesis, 1-2-locular when present.

2 All, or nearly all, ovaries developing to maturity; fruit with corky-thickened ribs separated by deep grooves ..... ***C. canadensis*** *ssp.* ***canadensis***

2 All ovaries aborting shortly after anthesis (very rarely a few persistent after anthesis); fruit (when somewhat persistent) with low ribs and shallow grooves ..... ***C. ×sterilis***

Circaea alpina Linnaeus *ssp.* ***alpina***, Alpine Enchanter's-nightshade. Mt (GA?, KY, NC, VA, WV), Ip (KY): moist organic soil at high elevations (especially in spruce-fir and northern hardwood forests), rocky seepages, in spray behind waterfalls, at dripping cliff bases; uncommon (rare in KY Interior low Plateau). June-September. *C. alpina* is treated by Z as a circumboreal complex of six subspecies. Ssp. *alpina* is itself circumboreal, in North America ranging from NL (Newfoundland) and NL (Labrador), west to AK, south to MD, w. NC, e. TN, n. GA (?), KY, n. IL, MN, MT, and WA, disjunct in montane sites southward in the w. United States, such as the Black Hills of SD, and isolated montane sites in CO, AZ, and NM. Another subspecies occurs in w. North America, and four subspecies occur in humid and montane parts of Asia. [= K, U, X, Z; < *C. alpina* – RAB, F, G, GW, S, W, WV; = *C. alpina* var. *alpina* – C]

Circaea canadensis (Linnaeus) Hill *ssp.* ***canadensis***, Canada Enchanter's-nightshade. Mt (GA, KY, NC, VA, WV), Pd (DE, GA, NC, SC, VA), Cp (DE, GA, KY, NC, VA), Ip (KY): mesic, nutrient-rich forests; common (rare in SC). June-August. NS and NB west to se. MB and ND, south to e. NC, c. SC, s. GA, LA, OK, and NE. The systematics of this taxon is controversial, and the best treatment is still unclear. Most recently, Boufford (2005) has treated the complex as 2 species, *C. canadensis* and *C. lutetiana*, the former with 2 subspecies, ssp. *canadensis* of eastern North America and ssp. *quadrisulcata* of Asia. Previously, Boufford (1983) treated the complex as a circumboreal complex of 3 subspecies of *C. lutetiana*, including the North American ssp. *canadensis* (Linnaeus) Ascherson & Magnus, the primarily Asian ssp. *quadrisulcata* (Maximowicz) Ascherson & Magnus, and the European ssp. *lutetiana*. Other authors have preferred varietal status for the 3 entities, full species status, no formal status at all (*C. lutetiana* as a polymorphic complex), or associating the more similar pair (North American and Asian) as 2 subspecies separate from the European at specific rank. Boufford (1983) and Averett & Boufford (1985) show convincingly that separate taxonomic status for the three entities is warranted, and that ssp. *canadensis* is more closely related to ssp. *quadrisulcata*. The question of the appropriate taxonomic level remains. Boufford (1983) states that "although subspp. *canadensis* and *quadrisulcata* are placed in *C. lutetiana*, this might not ultimately prove to be the best treatment." Later, flavonoid data showed strong differences between the three taxa, stronger than the differences between many of the other species in the genus (Averett & Boufford 1985). Morphologic differences between the three taxa are fairly subtle but appear to be consistent. The complicated synonymy is perhaps an example of a too-zealous attempt to have nomenclature reflect subtleties of relationship and

evolutionary divergence, our understanding of which is unclear and changeable. [=U, Y; = *C. lutetiana* Linnaeus ssp. *canadensis* (Linnaeus) Ascherson & Magnus – RAB, K, W, X, Z; = *C. lutetiana* var. *canadensis* Linnaeus – C; = *C. quadrisulcata* (Maximowicz) Franchet & Savatier var. *canadensis* (Linnaeus) Hara – G, WV; > *C. canadensis* var. *canadensis* – F; > *C. canadensis* var. *virginiana* Fernald – F; = *C. latifolia* Hill – S; = *C. quadrisulcata* ssp. *canadensis* (Linnaeus) Löve & Löve]

Circaea* ×*sterilis Boufford, Hybrid Enchanter's-nightshade. Mt (NC, VA, WV): mesic, nutrient-rich forests; rare. June-August. *C.* ×*sterilis* is reported to occur frequently in the absence of one or both of its parents (Z, Skvortsov 1979), and is therefore treated separately and keyed here. It ranges from NL (Newfoundland) west to ON and MN, south to w. NC, OH, and WI. It appears to be rare in our area, but should be sought more carefully. Recognition of *C. canadensis* (Linnaeus) Hill as distinct from *C. lutetiana* renders the hybrid binomial name *C.* ×*intermedia* inappropriate for North American plants, since it is the hybrid of *C. alpina* ssp. *alpina* and the European *C. lutetiana*. [= U, Y; = *C.* ×*intermedia* Ehrhart (pro sp.) – RAB, C, K, W, X, Z (but misapplied as to our material if *C. canadensis* is accepted as a species); > *C. canadensis* var. *canadensis* – F, misapplied; > *C. canadensis* var. *virginiana* Fernald – F; = *C. canadensis* (Linnaeus) Hill – G, WV, misapplied]

3. Chamerion Rafinesque ex Holub 1972 (Fireweed)

A genus of 8 species (9 taxa), herbs, of arctic, boreal, and temperate Northern Hemisphere. There is increasingly strong evidence for the recognition of this group of plants as a genus separate from *Epilobium*. References: Wagner, Hoch, & Raven (2007)=U; Mosquin (1966)=Z; Holub (1972)=Y; Munz (1965)=X.

Chamerion platyphyllum (Daniels) Löve & Löve, Great Willow-herb, Fireweed. Mt (NC, VA, WV), Pd (DE), Cp (DE): grassy balds, roadsides, disturbed areas; uncommon (rare in DE and NC). July-September. *Chamerion platyphyllum* has a circumboreal distribution; it is a member of a circumboreal complex, consisting of several related taxa that differ in chromosome number, a variety of morphological characters, and distribution. The tetraploid *C. platyphyllum* is generally more southern, extending south in North America to NJ, montane w. NC and ne. TN, n. IN, MN, SD, AZ, NM, and CA; it may be more appropriately treated as a variety or subspecies of *C. angustifolium*. The diploid *Chamerion angustifolium* (Linnaeus) Holub is arctic and boreal, extending south in North America to NB, QC, ON, alpine WY, and BC. The hexaploid is *Chamerion danielsii* D. Löve. [< *Epilobium angustifolium* – RAB, G, GW, W, WV; = *E. angustifolium* var. *canescens* A. Wood – C; >< *E. angustifolium* var. *angustifolium* – F, X; > *E. angustifolium* var. *platyphyllum* (Daniels) Fernald – F; = *Chamerion angustifolium* (Linnaeus) Holub ssp. *circumvagum* (Mosquin) Kartesz – K, U; < *Chamaenerion angustifolium* (Linnaeus) Scopoli – S; < *Chamerion angustifolium* (Linnaeus) Holub – Y; = *E. angustifolium* Linnaeus ssp. *circumvagum* Mosquin – Z]

4. Epilobium Linnaeus 1753 (Willow-herb) [also see *Chamerion*]

A genus of ca. 165 species (ca. 185 species), herbs, distributed primarily in boreal and alpine latitudes and elevations. All five of the species in our area reach or approach their southern limits in eastern North America in our area. All members of the genus is ur area are placed in section Epilobium. References: Wagner, Hoch, & Raven (2007)=U; Munz (1965)=Z.

1 Stigma 4-cleft; petals 10-15 mm long ..... ***E. hirsutum***
1 Stigma capitate; petals 2-8 mm long.
  2 Leaves lanceolate, distinctly broader below the middle, flat, the larger generally at least 10 mm wide, toothed.
    3 Principal leaves 3-7 cm long, with obscure marginal teeth, the apices merely acute; internodes (below the inflorescence) glabrous, glabrescent, or with pubescence scattered over the surface; mature coma (attached to plump seeds) nearly white; plants often strict or sparingly branched; seeds striate (with well-developed papillae arranged conspicuously in lines) ..... ***E. ciliatum ssp. ciliatum***
    3 Principal leaves 5-15 cm long, with conspicuous and often irregular marginal teeth, the apices acuminate to attenuate; internodes (below the inflorescence) with lines of pubescence (some internodes on a given plant sometimes with scattered pubescence or glabrous); mature coma cinnamon (attached to plump seeds) brown (pale when immature); plants generally well-branched, with a bushy habit; seeds papillose (the papillae sometimes forming weak lines) ..... ***E. coloratum***
  2 Leaves linear to narrowly lanceolate, broadest near the middle, revolute, the larger generally < 10 mm wide, not toothed.
    4 Pubescence spreading ..... ***E. strictum***
    4 Pubescence appressed, the upper leaf surface finely and rather densely pubescent ..... ***E. leptophyllum***

Epilobium ciliatum Rafinesque *ssp.* ***ciliatum***, American Willow-herb. Mt (NC, VA), Pd (VA): bogs, seeps, disturbed wet places (such as moist edges of logging roads); common (uncommon in VA, rare in NC). June-September. NL (Newfoundland) and NL (Labrador) west to AK, south to VA, w. NC, ne. TN, IN, IA, CA, TX, Mexico, Central America; disjunct in Chile and Argentina. [= K, U; < *E. ciliatum* – RAB, W; = *E. ciliatum* var. *ciliatum* – C; > *E. ciliatum* – F, X, in a narrower sense; > *E. glandulosum* Lehm. var. *adenocaulon* (Haussknecht) Fernald – F, WV; > *E. adenocaulon* Haussknecht var. *adenocaulon* – G, Z]

Epilobium coloratum Biehler, Bronze Willow-herb, Eastern Willow-herb. Mt (GA, KY, NC, SC, VA, WV), Pd (DE, NC, VA), Cp (DE, NC, VA), Ip (KY): seepages, moist open places; common (uncommon in KY Interior Low Plateau, rare in NC Coastal Plain). June-September. ME west to MN, south to NC, n. GA, AL, AR, and TX. There are some difficulties in distinguishing this species and *E. ciliatum* in our area. [= RAB, C, F, G, GW, K, S, U, W, WV, Z]

* ***Epilobium hirsutum*** Linnaeus, Hairy Willow-herb. Mt(WV): disturbed areas; rare, native of Eurasia. South to s. PA (Rhoads & Klein 1993) and WV (Kartesz 1999). [= C, F, G, K, U, Z]

Epilobium leptophyllum Rafinesque, Narrowleaf Willow-herb, American Marsh Willow-herb. Mt (NC, VA, WV): bogs, seepages, and boggy meadows; rare. July-October. NL (Newfoundland) and NT west to BC, south to w. NC, ne. TN, KS, ne. TX (Mink, Singhurst, & Holmes 2011b), and CA. [= RAB, C, F, G, GW, K, U, W, WV, Z]

Epilobium strictum Muhlenberg ex Sprengel, Northeastern Willow-herb, Downy Willow-herb, Soft Willow-herb. Marshes, bogs. QC west to MN, south to n. VA (?), OH, and n. IL. Reported for Arlington County, VA; the single record is regarded as questionable. [= C, F, G, K, U, Z]

5. Oenothera Linnaeus 1753 (Evening-primrose)

A genus of about 124 species, herbs, of America (especially temperate regions). This treatment provisional, with further revision likely, especially in the *O. fruticosa-O. tetragona-O. pilosella* complex. References: Wagner, Hoch, & Raven (2007)=U; Dietrich, Wagner, & Raven (1997)=Z; Dietrich & Wagner (1988)=Y; Munz (1965)=X; Straley (1977)=V. Keys adapted in part from those references. [also see *Calylophus*]

1 Fruit indehiscent; seeds 1-6 per capsule, 1.5-3.5 mm long; [].
  2 Pedicels 2-4 mm long; fruit with a stipe at maturity; clumped or matted perennials from woody rhizomes or rootstocks; [of sandy habitats of SC and GA southward].
    3 Clumped perennial; petals 4-10 mm long; body of the fruit 5-10 mm long; stipe of the fruit 0.5-4.5 mm long..... ***O. filipes***
    3 Mat-forming perennial; petals 7-15 mm long; body of the fruit 8-15 mm long; stipe of the fruit 2-8 mm long..... ***O. sinuosa***
  2 Pedicels 0-1 mm long; fruit without a stipe; annual, winter annual, or biennial; [collectively of various habitats and more widespread in our area].
    4 Sepals 2-3.5 mm long; petals 1.5-3 mm long ..... ***O. curtiflora***
    4 Sepals 2.5-12 mm long; petals 2.5-9 mm long.
      5 Sepals 2.5-8 mm long; leaves 0.1-1.3 cm wide, the widest rarely over 1 cm wide; flowers 3-4-merous (often mixed on a plant); fruits 3-4-angled (often mixed on a plant); [of the outer Coastal Plain of GA, NC, and SC]..... ***O. simulans***
      5 Sepals 8-13 mm long; leaves 0.3-2.5 cm wide, the larger nearly always > 1 cm wide; flowers 4-merous; fruits 4-angled; [primarily of the Mountains and Piedmont of NC, SC, and VA, extending to the Coastal Plain of GA and SC]..... ***O. gaura***
1 Fruit dehiscent; seeds (10-) 50-many per capsule, 0.3-2 mm long.
  6 Ovary essentially terete; fruit terete or with 4 rounded ridges; stamens equal in length (except in *O. speciosa*).
    7 Flowers white or pink; flower buds nodding; [section *Hartmannia*] ..... ***O. speciosa***
    7 Flowers yellow; flower buds erect; [section *Oenothera*]
      8 Fruit linear, nearly isodiametric through its length; seeds borne ascending in the locules, rounded or fusiform, more or less regularly pitted; [section *Oenothera*, subsection *Raimannia*].
        9 Petals acute to rounded at the apex.
          10 Inflorescence dense, with > 2 flowers per spike opening each day; leaves gray-green ..... ***[O. clelandii]***
          10 Inflorescence lax, 1-2 flowers per spike opening on each day; leaves green ..... ***O. curtissii***
        9 Petals truncate to emarginate at the apex.
          11 Nonflowering portion of stems stiff, densely strigillose or sometimes also villous; leaves gray-green, densely strigillose, usually subentire to shallowly dentate (rarely lyrate); [in maritime situations].
            12 Sepals 2.0-3.3 cm long; petals 2.5-4.5 cm long; stigma elevated above the anthers at anthesis; capsule 2.5-5.5 cm long; rosette leaves 5-14 cm long, 1-2 cm wide ..... ***O. drummondii*** *ssp.* ***drummondii***
            12 Sepals 0.3-1.1 cm long; petals 0.45-1.6 cm long; stigma surrounded by the anthers at anthesis; capsule 1.5-4.5 cm long; rosette leaves 4-8 cm long, 0.7-1.0 cm wide ..... ***O. humifusa***
          11 Nonflowering portion of stem not stiff, moderately to sparsely strigillose to sometimes densely villous, and also ± glandular puberulent; leaves green, sparsely to moderately strigillose and usually villous, deeply lobed to dentate (rarely some of them subentire); [in inland disturbed situations].
            13 Petals 2.5-4 cm long; style 4-7.5 cm long; stigma lobes well elevated above the anthers at anthesis ..... ***O. grandis***
            13 Petals 0.5-2.2 cm long; style 2-5 cm long; stigma lobes surrounded by the anthers at anthesis ..... ***O. laciniata***
      8 Fruit thickest near the base, tapering to the apex; seeds borne horizontally in the locules, angled-prismatic, not regularly pitted; [section *Oenothera*, subsection *Oenothera*].
        14 Stigma elevated above the anthers at anthesis; petals 2.5-5 cm long.
          15 Cauline leaves 0.4-1.0 cm wide; apex of the inflorescence curved; free sepal tips subterminal, usually spreading; capsules spreading at nearly right angles to the stem, long-attenuate toward apex, usually conspicuously arcuate..... ***O. argillicola***
          15 Cauline leaves 1.5-6 cm wide; apex of the inflorescence erect; free sepal tips terminal, erect; capsules erect or slightly spreading, gradually attenuate toward the apex.
            16 Upper stem, ovary, floral tube, and sepals always conspicuously pubescent, usually with at least some red-pustulate hairs; bracts green, persistent; sepals often flushed with red, or red-striped ..... ***O. glazioviana***
            16 Upper stem, ovary, floral tube, and sepals often apparently glabrous without magnification; pustulate hairs absent, or if present not red (in fresh material); bracts often pale-green and deciduous; sepals yellowish green, or flushed with some red... ..... ***O. grandiflora***
        14 Stigma surrounded by or below the anthers at anthesis; petals 0.7-2.5 (-3) cm long.
          17 Plant appearing exclusively appressed-pubescent (as seen without magnification).
            18 Apex of the inflorescence curved; free sepal tips subterminal in bud, erect to spreading; dry capsules usually rusty brown .... ***O. oakesiana***
            18 Apex of the inflorescence erect; free sepal tips erect in bud; dry capsules gray-green or dull green.
              19 Leaves green to pale green; stems, ovary, floral tube, and sepals sparsely appressed-pubescent ..... ***O. biennis***
              19 Leaves dull green to gray-green; stems, ovary, floral tube, and sepals densely appressed-pubescent ... ***O. villosa*** *ssp.* ***villosa***
          17 Plant appearing **either** glabrous **or** with a mixture of long pustular hairs and appressed pubescence (as seen without magnification).
            20 Apex of inflorescence curved; free sepal tips subterminal in bud.
              21 Plant (at least the lower portions) predominantly strigillose; leaves dull green to gray-green; dry capsules rusty brown .... ***O. oakesiana***

21 Plant predominantly erect-pubescent or appearing glabrous (as seen without magnification); leaves usually bright green; dry capsules usually dark green or black ..... ***O. parviflora***

20 Apex of inflorescence erect; free sepal tips terminal or subterminal in bud.

22 Inflorescence conspicuously pubescent ..... ***O. biennis***

22 Inflorescence glabrous (or appearing so without magnification).

23 Free sepal tips terminal in bud; petals 1.4-2.5 (-3) cm long; bracts caducous, pale green; capsules dull green when dry; petals fading yellowish-white to translucent ..... ***O. nutans***

23 Free sepal tips subterminal in bud; petals 0.8-1.5 (-2) cm long; bracts persistent, green; capsules usually black or dark green when dry; petals fading pale yellow, usually opaque ..... ***O. parviflora***

6 Ovary 4-angled or 4-winged (at least near its tip); fruit sharply 4-angled or 4-winged; stamens of two lengths (except *O. triloba* and *O. macrocarpa* ssp. *macrocarpa*).

24 Leaves all basal, pinnatifid; [section *Lavauxia*, subsection *Lavauxia*] ..... ***O. triloba***

24 Leaves in part cauline, entire or toothed.

25 Petals 50-70 mm long; flowers opening in the evening; wings of the fruit 10-25 mm wide; [section *Megapterium*] ..... ***[O. macrocarpa** ssp. **macrocarpa]***

25 Petals 3-30 mm long; flowers opening in the day; wings of the fruit <3 mm wide; [section *Kneiffia*]

26 Cauline leaves linear, < 1 mm wide; petals 3-5 (-7) mm long; floral bracts shorter than the subtended ovaries; mature fruits ellipsoid-rhomboid, 4-6 mm long; annual; [section *Kneiffia*, subsection *Peniophyllum*] ..... ***O. linifolia***

26 Cauline leaves lanceolate to ovate, > 1 mm wide; petals 5-30 mm long; floral bracts longer than the subtended ovaries; mature fruits clavate to oblong-elliptic, 8-20 mm long; perennial; [section *Kneiffia*, subsection *Kneiffia*].

27 Petals 5-10 mm long; inflorescence usually nodding ..... ***O. perennis***

27 Petals 15-30 mm long; inflorescence usually erect.

28 Plant conspicuously pilose-hirsute with hairs 1-3 mm long; free sepal tips 1-4 mm long, divergent ..... ***O. pilosella***

28 Plant either with shorter or appressed pubescence, of glandular or nonglandular hairs; free sepal tips 0-2 (-6) mm long, divergent or not.

29 Capsules oblong, widest near the middle, usually abruptly tapered to a stipe 0.1-3 (-7) mm long; hairs of the ovary and capsule predominantly glandular (or the ovary glabrous); leaves subglabrous or sparsely pubescent, more or less dentate.

30 Petals (20-) 25-35 mm long; cauline leaves lanceolate to ovate, 2-7 cm long, 1-3 cm wide, often glaucous beneath ..... ***O. tetragona** var. **fraseri***

30 Petals 12-20 (-25) mm long; cauline leaves linear to lanceolate, 2-7 cm long, 0.5-1.0 (-1.5) cm wide ..... ***O. tetragona** var. **tetragona***

29 Capsules clavate, widest above the middle, gradually tapered to a stipe 3-10 mm long; hairs of the ovary and capsule nonglandular (or with a mixture of glandular and nonglandular hairs); leaves generally pubescent, subentire.

31 Petals 15-30 mm long; stems 7-12 dm tall, freely branched, slightly pubescent; cauline leaves lanceolate, 5-12 cm long, 0.5-1.5 cm wide; [of tidal marshes, usually with spongy lower stems and adventitious roots where regularly submerged] ..... ***O. riparia***

31 Petals (8-) 15-22 mm long; stems 1-8 dm tall, less branched (unless mowed, grazed, or otherwise damaged), more pubescent; cauline leaves 2-6 (-8) cm long, 0.2-1.0 (-1.2) cm wide.

32 Capsule vestiture a mixture of glandular and nonglandular hairs.

33 Cauline leaves not velutinous, 5-10× as long as wide ..... ***O. tetragona** var. **brevistipata***

33 Cauline leaves velutinous, 2-4× as long as wide.

34 Petals 7-12 mm long; leaves lance-oblong, obtuse; [of barrens of TN, KY, and AL] ..... ***[O. tetragona** var. **sharpii]***

34 Petals 15-20 mm long; leaves lanceolate, acute; [of the Atlantic Coastal Plain] ..... ***O. tetragona** var. **velutina***

32 Capsule vestiture strictly nonglandular.

35 Free sepal tips 1-3 mm long, cartilaginous and often arching after the sepals have reflexed; calyx strigose ..... ***O. fruticosa** var. **unguiculata***

35 Free sepal tips < 1 mm long; calyx various.

36 Capsule body 6-11 mm long, the pubescence rather coarse ..... ***O. fruticosa** var. **fruticosa***

36 Capsule body 3-5 mm long, the pubescence very fine.

37 Capsule body 3.5-4 mm long, strigose-pilose; [of Coastal Plain bogs] ..... ***O. fruticosa** var. **microcarpa***

37 Capsule body 4-5 mm long; very finely strigillose; [of Piedmont rock outcrops] ..... ***O. fruticosa** var. **subglobosa***

Oenothera argillicola Mackenzie, Shale-barren Evening-primrose. Mt (VA, WV): shale barrens and woodlands; uncommon. Sc. PA south through MD to e. WV and w. VA (south to Montgomery County). [= C, F, G, H, K, W, WV, Z; > *O. argillicola* var. *argillicola* – X; > *O. argillicola* var. *pubescens* Core & Davis – X]

Oenothera biennis Linnaeus, Common Evening-primrose. Mt (GA, NC, SC, VA, WV), Pd (DE, GA, NC, SC, VA), Cp (DE, GA, NC, SC, VA): fields, pastures, roadsides, disturbed areas; common. June-October. Ranging widely in e. North America and Europe, and scattered in w. North America. [= H, K, W, Z; < *O. biennis* – RAB, G, S, WV (also see *O. nutans*); = *O. biennis* var. *biennis* – C; > *O. biennis* var. *biennis* – F; > *O. biennis* var. *pycnocarpa* (Atkinson & Bartlett) Wiegand – F; > *O. biennis* ssp. *caeciarum* Munz – X; > *O. biennis* ssp. *centralis* Munz – X]

* ***Oenothera curtiflora*** W.L. Wagner & Hoch, Small-flowered Gaura. Cp (GA, SC, VA), Pd (GA): sandy fields, disturbed areas, and clearings; rare, native of c. and w. North America. May-July. IN and IL west to WA, south to MS, and Mexico; apparently introduced eastward to MA, TN, GA, and SC. Kartesz's (1999) adoption of *G. mollis* as the name for this taxon has been rejected (Wagner & Hoch 2000, Brummitt 2001). [= U; = ***Gaura parviflora*** Douglas ex Lehmann – RAB, F, G, Q, S; = *Gaura mollis* James – K; > *Gaura parviflora* var. *parviflora* – X; > *Gaura parviflora* var. *lachnocarpa* Weatherby – X]

Oenothera curtissii Small. Cp (GA, SC): sandhills, sandy fields; rare. May-September. Se. SC south to n. peninsular FL, west to s. AL. Closely related to *O. rhombipetala*, which is restricted to the Great Plains, with scattered occurrences east to AR, IL, and MI. [= K, Y; < *O. rhombipetala* Nuttall ex Torrey & A. Gray – RAB, F, X, misapplied; = *Raimannia curtissii* Rose – S]

? ***Oenothera drummondii*** Hooker *ssp.* ***drummondii,*** Drummond's Evening-primrose. Cp (NC, SC): sandy ocean beaches; rare, perhaps only introduced or adventive from the Gulf Coast. April-October. Ssp. *drummondii* ranges from se. NC south to s. FL, west to se. TX, and south to Tamaulipas and Vera Cruz. Ssp. *thalassiphila* (Brandegee) W. Dietrich & W.L. Wagner is restricted to the southern tip of Baja California. [= Y; < *O. drummondii* – RAB, K; < *Raimannia drummondii* (Hooker) Rose ex Sprague & Riley – S; = *O. drummondii* var. *drummondii* – X]

Oenothera filipes (Spach) W. L. Wagner & Hoch, Threadstalk Gaura. Cp (GA, SC), Pd (GA), Mt (GA): sandy fields, disturbed areas, and clearings; common. April-July. SC west to n. TN and s. IN, south to ne. FL and e. LA. [= U; = ***Gaura filipes*** Spach RAB, C, G, K, Q, W; > *Gaura filipes* var. *filipes* – F, X; > *Gaura filipes* var. *major* Torrey & A. Gray – F, X; = *Gaura michauxii* Spach – S]

Oenothera fruticosa Linnaeus *var.* ***fruticosa***, Southern Sundrops. Cp (DE, GA, NC, SC, VA), Pd (DE, GA, NC, SC, VA), Mt (GA, NC, VA, WV): dry forests and woodlands, glades, and rock outcrops; common (rare in DE). April-August. MA west to IN, south to FL and LA. [= F, G, X; < *O. fruticosa* – RAB, C; < *O. fruticosa* ssp. *fruticosa* – H, K, V, W; > *O. fruticosa* var. *linearis* (Michaux) S. Watson – F, WV; > *O. fruticosa* var. *humifusa* Allen – F, G, X; > *Kneiffia fruticosa* (Linnaeus) Raimann – S; > *Kneiffia arenicola* Small – S; > *Kneiffia semiglandulosa* Pennell – S]

Oenothera fruticosa Linnaeus *var.* ***microcarpa*** Fernald, Small-fruited Sundrops. Cp (NC, SC, VA): boggy depressions. April-August. E. MD south to e. SC. [= F, X; < *O. fruticosa* – RAB, C; < *O. fruticosa* ssp. *fruticosa* – H, K, V]

Oenothera fruticosa Linnaeus *var.* ***subglobosa*** (Small) Munz, Flatrock Sundrops. Pd (GA): granite flatrocks and domes; rare. GA to AL. [= X; < *O. fruticosa* – RAB, C; < *O. fruticosa* ssp. *fruticosa* – H, K, V; = *Kneiffia subglobosa* Small – S]

Oenothera fruticosa Linnaeus *var.* ***unguiculata*** Fernald, Southern Sundrops. Cp (NC, SC, VA): sandhills, moist to wet loamy savannas; uncommon. April-August. Se. VA south to e. SC. [= F, X; < *O. fruticosa* – RAB, C; < *O. fruticosa* ssp. *fruticosa* – H, K, V]

Oenothera gaura W.L. Wagner & Hoch, Biennial Gaura, Northeastern Gaura. Mt (NC, SC, VA, WV), Pd (GA, NC, VA), Cp (DE, GA, SC, VA): roadsides, woodlands, streambanks, fields, disturbed areas; common (uncommon in VA Coastal Plain, rare in DE Coastal Plain). June-October. MA and NY west to WI, se. MN, and IA, south to sw. NC, c. GA (Jones & Coile 1988), sc. TN, and c. IL. [= U; = ***Gaura biennis*** Linnaeus – RAB, K, Q, S, W, WV; > *Gaura biennis* var. *biennis* – C, F, G, X]

* ***Oenothera glazioviana*** Micheli in Martius, Garden Evening-primrose. Cp (GA, NC, SC, VA), Pd (GA, NC, SC, VA), Mt (GA, NC, SC, VA): disturbed areas; uncommon. This species apparently arose as a garden hybrid, and has been widely cultivated and naturalized nearly worldwide. [= K, Z; = *O. erythrosepala* Borbás – X]

Oenothera grandiflora L'Héritier ex Aiton. Cp (GA, NC, SC), Pd (GA, NC, SC), Mt (GA, NC, SC): disturbed areas; uncommon. June-October. VT west to KY, south to c. peninsular FL and s. MS. [= F, K, X, S, Z]

* ***Oenothera grandis*** (Britton) Smyth. Cp (NC): roadsides; rare, introduced from further west. March-July. The native range of this species is centered in KS, OK, and TX. [= K, X, Y; = *O. laciniata* Hill var. *grandiflora* (S. Watson) B.L. Robinson – RAB, F, G]

Oenothera humifusa Nuttall, Seabeach Evening-primrose, Spreading Evening-primrose. Cp (DE, GA, NC, SC, VA): coastal sand dunes; common. Early May-October. S. NJ south to s. FL, west to s. LA, along the coast. [= RAB, C, F, G, H, K, X, Y; = *Raimannia humifusa* (Nuttall) Rose – S]

Oenothera laciniata Hill, Cutleaf Evening-primrose. Cp (DE, GA, NC, SC, VA), Pd (DE, GA, NC, SC, VA), Mt (GA, NC, SC, VA, WV): disturbed areas; common. February-October. ME west to ND, south to s. FL and TX; also in CA. [= K, W, WV; = *O. laciniata* var. *laciniata* – RAB, C, F, G; = *Raimannia laciniata* (Hill) Rose – S; = *O. laciniata* ssp. *laciniata* – X]

Oenothera linifolia Nuttall, Threadleaf Sundrops, Flaxleaf Sundrops. Pd (GA, NC, SC, VA*), Cp (GA, SC), Mt (GA): dry openings and fields; rare (SC Rare, VA Watch List). C. VA west to s. IL and se. KS, south to Panhandle FL and se. TX. Occurrences east of the Mississippi River may be mainly or entirely adventive. Belden et al. (2004) discuss the Virginia occurrence. [= RAB, C, F, G, K, W, V, X; = *Peniophyllum linifolium* (Nuttall) Pennell – S]

Oenothera nutans Atkinson & Bartlett. Mt (GA?, NC, SC?, VA, WV), Pd (GA?, NC, SC?): roadsides, openings, forest edges, pastures; common (rare in VA). July-October. ME west to MI, south to n. FL, s. AL, and s. MO. [= K, Z; < *O. biennis* – RAB, G, S, WV; = *O. biennis* Linnaeus var. *austromontana* (Munz) Cronquist – C; = *O. biennis* var. *nutans* (Atkinson & Bartlett) Wiegand – F; = *O. austromontana* (Munz) Raven, Dietrich, & Stubbe – H, W; = *O. biennis* ssp. *austromontana* Munz – X]

Oenothera oakesiana (A. Gray) Robbins ex S. Watson & Coulter. Cp (DE, NC, VA), Pd (VA), Mt (VA): disturbed areas, roadsides; uncommon (rare in VA). NS west to MB, south to e. NC, sc. VA, PA, n. IN, n. IL, and s. MN. [= G, K, Z; = *O. parviflora* Linnaeus var. *oakesiana* (A. Gray) Fernald – C, F; = *O. parviflora* ssp. *parviflora* var. *oakesiana* (A. Gray) Fernald – X]

Oenothera parviflora Linnaeus, Small-flowered Evening-primrose. Mt (NC, VA, WV), Pd (NC, VA), Cp (NC, SC, VA), {GA}: fields, disturbed areas; uncommon (rare in VA Coastal Plain). May-September. NS west to MB, south to NC, TN, KY, and MO. Reported for GA (GANHP). [= RAB, G, K, W, Z; > *O. parviflora* var. *parviflora* – C, F, WV; > *O. parviflora* var. *angustissima* (R.R. Gates) Wiegand – F, WV; > *O. parviflora* ssp. *parviflora* var. *parviflora* – X; > *O. parviflora* ssp. *angustissima* (R.R. Gates) Munz – X]

Oenothera perennis Linnaeus, Little Sundrops. Mt (NC, SC, VA, WV), Pd (DE, NC, VA), Cp (DE, VA): bogs, sphagnous seeps, moist fields; uncommon (rare in DE, NC, and SC, rare in VA Coastal Plain). May-August. NS west to MB, south to w. NC, nw. SC, KY, and MO. [= RAB, C, G, K, W, X, WV; > *O. perennis* var. *perennis* – F; = *Kneiffia perennis* (Linnaeus) Pennell – S]

Oenothera pilosella Rafinesque, Midwestern Evening-primrose. Mt (VA, WV), Pd (VA), Cp (VA): moist fields, disturbed areas; rare. NH west to ON, south to s. VA, KY, n. AL, c. MS, and c. LA. *O. sessilis* (Pennell) Munz, treated by Straley (1977) as *O. pilosella* ssp. *sessilis* (Pennell) Straley, is best recognized as a species; it is restricted to West Gulf Coastal Plain. [= F, G, WV, X; = *O. pilosella* ssp. *pilosella* – C, K, V; > *Kneiffia pratensis* Small – S; = *O. fruticosa* Linnaeus var. *hirsuta* Nuttall ex Torrey & A. Gray]

Oenothera riparia Nuttall, Riverbank Evening-primrose. Cp (NC, SC, VA?): tidal marshes; rare (NC Rare). June-July. Se. VA (?) south to se. NC and e. SC. Distinct from *O. fruticosa*. Present in the freshwater tidal portions of the Waccamaw, Northeast Cape Fear, Black, Greater Pee Dee, and Cape Fear (?) rivers. [< *O. fruticosa* – RAB; < *O. fruticosa* ssp. *fruticosa* – K, V; = *Kneiffia riparia* (Nuttall) Small – S; = *O. tetragona* Roth ssp. *glauca* (Michaux) Munz var. *riparia* (Nuttall) Munz – X]

Oenothera simulans (Small) W.L. Wagner & Hoch, Southeastern Gaura. Cp (GA, NC, SC): open woodlands, sandy fields, roadsides, primarily in the outer Coastal Plain; common. May-September. E. NC (Dare County) south to s. FL, west to e. TX, endemic to the Coastal Plain. [= U; = ***Gaura angustifolia*** Michaux – RAB, K, Q, S; > *Gaura angustifolia* var. *angustifolia* – X]

* ***Oenothera sinuosa*** W.L. Wagner & Hoch, Texas Gaura. Cp (GA, SC), Pd (GA): sandy fields, disturbed areas, and clearings; uncommon, native of further west. April-June. AR and OK south to s. TX, introduced eastward to SC and FL. [= U; = ***Gaura sinuata*** Nuttall ex Seringe – RAB, K, Q, X]

* ***Oenothera speciosa*** Nuttall, White Evening-primrose, Pink-ladies. Cp (GA, NC, SC, VA), Pd (GA, NC, SC, VA), Mt (GA, NC, SC, VA, WV): roadsides and fields, also cultivated as an ornamental; common (rare in Mountains), introduced from further west. May-August. [= RAB, C, F, G, K, W, X; = *Hartmannia speciosa* (Nuttall) Small – S]

Oenothera tetragona Roth *var.* ***brevistipata*** (Pennell) Munz. Mt (GA, NC, SC, VA), Pd (GA, NC, SC, VA), Cp (VA): dry forests and woodlands, roadsides; common. May-August. SC and KY, south to GA and MS. Should perhaps be considered more closely related to *O. fruticosa* (where placed in synonymy by Straley), if it is determined to be valid. [= G; < *O. tetragona* – RAB, C; < *O. fruticosa* Linnaeus ssp. *fruticosa* – H, K, V, W; = *Kneiffia brevistipata* Pennell – S; = *O. tetragona* ssp. *tetragona* var. *brevistipata* – X]

Oenothera tetragona Roth *var.* ***fraseri*** (Pursh) Munz, Appalachian Sundrops. Mt (GA, NC, SC, VA, WV), Pd (NC, SC, VA), Cp (VA): dry to moist forests and woodlands, roadsides; common. May-August. NY and PA, south to nw. SC and n. GA. This is the more montane and high elevation variant of *O. tetragona*. [= F, G, X; < *O. tetragona* – RAB, C; > *O. tetragona* var. *hybrida* (Michaux) Fernald – F, WV; > *O. tetragona* var. *latifolia* (Rydberg) Fernald – F, WV; < *O. fruticosa* Linnaeus ssp. *glauca* (Michaux) Straley – H, K, V, W; > *Kneiffia glauca* (Michaux) Spach – S; > *Kneiffia hybrida* (Michaux) Small – S; > *Kneiffia latifolia* Rydberg – S; = *O. tetragona* ssp. *glauca* var. *glauca* – X]

Oenothera tetragona Roth *var.* ***tetragona***, Northern Sundrops. Mt (NC, SC, VA, WV), Pd (DE, NC, SC, VA), Cp (DE, VA): dry forests and woodlands, roadsides; common (rare in DE). May-August. NL (Newfoundland) west to MI, south to e. VA and MO. [= F; < *O. tetragona* – RAB, C; > *O. tetragona* var. *longistipitata* (Pennell) Munz – F, WV; < *O. tetragona* var. *tetragona* – G; < *O. fruticosa* Linnaeus ssp. *glauca* (Michaux) Straley – H, K, V, W, WV; = *Kneiffia tetragona* (Roth) Pennell – S; = *O. tetragona* ssp. *tetragona* var. *tetragona* – X]

Oenothera tetragona Roth *var.* ***velutina*** (Pennell) Munz. Cp (VA): dry sandy soils. Se. NY (Long Island) south to se. VA. Should perhaps be considered more closely related to *O. fruticosa* (where placed in synonymy by Straley), if it is determined to be valid. [= F, G; < *O. tetragona* – RAB, C; < *O. fruticosa* Linnaeus ssp. *fruticosa* – H, K, V, W; = *Kneiffia velutina* Pennell – S; = *O. tetragona* ssp. *tetragona* var. *velutina* – X]

Oenothera triloba Nuttall, Stemless Evening-primrose. Mt (GA, VA*): limestone glades (in GA), blackbelt prairies, disturbed areas (in VA); rare, perhaps only introduced in VA, though native into eastern KY and TN (GA Watch List). [= C, F, G, H, K, X; = *Lavauxia triloba* (Nuttall) Spach – S]

* ***Oenothera villosa*** Thunberg *ssp.* ***villosa***. Mt (VA, WV), Pd (VA): disturbed areas; uncommon (rare in WV), apparently naturalized in our area from an original distribution in the Great Plains. [= K, Z; *? O. strigosa* (Rydberg) Mackenzie & Bush – G; *? O. biennis* var. *canescens* Torrey & A. Gray – C, F; *? O. strigosa* (Rydberg) Mackenzie & Bush ssp. *canovirens* (Steele) Munz – X]

* *Oenothera clelandii* W. Dietrich, Raven, & W.L. Wagner. Reported for SC (Kartesz 1999). {investigate} Centered in IL and WI, ranging east, probably mostly as introductions, to NJ, WV, KY. [= C, K, Y; < *O. rhombipetala*, misapplied]

Oenothera filiformis (Small) W.L. Wagner & Hoch. East to MD, PA, KY, TN, and AL (Kartesz 1999). [= U; = *Gaura longiflora* Spach – K, preoccupied name; = *Gaura biennis* Linnaeus var. *pitcheri* Torrey & A. Gray – C, F, G, X; > *Gaura filiformis* Small – S; > *Gaura longiflora* – S] {not yet keyed}

Oenothera macrocarpa Nuttall ssp. *macrocarpa*, Wingfruit Evening-primrose, occurs as a disjunct in c. TN. [= K; < *O. missouriensis* Sims – F; < *O. macrocarpa* Nuttall – C, G; = *O. missouriensis* Sims var. *missouriensis* – X; *? Megapterium missouriense* (Sims) Spach]

Oenothera serrulata Nuttall, east to w. KY. [= U; = *Calylophus serrulatus* (Nuttall) Raven – K] {not yet keyed; synonymy incomplete}

Oenothera tetragona Roth var. *sharpii* Munz. Known from the Eastern Highland Rim of TN, AL, and KY. [< *O. tetragona* – RAB, C; < *O. tetragona* var. *tetragona* – G; < *O. fruticosa* Linnaeus ssp. *fruticosa* – H, K, V, W; = *O. tetragona* ssp. *tetragona* var. *sharpii* – X]

Oenothera xenogaura W.L. Wagner & Hoch. Disjunct eastward in GA (Kartesz 1999). [= U; = ***Gaura drummondii*** (Spach) Torrey & A. Gray K] {not yet keyed}

222. MYRTACEAE A.L. de Jussieu 1789 (Myrtle Family) [in MYRTALES]

A family of about 100 genera and 3500 species, trees and shrubs, nearly worldwide in tropical and subtropical areas.

Melaleuca Linnaeus 1767 (Cajeput, Bottlebrush, Punktree)

A genus of ca. 300 species (if circumscribed, as here, to include *Callistemon*), trees and shrubs, of tropical and subtropical Australia and nearby Asia and Pacific Islands.

1 Filaments red or crimson; flowers attached to the inflorescence axis singly ..... ***M. citrina***
1 Filaments white, greenish, or yellowish; flowers attached to the inflorescence in triads ..... ***M. quinquenervia***

* ***Melaleuca citrina*** (Curtis) Dumont de Courset, Crimson Bottlebrush. Disturbed areas; native of Australia. [= *Callistemon citrinus* (Curtis) Skeels – K2, WH]

* ***Melaleuca quinquenervia*** (Cavanilles) Blake, Punktree, Paperbark Tree. Wetlands, disturbed areas; native of Australia. [= GW, K2, WH; = *M. leucadendra* Linnaeus – S, misapplied]

223. MELASTOMATACEAE A.L. de Jussieu 1789 (Melastome Family) [in MYRTALES]

A family of about 200 genera and 4500-5000 species, trees, shrubs, vines, and herbs, of tropical, subtropical , and warm temperate areas.

Rhexia Linnaeus 1753 (Meadow-beauty)
(by Richard J. LeBlond)

A genus of about 15 species, herbs, of North America. *Rhexia* is the only genus of the Melastomataceae to occur in North America north of s. FL. References: Kral & Bostick (1969)=Z; Bounds (1987); Wurdack & Kral (1982); Snyder (1996).

Identification notes: Measurements of the hypanthium are to the base of the calyx lobes.

1 Anthers straight, ca. 2 mm long.
2 Stem internodes with at least some hairs; leaves oblong, linear, or spatulate; petals yellow ..... ***R. lutea***
2 Stem internodes glabrous; leaves ovate, suborbicular, or widely elliptic; petals lavender-rose to pink.
3 Calyx segments blunt to acute; floral tube glandular-pubescent; surface of seeds irregularly ridged ..... ***R. nuttallii***
3 Calyx segments acuminate-aristate; floral tube nearly glabrous except along the calyx lobes; surface of seeds pebbled ..... ***R. petiolata***
1 Anthers curvate, 5-11 mm long.
4 Stem nodes and internodes glabrous; stem and foliage blue-green ..... ***R. alifanus***
4 Stem nodes and usually also the internodes hirsute; stem and foliage green.
5 Sepal lobes aristate, the awn-tip 0.5-1.5 mm long, and also with flaring, yellowish, stiff hairs 3-5 mm long ..... ***R. aristosa***
5 Sepal lobes obtuse to acuminate, not aristate, the hairs shorter and not yellowish or stiff.
6 Leaves 1-5 (-8) mm wide, linear, linear-elliptic, narrowly oblong, or narrowly spatulate.
7 Leaves twisted at base, borne in a vertical plane; four stem faces subequal, the angles narrowly winged; mature hypanthium neck shorter than body; calyx lobes 1.5-2 mm long; anthers 4-5 mm long ..... ***R. salicifolia***
7 Leaves not twisted at base, borne more or less horizontally; four stem faces markedly unequal, the angle wings inconspicuous or absent; mature hypanthium neck as long as or longer than body; calyx lobes 2-4 mm long; anthers 5-10 mm long.
8 Petals lavender-rose, (1-) 1.5-2 (-2.5) cm long; mature hypanthium 10-14 mm long, with glandular hairs; marginal nerves of leaf abaxial surface either absent or obscure and discontinuous; anthers 7-10 mm long ..... ***R. cubensis***
8 Petals white to pink (-rose-purple), (7-) 0.9-1.4 cm long; mature hypanthium 6-10 mm long, glabrous or sparsely glandular-hairy; marginal nerves of leaf abaxial surface prominent; anthers 5-8 mm long ..... ***R. mariana*** *var.* ***exalbida***
6 Leaves (5-) 7-20 (-35) mm wide, lanceolate, elliptic, or ovate.
9 Four stem faces at mid-stem markedly unequal, one pair of opposite faces broader, convex, darker green, the narrower pair concave or flat, pale.
10 Mature hypanthium 6-10 (-11) mm long, glandular-setose; petals 12-15 (-18) mm long, glabrous on the lower surface; anthers 5-8 mm long ..... ***R. mariana*** *var.* ***mariana***
10 Mature hypanthium (9-)10-15 (-20) mm long, glabrous or glabrate; petals (18-) 20-25 mm long, glandular-hairy on the lower surface (best seen in bud); anthers 8-11 mm long ..... ***R. nashii***
9 Four stem faces at mid-stem about equal, almost flat, the angles sharp or winged.
11 Roots tuberous; stem angles at mid-stem conspicuously winged; hypanthium 7-10 mm long, the neck shorter than the body ..... ***R. virginica***
11 Roots not tuberous; stem angles sharp to narrowly winged; hypanthium 10-13 mm long, the neck as long as or longer than the body.
12 Hypanthium 7-9 (-10) mm long; petals 8-12 mm long; seeds irregularly ridged, especially along the crest [west of the Appalachians] ..... ***R. interior***
12 Hypanthium (9-) 10-12 mm long; petals 10-25 mm long; seeds papillate, the papillae in concentric lines [from NJ to SC east of the Appalachians] ..... ***R. ventricosa***

Alternate Key based largely on vegetative characters

1 Stem internodes glabrous.
2 Stem nodes as well as internodes glabrous, leaf margins entire or remotely low-toothed apically, glabrous ..... ***R. alifanus***
2 Stem nodes hirsute, leaf margins toothed, the teeth often tipped with hairs.
3 Longest leaves 1.5 (-2) cm long, ovate or suborbicular ..... ***R. nuttallii*** **or** ***R. petiolata***
3 Longest leaves > 2 cm long, lanceolate, elliptic, or ovate.
4 Rhizomes present, roots not tuberiferous or spongy-thickened ..... ***R. mariana*** *var.* ***ventricosa***
4 Rhizomes absent, roots tuberiferous or spongy-thickened.
5 Stem leaves gradually reduced upward ..... ***R. virginica***
5 Stem leaves gradually lengthening from the base to mid-stem ..... ***R. aristosa***
1 Stem internodes (and nodes) hirsute or glandular-hairy.
6 Leaves linear, narrowly elliptic, or broadest above the middle.
7 Plant bushy-branched ..... ***R. lutea***
7 Plant simple below the cymose inflorescence.
8 Mature hypanthium 10-14 mm long, with glandular hairs; petals lavender-rose, 1.5-2.0 cm long ..... ***R. cubensis***
8 Mature hypanthium 6-10 mm long, glabrous or sparsely glandular-hairy; petals white, 1.2-1.5 cm long ..... ***R. mariana*** *var.* ***exalbida***

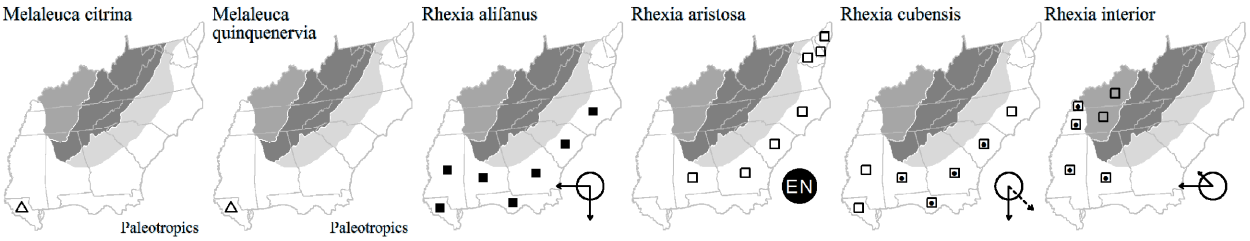
6 Leaves lanceolate, elliptic, or ovate, broadest at or below the middle.
9 Four stem faces at mid-stem about equal, almost flat, the angles sharp or winged.
10 Rhizomes present, roots not tuberiferous or spongy-thickened ..... ***R. ventricosa***
10 Rhizomes absent, roots tuberiferous or spongy-thickened ..... ***R. virginica***
9 Four stem faces at mid-stem markedly unequal, one pair of opposite faces broader, convex, darker green, the narrower pair concave or flat, pale.
11 Mature hypanthium 6-10 mm long, glandular-hairy; petals 1.2-1.5 cm long, glabrous on the lower surface ..... ***R. mariana*** *var.* ***mariana***
11 Mature hypanthium 10-15 mm long, glabrous or glabrate; petals 2.0-2.5 cm long, glandular-hairy on lower surface (best seen in bud) ..... ***R. nashii***

Rhexia alifanus Walter, Smooth Meadow-beauty. Pine flatwoods and savannas, pocosins borders, more able to tolerate merely moist soils than other *Rhexia* species. May-September. A Southeastern Coastal Plain species: e. NC south to n. peninsular FL and west to se. Texas (Singhurst, Mink, & Holmes 2010). Our tallest and showiest *Rhexia*: the unbranched (unless injured), wandlike stems, with strongly ascending, bluish-green, generally entire leaves make this species unmistakeable. [= GW, K, RAB, S, WH, Z]

Rhexia aristosa Britton, Awned Meadow-beauty, Bristly Meadow-beauty. Clay-based Carolina bays, depression meadows, and limesink ponds (dolines). June-September. This species has a very local and disjunct range extending (strictly on the Coastal Plain) from NJ south to AL. The long yellowish bristles at the summit of the calyx/hypanthium are diagnostic. *R. aristosa* × *virginica* is known from the Coastal Plain of NJ (Snyder 1996). [= C, F, G, GW, K, RAB, S, Z]

Rhexia cubensis Grisebach, West Indies Meadow-beauty. Limesink ponds (dolines). June-September. Se. NC south to s. FL and west to sw. MS; also in the West Indies. [= GW, K, RAB, S, WH, Z]

Rhexia interior Pennell. Moist to wet areas, ditches, prairies. S. IN, s. IL, s. MO, and se. KS south to c. AL, c. MS, n. LA, and se. OK. [= F, G; = *R. mariana* Linnaeus var. *interior* (Pennell) Kral & Bostick – GW, K, Z; < *R. interior* – C]



Rhexia lutea Walter, Yellow Meadow-beauty, Golden Meadow-beauty. Wet pine flatwoods and savannas, seepage slopes, and bogs. April-July (and later in response to growing-season fire). A Southeastern Coastal Plain species: e. NC south to ne. FL and Panhandle FL, and west to se. TX. The only yellow-flowered *Rhexia* and also our bushiest species. [= GW, K, RAB, S, WH, Z]

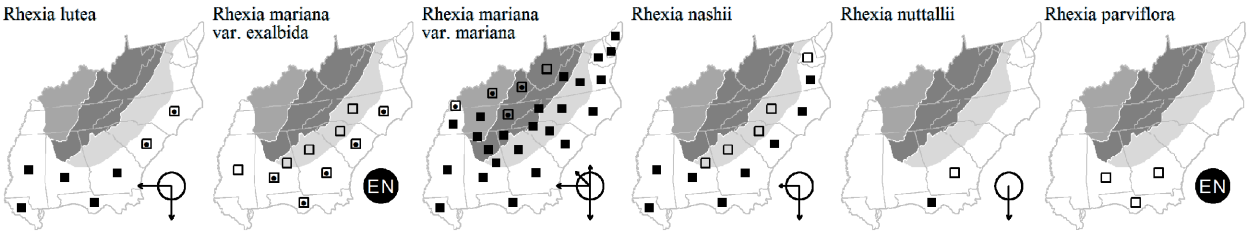
Rhexia mariana Linnaeus *var.* ***exalbida*** Michaux, White Meadow-beauty. Wet pine flatwoods and savannas, wet meadows, ditches, and wet roadsides. June-September. NC south to FL and west to MS. Merging into *R. mariana* var. *mariana* from FL westward, var. *exalbida* appears quite distinct in NC. The white flowers and linear leaves are diagnostic. [= RAB; ? *R. lanceolata* – S; < *R. mariana* var. *mariana* – GW, K, Z; < *R. mariana* – WH]

Rhexia mariana Linnaeus *var.* ***mariana***, Maryland Meadow-beauty, Dull Meadow-beauty, Pale Meadow-beauty. Pine flatwoods, wet meadows, bog margins, ditches, wet roadsides, often weedy. May-October. E. MA south to s. FL, west to TX, and north to s. IN and IL. [= G, W, RAB; < *R. mariana* var. *mariana* – F, GW, K, Z (also see *R. mariana* var. *exalbida*); > *R. mariana* var. *leiosperma* Fernald & Griscom – F; ? *R. delicatula* Small – S; < *R. mariana* – WH, WV]

Rhexia nashii Small, Hairy Meadow-beauty, Maid Marian. Wet pine flatwoods and savannas; pondshores, bogs, marshes, ditches, wet roadsides. May-October. Primarily a Southeastern Coastal Plain species: e. VA south to s. FL and west to se. LA. [= GW, K, S, WH, Z; = *R. mariana* var. *purpurea* Michaux – F, G, RAB]

Rhexia nuttallii C.W. James, Nuttall's Meadow-beauty. Pine flatwoods, bogs. Coastal Plain of se. GA west to FL Panhandle, south to s. peninsular FL. [= GW, K, WH, Z; = *R. serrulata* Nuttall – S]

Rhexia parviflora Chapman, Small-flowered White Meadow-beauty, Apalachicola Meadow-beauty. Limesink pond margins. Sw. GA (Mitchell County) south into Panhandle FL. [= GW, K, S, WH, Z]



Rhexia petiolata Walter, Ciliate Meadow-beauty, Short-stemmed Meadow-beauty. Wet pine flatwoods and savannas, pocosin borders, and ditches. June-September. May-October. A Southeastern Coastal Plain endemic: se. VA south to s. FL and west to se. TX. The flowers are sessile, the petals ascending. [= C, G, GW, K, RAB, WH, Z; = *R. ciliosa* Michaux – F, S]

Rhexia salicifolia Kral & Bostick, Willowleaf Meadow-beauty, Panhandle Meadow-beauty. Drawdown zones of Coastal Plain depression ponds and interdune swales. Sw. GA and FL Panhandle west to s. AL (Jensen 2007). [= GW, K, WH, Z]

Rhexia ventricosa Fernald & Griscom, Swollen Meadow-beauty. Pine flatwoods and savannas, clearings in cypress-hardwood swamps, ditches, wet roadsides. June-September. S. NJ south to e. SC. This taxon is closely related to *R. interior* Pennell, which is distributed west of the Appalachians. [= F, RAB; = *R. mariana* Linnaeus var. *ventricosa* (Fernald & Griscom) Kral & Bostick – GW, K, W, Z; < *R. interior* Pennell – C]

Rhexia virginica Linnaeus, Virginia Meadow-beauty, Deergrass, Handsome Harry, Wing-stem Meadow-beauty. Wet pine flatwoods and savannas, pond shores, bogs, and ditches. May-October. E. Canada and WI south to ne. FL, Panhandle FL, and TX. [= C, G, GW, K, W, WH, WV, Z; > *R. virginica* var. *purshii* (Sprengel) C.W. James – RAB; > *R. virginica* var. *virginica* – F, RAB; > *R. virginica* var. *septemnervia* (Walter) Pursh – F; = *R. stricta* Pursh – S]

230. STAPHYLEACEAE Martynov 1820 (Bladdernut Family) [in CROSSOSOMATALES]

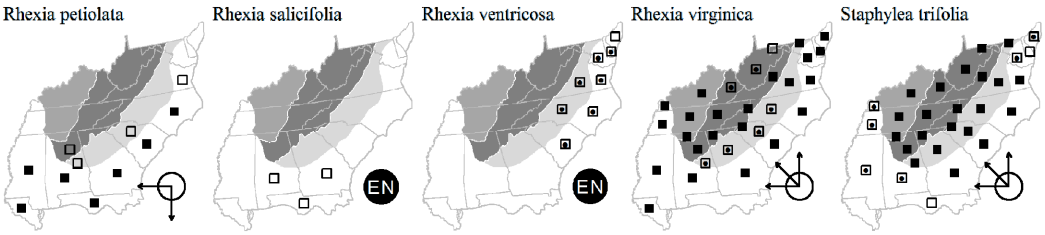
A family of 2 genera and about 45-50 species, trees and shrubs, of mainly temperate Northern Hemisphere, especially e. Asia. References: Spongberg (1971)=Z; Simmons in Kubitzki, Bayer, & Stevens (2007).

Staphylea Linnaeus 1753 (Bladdernut)

A genus of 23 species, trees and shrubs, mainly of temperate Eurasia and e. North America, but extending into Central and South America. References: Simmons in Kubitzki, Bayer, & Stevens (2007).

Identification notes: The opposite, trifoliolate leaves with serrulate margins are diagnostic.

Staphylea trifolia Linnaeus, Bladdernut. Nutrient-rich bottomland forests, extending upslope over calcareous or mafic rocks. April; September-October. QC west to MN, south to sw. GA, Panhandle FL, n. AL, n. MS, and OK. [= RAB, C, F, G, GW, K, S, W, WH, WV, Z]



239. ANACARDIACEAE R. Brown 1818, nom. cons. (Cashew Family) [in SAPINDALES]

A family of about 70-81 genera and about 800-875 species, trees, shrubs, lianas, and rarely herbs, of tropical, subtropical, and temperate regions. Our representatives are all classed in subfamily Anacardioideae (Pell et al. 2011). References: Pell et al. in Kubitzki (2011); Barkley (1937).

1 Leaves simple ..... ***Cotinus***
1 Leaves compound.
  2 Leaves even-pinnate ..... ***Pistacia***
  2 Leaves odd-pinnate.
    3 Fruits both red and glabrous ..... ***Schinus***
    3 Fruits not simultaneously red and glabrous.
      4 Fruits red, glandular pubescent; foliage and stems lacking contact poisons; inflorescences dense, either terminal or lateral on last year's growth ..... ***Rhus***
      4 Fruits white or yellow, glabrous or puberulent (the hairs not glandular); foliage and stems containing contact poisons; inflorescences openly branched, axillary ..... ***Toxicodendron***

Cotinus P. Miller 1754 (Smoketree)

A genus of 4-8 species, of se. and sc. North America and temperate Eurasia. References: Pell et al. in Kubitzki (2011).

1 Leaves elliptic, to 10 cm long; [planted tree, rarely persistent] ..... ***C. coggygria***
1 Leaves obovate, to 20 cm long; [native tree of calcareous habitats] ..... ***C. obovata***

* ***Cotinus coggygria*** Scopoli, European Smoketree. Suburban areas; native of Eurape and Asia. *C. coggygria* is planted as an ornamental, and is reported as naturalized in various states in ne. United States. There is little evidence of its true naturalization or persistence in our area. [= K1, K2]

Cotinus obovata Rafinesque, American Smoketree. Limestone woodlands and glades. Se. TN (Cumberland Plateau) (Chester, Wofford, & Kral 1997), nw. GA, and n. AL west to OK and e. and sc. TX. A small tree of limestone woodlands and glade margins, occasionally planted as an ornamental tree. [= *C. obovatus* Rafinesque – K1, K2, orthographic variant; = *C. americanus* Nuttall – S]

Pistacia Linnaeus 1753 (Pistachio)

A genus of about 12 species, trees and shrubs, of tropical and temperate Asia, n. Africa. Mediterranean Europe, and s. North America and c. America. References: Pell et al. in Kubitzki (2011).

* ***Pistacia chinensis*** Bunge, Chinese Pistachio. Uncommonly planted, rarely persistent or naturalizing; native of China, the Philippines, and Taiwan. March-April. AL, GA. [= K1; > *P. chinensis* ssp. *subintegerrima* (Stewart) Rech. f. – K2]

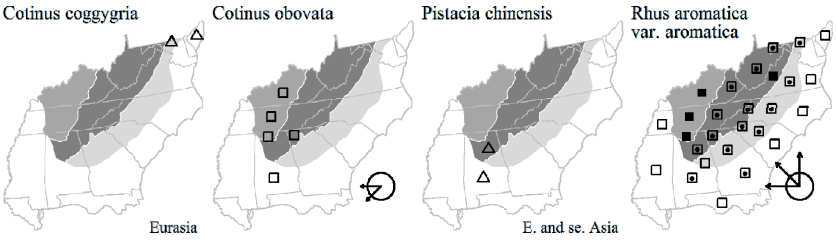
Rhus Linnaeus 1753 (Sumac)

A genus of about 35 species, trees, shrubs, and lianas, temperate and subtropical, of Eurasia, Hawaii, North America, and n. Central America. References: Pell et al. in Kubitzki (2011); Yi, Miller, & Web (2007); Hardin & Phillips (1985a); Miller, Young, & Wen (2001).

Identification notes: Two hybrids have been documented to occur naturally in our area: *Rhus ×pulvinata* Greene (*glabra* × *typhina*) and *Rhus ×ashei* (Small) Greene (*glabra* × *michauxii*). They are intermediate between their parents. For instance, *R. ×ashei* has sparsely pubescent leaves and stems, slight winging of the rachis between the terminal leaflets, potentially greater stature than *R. michauxii,* and leaflets with a length/width ratio of 2.5-3. Hardin & Phillips (1985b) discuss other natural and artificial hybrids in *Rhus*.

1 Leaves 3-foliolate; shrub to 2 m tall; inflorescence of small lateral and terminal clusters; [subgenus *Lobadium*]..... ***R. aromatica*** *var.* ***aromatica***
1 Leaves (5-) 7-31-foliolate; shrub or small tree, to 12 m tall; inflorescence of dense, terminal panicles; [subgenus *Rhus*].
2 Rachis of the leaf winged between each pair of adjacent leaflets; stems and petioles puberulent; leaflets entire to remotely toothed.
3 Leaflets 11-25, attenuate to base, 2-9 cm long, 1-2 cm wide, **either** >3× as long as wide **or** < 4 cm long; leaflet margins entire (rarely serrate); leaflet apex rounded, obtuse, acute, or acuminate (often at least the more basal leaflets with an obtuse tip)..... ***R. copallinum*** *var.* ***copallinum***
3 Leaflets 5-13, rounded to base on the upper side, 4-9 cm long, 1.5-5 cm wide, > 2.5× as long as wide; leaflet margins entire or serrate; leaflet apex acute or acuminate tip..... ***R. copallinum*** *var.* ***latifolia***
2 Rachis of the leaf not winged between each pair of adjacent leaflets (sometimes winged between the last 1 or 2 pairs of leaflets on each side of the rachis); stems and petioles either densely villous or essentially glabrous; leaflets sharply and rather coarsely serrate.
4 Leaflets densely pubescent (rarely sparsely pubescent); short shrubs to 1 m tall; stems densely long-pubescent; rachis of the leaf often winged terminally; leaflets mostly ovate, averaging about 2× as long as wide, acute..... ***R. michauxii***
4 Leaflets glabrous, glaucous beneath; medium shrubs to small trees, to 12 m tall; stems densely long-pubescent or essentially glabrous; rachis of the leaf not winged; leaflets mostly lanceolate, averaging 3-4× as long as wide, acuminate.
5 Stems essentially glabrous; pubescence of the fruit short and blunt-tipped..... ***R. glabra***
5 Stems densely long-pubescent; pubescence of the fruit long and pointed..... ***R. typhina***

Rhus aromatica Aiton var. ***aromatica***, Fragrant Sumac, Squawbush. Rocky, rather dry, woodlands, usually over mafic rocks (such as gabbro or diabase) or calcareous rocks, less commonly in sandy soils. Late February-early May; late April-June. The species ranges throughout much of temperate North America; var. *aromatica* is the most eastern component of the complex, distributed from NH, ON, and MN south to Panhandle FL and TX. The foliage of *R. aromatica* bears some superficial resemblance to *Toxicodendron pubescens*. [= C, F, G, K, WV; < *R. aromatica* – RAB, W, WH; = *Schmaltzia crenata* (P. Miller) Greene – S]



Rhus copallinum Linnaeus var. ***copallinum***, Winged Sumac, Flameleaf Sumac. Sandhills, dry woodlands, maritime thickets (especially from VA northward), old fields, roadsides. S. NY south to s. FL, mainly on the Coastal Plain and lower Piedmont. The Linnaean epithet "*Copallinum*" is grammatically a noun in apposition rather than an adjective, and therefore does not change grammatical gender. [= K; < *R. copallina* – RAB, W; < *R. copallinum* – C, G, WH; = *R. copallina* var. *copallina* – F; > *R. copallinum* – S; ; > *R. leucantha* Jacquin – S; > *R. obtusifolia* (Small) Small – S]

Rhus copallinum Linnaeus var. ***latifolia*** Engler, Eastern Winged Sumac. Rocky glades, dry woodlands. S. ME to n. IL, south to c. GA, AL, LA, and e. TX. [= K; < *R. copallina* – RAB, W; < *R. copallinum* – C, G, S; = *R. copallina* var. *latifolia* – F]

Rhus glabra Linnaeus, Smooth Sumac. Disturbed areas, clearings, roadsides, woodlands. Late May-July; June-October. ME west to BC, south to Panhandle FL, TX, CA, and beyond. [= RAB, C, G, K, S, W, WH, WV; > *R. glabra* var. *glabra* – F]

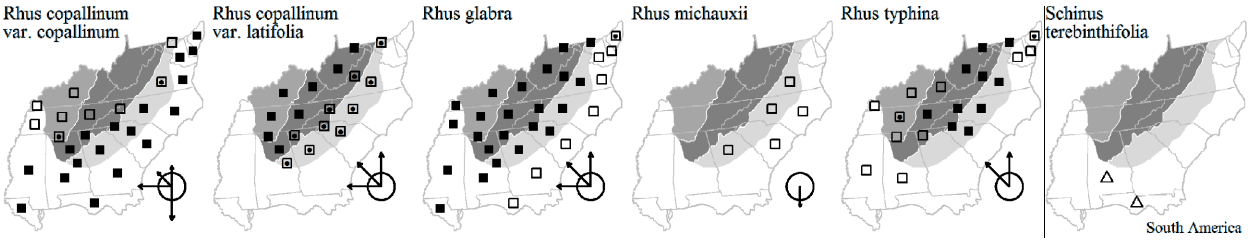
Rhus michauxii Sargent, Michaux's Sumac, Dwarf Sumac. In the fall line sandhills characteristically in submesic, loamy swales, usually associated with such species as *Paspalum bifidum, Helianthus divaricatus, Tridens carolinianus, Rhus copallinum, Anthaenantia villosa, Gymnopogon* sp., and *Aristida lanosa;* in the eastern Piedmont on sandy soils derived from granite; in the central Piedmont on clayey soils derived from mafic rocks such as gabbro or mafic Carolina slates, probably all of its habitats (formerly) in frequently burned situations. June; August-September. Rare and scattered (though formerly more common) from s. VA south to GA; disjunct in Alachua County, FL (just south of area). Large populations were found in sc. VA (Nottoway and Dinwiddie counties) in frequently burned military artillery "impact areas" (Fleming & Ludwig 1996). Barden & Matthews (2004) present a detailed account of its discovery by André Michaux in 1794 in what is now Union County, NC. [= RAB, K, S; = *R. pumila* Michaux]

Rhus typhina Linnaeus, Staghorn Sumac. Roadsides, old pastures, thickets, clearings, rock outcrops, barrens. May-June; June-September. NS and NB west to MN, south to n. GA, AL, MS, and KS . The apparently older epithet "*hirta*" was rejected in 1999. The species, especially in its cut-leaved forms, forma *laciniata* (Wood) Rehder and forma *dissecta* Rehder, is very popular in Europe as a cultivated ornamental. [= RAB, C, F, G, K, W, WV; = *R. hirta* (Linnaeus) Sudworth – S]

Schinus Linnaeus 1753 (Brazilian-pepper)

A genus of about 15 species, shrubs and trees of the tropics. References: Pell et al. in Kubitzki (2011).

* ***Schinus terebinthifolia*** Raddi, Brazilian-pepper. Disturbed areas, especially moist or wet; native of Brazil and Paraguay. A noxious invasive in the FL peninsula. [= *S. terebinthifolius* Raddi – GW, WH, orthographic variant; > *S. terebinthifolius* var. *raddianus* Engl. – K]



Toxicodendron P. Miller 1754 (Poison Ivy, Poison Oak, Poison Sumac)

A genus of about 10-15 species, trees and shrubs, primarily temperate, of North America, n. South America, Indonesia, and e. Asia. References: Gillis (1971)=Z; Pell et al. in Kubitzki (2011).

1 Leaflets 7-13, entire; small tree ..... ***T. vernix***
1 Leaflets 3, toothed, lobed, or entire; shrub or vine.
  2 Fruits pubescent or papillose; leaflets entire, coarsely toothed, undulate, or round-lobed; lower surfaces of leaflets either velvety puberulent, sometimes becoming glabrate in age (*T. pubescens*) or glabrous (glabrescent or rarely pilose beneath) but with prominent tufts of tannish hairs present in the vein axils (*T. radicans* ssp. *radicans*).
    3 Leaves sparsely pubescent (rarely pilose beneath), the apex and the lobes (if present) generally acute to acuminate; drupes papillose, scabrous or puberulent; plant a high-climbing vine or stoloniferous shrub; [of mesic, swampy, or dry habitats] ..... ***T. radicans*** *var.* ***radicans***
    3 Leaves velvety puberulent (sometimes becoming glabrate in age), the apex and the lobes (if present) generally obtuse to broadly acute; drupes pubescent (becoming glabrate); plant a stoloniferous shrub; [of dry habitats, especially sandhills] ..... ***T. pubescens***
  2 Fruits glabrous (or very sparsely pubescent); leaflets coarsely toothed or notched (rarely entire); lower surfaces of leaflets glabrous to pubescent, but without tufts of tannish hairs in the vein axils.
    4 Leaves densely pilose and velvety on the lower surface; leaves pubescent on the upper surface; pubescence of the leaves erect ..... ***T. radicans*** *var.* ***pubens***
    4 Leaves glabrous to sparsely strigose on the lower surface; leaves glabrous on the upper surface; pubescence of the leaves appressed.
      5 Leaflets suborbicular or broadly ovate, nearly as wide as long; petiole glabrous (rarely glabrescent); plant a shrub, the stems upright, entirely lacking aerial roots, not vining; fruits (3-) 4-7 mm in diameter ..... ***T. rydbergii***
      5 Leaflets ovate to lanceolate; petiole puberulent to densely pubescent; plant a shrub or vine, the stems upright or twining; fruits 2.5-5.5 mm in diameter ..... ***T. radicans*** *var.* ***negundo***

Toxicodendron pubescens P. Miller, Poison Oak. Dry woodlands, around dry rock outcrops in the Piedmont and Mountains, especially prevalent in sandhills. Late April-May; August-October. Primarily Southeastern: NY (Long Island) south to n. FL, west to e. TX, inland to WV, e. TN, c. TN, se. MO, and s. KS. The nomenclatural confusion may still not be resolved. [= C, K, WH; = *Rhus toxicodendron* – RAB, F, G; = *T. toxicodendron* (Linnaeus) Britton – S; = *T. toxicarium* Gillis – W, Z; = *T. quercifolium* (Michaux) Greene]

Toxicodendron radicans (Linnaeus) Kuntze *var.* ***negundo*** (Greene) Reveal, Midwestern Poison Ivy. In a wide range of habitats, including mesic forests, rock outcrops, open areas, and disturbed ground. Late April-May; August-October. NY west to

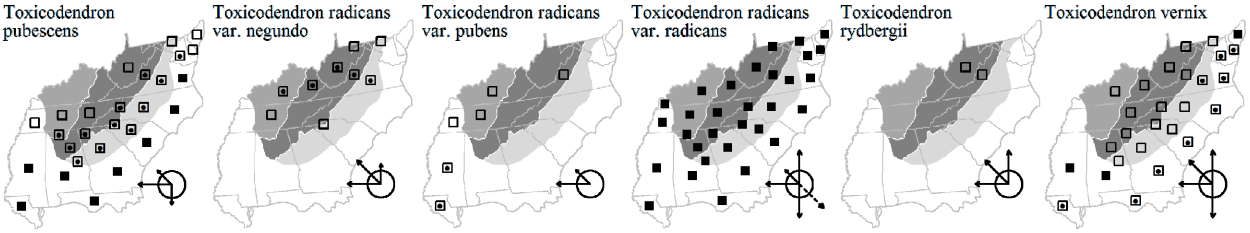
MI, MN, and NE, south to sw. VA, KY, AR, and TX, almost entirely in or west of the Appalachians. In our area seemingly mostly in the New River drainage; to be expected in nw. NC. [= C; = *Rhus radicans* var. *vulgaris* (Michaux) A.P. de Candolle forma *negundo* (Greene) Fernald – F, G; = *T. radicans* ssp. *negundo* (Greene) Gillis – K, Z]

Toxicodendron radicans (Linnaeus) Kuntze *var.* ***pubens*** (Engelmann ex S. Watson) Reveal. Xeric limestone sites. S. IL and MO south to se. LA and s. TX; disjunct eastward in c. KY, c. TN, and w. VA (Virginia Botanical Associates 2006). [< *T. radicans* – GW, W; = *T. radicans* ssp. *pubens* (Engelmann ex S. Watson) Gillis – K, Z; < *Rhus radicans*]

Toxicodendron radicans (Linnaeus) Kuntze *var.* ***radicans***, Eastern Poison Ivy. In a wide range of habitats, including mesic forests, rock outcrops, swamp forests, brackish marshes, open areas, disturbed ground, usually in more mesic to hydric sites than *T. pubescens*, and particularly common in areas with fertile soils, such as bottomlands or over calcareous rocks or calcareous sands (as in maritime forests). Late April-May; August-October. Var. *radicans* is the typical poison ivy of the Atlantic and Gulf Coastal Plains, rarely found west of the Appalachians. It ranges from NS south to s. FL (and the Bahamas), west to e. TX, inland to VT, c. PA, WV, KY, and AR. It is normally a vine, climbing by adventitious roots, and can attain diameters of 10 cm and climb to the crowns of forest trees. It can also resemble *T. pubescens* in habit, producing numerous meter-high upright stems from rhizomes. *T. radicans* var. *radicans* is ubiquitous in our area, absent only from the high mountains of NC. [= C; < *Rhus radicans* Linnaeus – RAB; > *Rhus radicans* var. *radicans* – F, G, WV; > *Rhus radicans* var. *vulgaris* (Michaux) A.P. de Candolle forma *vulgaris* – F, G; < *T. radicans* – GW, S, W, WH; = *T. radicans* ssp. *radicans* – K; > *Rhus radicans* var. *vulgaris* (Michaux) A.P. de Candolle – WV]

Toxicodendron rydbergii (Small ex Rydberg) Greene, Western Poison Ivy. Acid pine-oak forests and woodlands at moderate elevations. NS west to BC, south to New England, NY, n. OH, n. IL, IA, w. KS, w. TX, AZ, and OR; disjunct in the Appalachians in PA, WV, and VA. Reported for NC by Gillis (1971), but the location (Cumberland Co., in the fall-line Sandhills), does not seem plausible {investigate further with specimen}. [= C, K, Z; = *Rhus radicans* var. *rydbergii* (Small) Rehder – F, G, WV; = *T. radicans* (Linnaeus) Kuntze var. *rydbergii* (Small ex Rydberg) Erskine]

Toxicodendron vernix (Linnaeus) Kuntze, Poison Sumac, Thunderwood. In peaty habitats, in the Coastal Plain frequent in streamhead pocosins and sandhill seepage bogs, in the mountains in bogs. May-early June; August-September. NS west to MN, south to c. peninsular FL and TX. The leaf rachis and leaflet petiolules are usually a dark red or maroon color. The leaves turn a very attractive shade of orange-red in autumn. [= C, GW, K, S, W, WH; = *Rhus vernix* Linnaeus – RAB, F, G, WV]



240. SAPINDACEAE A.L. de Jussieu 1789 (Soapberry Family) [in SAPINDALES]

A family of about 133 genera and 1465 species, trees, shrubs, vines, and herbs, primarily of tropical (rarely temperate) regions of the Old World and New World. APG III (2009) and others have recently included Hippocastanaceae and Aceraceae in the Sapindaceae. References: Buerki et al. (2009).

1 Leaves simple (lobed and/or toothed); fruits winged.
  2 Leaves 0.8-2× as long as wide, orbicular in outline, lobed, the margin often also toothed; fruit a schizocarp of 2 samaras; [subfamily *Hippocastanoideae*] ..... ***1. Acer***
  2 Leaves 3-10× as long as wide, oblanceolate, unlobed, margin entire; fruit a winged capsule; [subfamily *Dodonoideae*] ..... ***6. Dodonaea***
1 Leaves compound; fruits winged or not.
  3 Leaves palmately compound; [subfamily *Hippocastanoideae*] ..... ***2. Aesculus***
  3 Leaves pinnately or biternately compound.
    4 Vine; leaves biternately compound; [subfamily *Sapindoideae*] ..... ***3. Cardiospermum***
    4 Tree or shrub; leaves pinnately compound.
      5 Leaflets entire; fruit drupe-like; [native, of coastal hammocks of se. SC southward]; [subfamily *Sapindoideae*] ..... ***5. Sapindus***
      5 Leaflets coarsely toothed; fruit a samara or inflated "pod;" [native or alien, collectively widespread].
        6 Fruit winged; [native]; [subfamily *Hippocastanoideae*] ..... ***1. Acer***
        6 Fruit inflated; [alien ornamental, rarely escaped]; [subfamily *Sapindoideae*] ..... ***4. Koelreuteria***

1. Acer Linnaeus 1753 (Maple)

A genus of about 111 species, primarily north temperate. References: Murray (1970)=Z; van Gelderen, de Jong, and Oterdoom 1994).

Section *Parviflora*, Series *Caudata*: *spicatum*
Section *Palmata*, Series *Palmata*: *palmatum*
Section *Negundo*, Series *Negundo*: *negundo*
Section *Rubra*: *drummondii, rubrum, saccharinum*
Section *Macrantha*: *pensylvanicum*

Section *Platanoidea*: *platanoides*, *campestre*
Section *Acer*, Series *Acer*: *pseudoplatanus*
Section *Acer*, Series *Saccharodendron*:
Section *Ginnala*: *ginnala*

1 Leaves compound, divided into 3-7 (-9) leaflets; [section *Negundo*].
2 Twigs glabrous.....***A. negundo*** *var.* ***negundo***
2 Twigs puberulent .....***A. negundo*** *var.* ***texanum***
1 Leaves simple, generally shallowly to deeply 3-5 (-7) lobed.
3 Leaves not toothed, or often with a few rounded, coarse, and irregular teeth on the principal lobes, these teeth 0-5 per principal lobe; sinuses between the principal leaf lobes generally broadly rounded, the sinus broader than deep.
4 Petioles and young twigs exuding milky sap when broken; inflorescence peduncled, the flowers on ascending, moderately stout pedicels; paired samaras held at >135° from one another; [section *Platanoidea*]; [alien].
5 Leaves 3-5-lobed, 4-8 (-10) cm wide .....***A. campestre***
5 Leaves 5-7-lobed, 10-18 cm wide .....***A. platanoides***
4 Petioles and young twigs exuding clear sap when broken; inflorescence sessile, the flowers on drooping, filiform pedicels; paired samaras held at <110° from one another; [section *Acer*, series *Saccharodendron*]; [native, also widely planted.
6 Leaves pale, grayish, silvery-gray, or strongly glaucous beneath, glabrous, pubescent on the veins, or pubescent across the surface; leaf sinuses on either side of the terminal lobe deep, the two sides of each sinus forming an angle of < 70 degrees (the terminal lobe typically with parallel margins, or even narrower toward the base than toward the tip); leaves usually planar, but sometimes with drooping lobe tips, especially in *A. floridanum*, and especially also in sun-exposed individuals of *A. floridanum* or *A. saccharum*.
7 Leaves small, (3.5-) avg. 8 (-11) cm broad; leaf undersurface usually pubescent; fruits 20-25 mm long; medium to large trees; bark gray, smooth and beech-like, becoming irregularly furrowed or plated in large individuals; [primarily of the Coastal Plain and Piedmont, extending into the Mountains in GA] .....***A. floridanum***
7 Leaves large, (8-) avg. 15 (-20) cm broad; leaf undersurface glabrous or pubescent only on the veins; fruits 25-30 mm long; large trees; bark grayish-brown, with loose-edged plates; [primarily of the Mountains and upper Piedmont] .....***A. saccharum***
6 Leaves green beneath, moderately to densely pubescent across the surface; leaf sinuses on either side of the terminal lobe shallow, the two sides of each sinus forming an angle of > 90 degrees (the terminal lobe typically broadly triangular); leaves sometimes planar, more usually with drooping lobe tips.
8 Leaves small, (3-) avg. 6 (-11) cm broad; small trees, often multi-trunked and crooked; bark whitish (in part because of dense growth of crustose lichens), becoming cracked and blackened on larger stems; [primarily of the Piedmont, extending into the lower Mountains in w. SC and n. GA].....***A. leucoderme***
8 Leaves large, (8-) avg. 15 (-20) cm broad; large trees, single-trunked; bark dark brown or blackish, becoming furrowed in large individuals; [primarily of the Mountains and westward] .....***A. nigrum***
3 Leaves finely to coarsely toothed, the toothing often regular, the teeth 8-50 per principal lobe; sinuses between the principal leaf lobes generally sharp, forming a definite angle (or if rounded, then the sinus much deeper than broad).
9 Leaves deeply lobed, the two sinuses on either side of the central lobe deep and narrow, approaching the midrib, the terminal lobe thus narrower at its base than at its middle; flowers **either** with petals (*A. palmatum*) **or** without petals (*A. saccharinum*).
10 Leaves green beneath (or purple in many forms); main leaf lobes 5-9, these main lobes merely toothed or in some cultivars variously further divided; [small exotic tree, commonly planted and weakly naturalizing]; [section *Palmata*] .....***A. palmatum***
10 Leaves silvery white beneath; main leaf lobes 3-5, these main lobes with coarse teeth and smaller lateral lobes; [large native tree (also extensively planted)]; [section *Rubra*] .....***A. saccharinum***
9 Leaves shallowly lobed, the two sinuses on either side of the central lobe broadly wedge-shaped, not approaching the midrib, the terminal lobe thus broadest at its base and progressively (though often irregularly) narrowing toward the tip; flowers with petals.
11 Winter buds stalked, with 2-4 valvate scales; inflorescence an elongate drooping raceme or erect panicle; petals green to bright yellow, 2-10 mm long; fruits maturing in midsummer to autumn; leaves green beneath; shrub, small tree, or medium tree (to 35 cm DBH).
12 Bark with narrow white stripes on a green background (best seen on stems 3-10 cm in diameter); leaf blades 12-20 (-30) cm long and wide, finely serrate (5-10 teeth per cm), pubescent beneath with yellow to orange hairs 0.1-0.3 mm long (as seen at 10× magnification); inflorescence a drooping raceme; [section *Macrantha*] .....***A. pensylvanicum***
12 Bark brownish, never conspicuously striped; leaf blades 8-12 (-14) cm long and wide, coarsely serrate (2-3 teeth per cm), pubescent beneath with whitish hairs 0.3-1.0 mm long (as seen at 10× magnification); inflorescence an erect panicle; [section *Parviflora*] .....***A. spicatum***
11 Winter buds sessile, with 4-10 imbricate scales; inflorescence **either** a drooping panicle (*A. pseudoplatanus*) **or** a sessile or subsessile cluster or fascicle; fruits maturing **either** in midsummer to autumn (*A. pseudoplatanus*) **or** in spring; leaves slightly to strongly glaucous-whitened beneath; medium to large tree (to 100 cm DBH).
13 Inflorescence a drooping panicle, flowering in May-June, fruiting August-September (and persisting overwinter); petals yellowish-green; leaf blades 8-17 cm long; [section *Acer*, series *Acer*] .....***A. pseudoplatanus***
13 Inflorescence a sessile or subsessile cluster or fascicle, flowering in January-March, fruiting April-July (and dropping); petals red (rarely yellowish), 1-3 mm long; leaf blades < 10 cm long; [section *Rubra*].
14 Mature leaves densely white tomentose (felty-pubescent) beneath; petioles usually with white tomentum; mature samaras 2.7-5 cm long .....***A. rubrum*** *var.* ***drummondii***
14 Mature leaves glabrous to densely pubescent (but not white-tomentose) beneath; petioles usually glabrous; mature samaras 1.5-3 cm long.
15 Leaves (3-) 5 (-9)-lobed, the central lobe 4-8 cm long, the 2 upper lateral lobes 2-5 cm long; leaf base generally cordate (rarely rounded); leaves 7-18 cm wide; [widespread, in nearly all habitats] .....***A. rubrum*** *var.* ***rubrum***
15 Leaves unlobed or 3 (-5)-lobed, the central lobe 1-5 cm long, the lateral lobes (if present) 0.5-2 (-3) cm long; leaf base broadly cuneate to rounded or subcordate; leaves 2-10 cm wide; [primarily of wetlands, especially in the Coastal Plain] ....***A. rubrum*** *var.* ***trilobum***

* ***Acer campestre*** Linnaeus, Hedge Maple. Suburban woodlands, planted and persistent and weakly spreading; native of Europe and w. Asia. Reported to be "occasionally spreading from cultivation to moist, rocky, disturbed woods" in sc. and se. PA (Rhoads & Klein 1993). Infraspecific taxa are often recognized in its native area. [= C, F, G, K, Z]

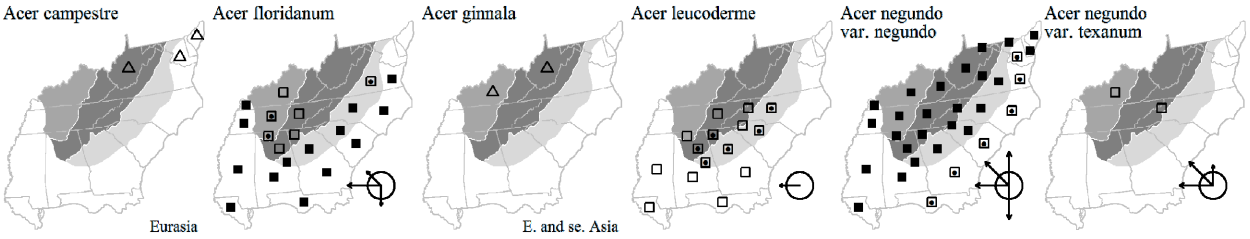
Acer floridanum (Chapman) Pax, Southern Sugar Maple, Florida Maple. Bottomland forests, mesic slopes, especially common over mafic or calcareous rocks, but not at all limited to such situations. April-May; June-October. S. VA, w. KY, se. MO, e. OK, c. OK, and n. TX, south to c. peninsular FL and e. TX. It is widely planted in southern cities and towns as a street tree. Ward (2004b) discusses the reasons for accepting *A. floridanum* as the correct name for this species; the Michauxian name *A. barbatum* is associated with specimens that are demonstrably *A. saccharum*. [= *A. saccharum* ssp. *floridanum* (Chapman) Desmarais – RAB, WH, Z; = *Acer barbatum* Michaux – C, K; > *A. barbatum* var. *barbatum* – F, G; > *A. barbatum* var. *longii* (Fernald) Fernald – F, G; = *Saccharodendron floridanum* (Chapman) Nieuwland – S]

* ***Acer ginnala*** Maximowicz, Amur Maple. Mt (WV), Ip (KY): disturbed areas; rare, native of e. Asia. Reported as "cultivated and escaped" in s. PA (Rhoads & Klein 1993). Infraspecific taxa are often recognized in its native area. [= F, K, Z] {not yet keyed}

Acer leucoderme Small, Chalk Maple. Rocky slopes and bluffs, particularly over mafic or calcareous rock, on the Gulf Coast in floodplains. March-April; May-September. A species of se. North America, primarily of the Piedmont from NC to AL, less commonly in the Ridge and Valley of se. TN (Chester, Wofford, & Kral 1997), low Blue Ridge of w. NC and adjacent TN and GA, Coastal Plain of Panhandle FL, GA, AL, MS, LA, and se. TX, and in sw. AR and se. OK. The leaves, at least those on lower and inner branches, tend to dry a tawny color and remain on the tree until spring, reminiscent of beech. [= K, W; = *A. saccharum* ssp.*leucoderme* (Small) Desmarais – RAB, WH, Z; = *Saccharodendron leucoderme* (Small) Nieuwland – S]

Acer negundo Linnaeus var. ***negundo***, Eastern Box Elder, Ash-leaved Maple. Riverbanks, swamps, bottomlands, also upslope on calcareous substrates. March-April; May-October. The species, broadly treated, ranges nearly across North America, including well into the arid west along rivers. Var. *negundo* occurs from NB west to MB, south to c. peninsular FL and TX; also allegedly in nw. United States. *A. negundo* often grows on the banks of rivers, leaning out over the water at a 45 degree angle. The leaves can resemble poison ivy (*Toxicodendron radicans*), which has alternate leaves. The coarse toothing (approaching lobing) distinguishes it from any of our ashes (*Fraxinus*). [= C; < *A. negundo* – RAB, GW, W, WH; > *A. negundo* var. *negundo* – F, G, K, Z; > *A. negundo* Linnaeus var. *violaceum* (Kirchner) Jaeger – F, G, K, Z; < *Negundo negundo* (Linnaeus) Karsten – S; < *Negundo aceroides* (Linnaeus) Moench]

Acer negundo Linnaeus var. ***texanum*** Pax, Texas Box Elder. Riverbanks and bottomlands. April; June-October. Sw. NC, KY, MO, KS, and NM south to AL, MS, and TX. The status of this variety in our area is poorly known at present. [= C, F, G, K, Z; < *A. negundo* – RAB, GW, W; < *Negundo negundo* (Linnaeus) Karsten – S; < *Negundo aceroides* (Linnaeus) Moench]



Acer nigrum Michaux f., Black Maple. Riverbanks, streambanks, cove forests, river slope forests. May-June; June-September. NH west to MN, south to NC, GA, AL, AR, and KS, primarily west of the Appalachians. [= C, F, G, K, W; = *A. saccharum* Marshall ssp. *nigrum* (Michaux f.) Desmarais – RAB, Z; = *Saccharodendron nigrum* (Michaux f.) Small – S; *A. saccharum* Marshall var. *viride* (Scmidt) A.E. Murray]

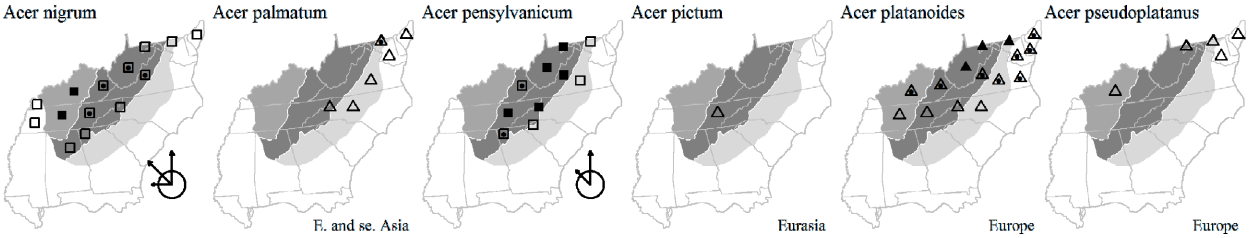
* ***Acer palmatum*** Thunberg, Japanese Maple. Suburban woodlands; native of e. Asia. April; August-September. Frequently planted in its numerous cultivars. Infraspecific taxa are recognized in its native area. It is also reported as escaped in the DC area (Shetler & Orli 2000). [= K, Z]

Acer pensylvanicum Linnaeus, Striped Maple. Dry to mesic forests. May; June-September. NS west to MB, south to w. NC, nw. SC, ne. GA, e. TN, WI, and MN. The prominently striped bark of this common, mid-elevation understory tree is unmistakable. [= RAB, C, F, G, K, S, W, Z]

* *Acer pictum* Thunberg. Moist forests; native of Eurasia. [= *A. mono* Maximowicz] {not yet keyed}

* ***Acer platanoides*** Linnaeus, Norway Maple. Suburban woodlands, disturbed forests, hedgerows; native of Europe. March-April. In much of the ne. United States, *A. platanoides* has become a noxious weed tree. A commonly planted cultivar has purple foliage. [= C, F, G, K, W, Z]

* ***Acer pseudoplatanus*** Linnaeus, Sycamore Maple. Suburban woodlands; native of Europe. Planted widely in our area as a street and yard tree, especially in the mountains. It may be naturalized more extensively in our area; northward it is a noxious weed tree. [= C, G, K, Z; = *Acer pseudo-platanus* – F, orthographic variant]



Acer rubrum Linnaeus *var.* ***drummondii*** (Hooker & Arnott ex Nuttall) Sargent, Swamp Red Maple, Drummond Red Maple. Cp (FL, GA, NC, SC, VA): swamps and floodplains; uncommon. January-March; April-June. *A. rubrum* var. *drummondii* is mostly southern, ranging north to NJ (?), IN, and MO. It reaches its greatest abundance in the basin of the Mississippi River. [= F, G, K; < *A. rubrum* – RAB, C, GW, WH; = *Rufacer drummondii* (Hooker & Arnott ex Nuttall) Small – S; = *A. rubrum* ssp. *drummondii* (Nuttall) A.E. Murray – Z; = *A. drummondii* Hooker & Arnott ex Nuttall]

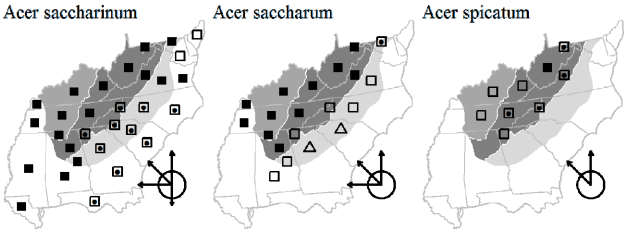
Acer rubrum Linnaeus var. ***rubrum***, Eastern Red Maple. Mt (GA, NC, SC, VA, WV), Pd (DE, GA, NC, SC, VA), Cp (DE, FL, GA, NC, SC, VA): upland deciduous forests, up to at least 1500m elevation, moist bottomlands and slopes; common. January-March; April-July. This variety is the most widespread and common in our area; indeed it is one of the most ubiquitous and common trees of e. North America. It is probably more abundant than formerly, because of its weedy abilities. Overall, it ranges throughout e. North America. Whether the varieties of *A. rubrum* are worthy of recognition is a matter of disagreement; I choose here to try to distinguish them. [= F, K, Z; < *A. rubrum* – RAB, C, GW, W, WH; < *A. rubrum* var. *rubrum* – G (also see var. *trilobum)*; = *Rufacer rubrum* (Linnaeus) Small – S]

Acer rubrum Linnaeus var. ***trilobum*** Torrey & A. Gray ex K. Koch, Carolina Red Maple. Cp (DE, FL, GA, NC, SC, VA), Pd (GA, NC, SC, VA), Mt (NC, VA, WV): wetlands, especially peaty, acid sites; common (rare in Piedmont and Mountains. January-March; April-June. Primarily a Southeastern Coastal Plain variety, the range of var. *trilobum* is unclear, possibly extending well inland and northward (see F). This variety has greatly increased in abundance in the Coastal Plain of our area because of fire suppression and mechanical disturbance of peaty wetlands. Former large pocosin tracts, such as the Dismal Swamp, are now largely dominated by this tree. [= F, K, Z; < *A. rubrum* – RAB, C, GW, WH; < *A. rubrum* var. *rubrum* – G; = *Rufacer carolinianum* (Walter) Small – S]

Acer saccharinum Linnaeus, Silver Maple, Soft Maple. Bottomlands, riverbanks, and disturbed areas. February-April; April-July. NS west to SK, south to Panhandle FL, LA, and OK, rare and mostly introduced east of the Appalachians and south of VA. This is an abundant tree along major rivers in the Piedmont of VA. In our area (particularly from c. NC south), the species is more common as a street tree or an escape from cultivation than as a native tree. On the Coastal Plain of NC and SC, *A. saccharinum* is largely confined to the banks and levees of large brownwater rivers, such as the Roanoke and Congaree. The silvery undersides of the leaves are obvious in windy conditions. The hybrid *Acer ×freemanii* A.E. Murray [*A. rubrum* × *saccharinum*] has been collected at scattered locations in our area. [= RAB, C, F, G, GW, K, W, WH, Z; = *Argentacer saccharinum* (Linnaeus) Small – S]

Acer saccharum Marshall, Sugar Maple, Hard Maple, Sugar Tree. Cove forests, other rich forests, especially over mafic and calcareous rocks, on calcareous soils common and typical in dry-mesic forests and dry woodlands as well, less typically extending to high elevation northern hardwood forests where sometimes in acidic situations (as in Highlands County, VA), in parts of thye Piedmont perhaps more common as an introduction by ornamental planting than as a native, at least south of VA. April-June; June-September. Two varieties are sometimes recognized. Var. *saccharum* is distributed from NS west to ND, south to GA, LA, and OK. Var. *schneckii* Rehder, with petioles and lower leaf surfaces densely pubescent, is alleged to occur in s. PA (Rhoads & Klein 1993), IN, IL, and MO; it is probably only a form. *A. saccharum* is the primary source of maple sugar and maple syrup; formerly, commercial sugaring was done in w. NC and w. VA. Large individuals of this species are the favorite substrate of a number of lichens, including *Lobaria pulmonaria*. The brown, platy bark is often similar to that of *Aesculus flava*. For its bright orange fall color, *A. saccharum* is one of our most prized ornamental trees. In NC, it is most common northward and on mafic rocks, thus reaching perhaps its best development in the amphibolite peaks of Ashe, Watauga, Avery, and Mitchell counties; it is more general in VA. [= C; > *A. saccharum* var. *saccharum* – F, G, K, Z; = *A. saccharum* ssp. *saccharum* – RAB, W; = *Saccharodendron barbatum* (Michaux) Nieuwland – S]

Acer spicatum Lamarck, Mountain Maple. High elevation forests (northern hardwoods or spruce-fir), generally above 1500 m in NC, above 1000 m in VA, especially common in periglacial boulderfields. May-July; August-October. NL (Newfoundland), NL (Labrador), and SK south to PA, OH, and IA, and in the mountains to w. NC, e. TN, ne. GA, and ne. AL. The foliage is quite similar to that of *A. rubrum* var. *rubrum*, with which it can occur; in addition to the key characters, *A spicatum* can be distinguished from *A. rubrum* by its leaves which have a strongly rugose texture, the secondary and tertiary veins impressed on the upper surface, distinctly raised on the lower (vs. not rugose, the secondary and tertiary veins only slightly impressed on the upper surface, and slightly raised on the lower). *A. spicatum* is also sometimes confused with *A. pensylvanicum*, but these two species are readily distinguished by their leaves (see key). [= RAB, C, F, G, K, S, W, Z]



2. Aesculus Linnaeus 1753 (Buckeye)

A genus of about 13 species, trees and shrubs, of temperate e. North America, w. North America, e. Asia, and se. Europe. References: Hardin (1957a, 1957b)=Z; Harris, Xiang, & Thomas (2009).

Identification notes: The following hybrids are known from our area: *Aesculus* ×*neglecta* Lindley [*flava* × *sylvatica*] and *Aesculus* ×*mutabilis* (Spach) Scheele [*pavia* × *sylvatica*]. They can be recognized by their intermediate morphology.

1 Petals usually 5, white with a reddish mark near the cordate base of the petal blade; buds glutinous (sticky); fruit spiny; leaflets 7 (-9) per leaf; [alien, uncommonly planted, rarely naturalized]; [section *Aesculus*] ..... ***A. hippocastanum***
1 Petals 4 (or 4-5 in *A. parviflora*), cream-colored, yellow, red; or white (and then lacking a red blaze); buds not glutinous; fruit smooth (or with some prickles in *A. glabra* var. *glabra*); leaflets 5 (-7) per leaf; [native].
2 Petals white, unmarked with red; stamens exserted, 2-4× as long as the petals; inflorescence 2-5 dm long; [section *Macrothyrsus*] ..... ***A. parviflora***
2 Petals cream-colored, yellow, or red; stamens included or exserted, 1-2× as long as the petals; inflorescence 1-2.5 dm long; [section *Pavia*].
3 Stamens about 2× as long as the petals, well-exserted beyond the corolla; petals only slightly unequal in size; fruit spiny with short prickles (rarely essentially smooth) ..... ***A. glabra*** *var.* ***glabra***
3 Stamens about 1× as long as the petals, included or barely exserted beyond the corolla; petals markedly unequal in size; fruit smooth.
4 Petal margins stipitate-glandular; petals scarlet; fruits 3-6 cm in diameter ..... ***A. pavia*** *var.* ***pavia***
4 Petal margins villous, not glandular; petals yellow; fruits 2-8 cm in diameter.
5 Calyx and pedicels stipitate-glandular; large tree; petiolules 2-3 (-4) mm long; fruits 5-8 cm in diameter ..... ***A. flava***
5 Calyx and pedicels puberulent; shrub to small tree; petiolules 3-12 mm long; fruits 2-4 cm in diameter ..... ***A. sylvatica***

Aesculus flava Solander, Yellow Buckeye. Moist forests, up to nearly 2000m, especially prominent in seepy cove forests, in the Piedmont only in "montane" habitats. Late April-mid June; August-September. A broad Southern Appalachian endemic: sw. PA, s. OH, s. IN, and s. IL south through KY, WV, sw. VA, and TN to n. AL, n. GA, nw. SC, and w. NC. *A. flava* is one of the largest, most massive, and commonest trees in Southern Appalachian coves, recognizable in winter by the bark of large plate-like slabs, thick twigs, and massive form. Meyer & Hardin (1987) discuss the nomenclatural issues relating to the names "*A. flava*" and "*A. octandra*." [= C, K, W; = *A. octandra* Marshall – RAB, F, G, Z; < *A. octandra* – S (also see *A. sylvatica*)]

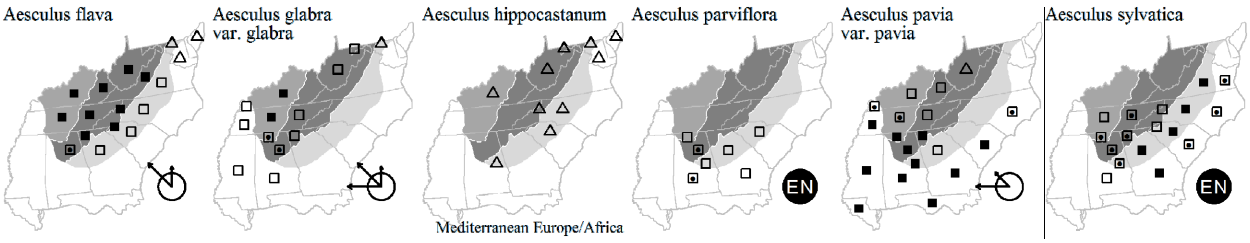
Aesculus glabra Willdenow *var.* ***glabra***, Ohio Buckeye. Mesic forests over limestone. April-May. Largely midwestern, but ranges east to sw. PA, e. TN, and nw. GA (Jones & Coile 1988); it is also sometimes introduced eastward of that distribution. It occurs in TN counties adjacent to both VA and NC. [= C, F, G, K, Z; < *A. glabra* – S, WV]

* ***Aesculus hippocastanum*** Linnaeus, Horsechestnut. Urban and suburban areas, perhaps not definitely naturalized, but fairly often planted as a street tree and escaping as seedlings in the vicinity of plantings; native of se. Europe. [= C, F, G, K, Z]

Aesculus parviflora Walter, Bottlebrush Buckeye. Mesic forests on bluffs and in ravines (the SC occurrence is on Fall Line river bluffs, with shaley, subcalcareous soils). Wc. GA west to nc. AL, south to sw. GA and sw. AL; disjunct in wc. SC (Aiken County). See Wyatt (1985) for a discussion of the interesting, relictual occurrence in SC. Occasionally planted outside its native range. [= K, S, Z]

Aesculus pavia Linnaeus *var.* ***pavia***, Red Buckeye. Swamp forests, usually stagnant, usually blackwater (not receiving significant alluvium), and especially over marl (coquina limestone). April-early May; July-August. Var. *pavia* ranges from se. NC south to c. peninsular FL and west to e. TX, extending north in the Missisippi Embayment to se. MO and s. IL, and in scattered occurrences off the Coastal Plain, as in sc. TN; also it is sometimes cultivated further inland and persistent or slightly naturalizing. Var. *flavescens* (Sargent) Correll occurs in the Edwards Plateau of c. TX. Fernald reports this species from VA and WV, but there is likely taxonomic or nomenclatural confusion. [= K, Z; < *A. pavia* – RAB, C, G, S, W, WH; >< *A. pavia* – F; >< *A. discolor* Pursh – F]

Aesculus sylvatica Bartram, Painted Buckeye. In the Piedmont in mesic, nutrient-rich forests, on bottomlands, lower slopes, and in ravines, in the Coastal Plain primarily on floodplains of brownwater (alluvium-carrying) rivers (most notably the Roanoke River in NC), in the Mountains only at low elevations. April-mid May; July-August. Primarily a Southeastern Piedmont endemic, occurring primarily in the Piedmont from sc. VA south through c. NC, c. SC, and nc. GA to nc. AL, with an extension north into e. TN. [= RAB, C, F, K, W, Z; = *A. neglecta* Lindley – G, misapplied; < *A. octandra* – S (also see *A. flava*); > *A. georgiana* Sargent]



3. Cardiospermum Linnaeus 1753 (Balloon Vine)

A genus of about 14 species, vines, of tropical regions (especially America).

* ***Cardiospermum halicacabum*** Linnaeus, Balloon Vine, Heartseed, Love-in-a-puff. Mt (GA), Pd (DE, SC), Cp (VA): disturbed areas; rare, native of tropical America. August-September. [= RAB, F, G, K, S, WH; = *C. halicababum* – C, orthographic error]

4. Koelreuteria Laxmann 1772 (Golden Rain Tree)

A genus of 4 species, trees, of temperate China and Taiwan. References: Meyer (1976)=Z. Key based on Meyer (1976).

1 Leaves pinnate (rarely bipinnate in part), the leaflets coarsely crenate to lobulate; capsule valves ovate, ca. 2 × as long as wide; capsules greenish to tawny when young, aging to dark brown ..... ***K. paniculata***
1 Leaves bipinnate, the leaflets entire to shallowly serrate; capsule valves orbicular, 0.9-1.4 × as long as wide; capsules rose-purple when young, aging to tawny-brown.
  2 Leaflets weakly oblique, acute to short-acuminate, entire to uniformly serrate; petals 4 (-5) ..... ***K. bipinnata***
  2 Leaflets strongly oblique, long acuminate to caudate, entire to irregularly crenate-serrate; petals (4-) 5 ..... ***K. henryi***

* ***Koelreuteria bipinnata*** Franchet, Bougainvillea Golden Rain Tree. Disturbed areas, roadsides; native of s. China. Becoming popular horticulturally, and producing abundant seedlings near the planted specimens; potentially invasive. [= Z]
* ***Koelreuteria henryi*** Dümmer, Flamegold. Disturbed areas, roadsides; native of Taiwan. This taxon appears to be distinct morphologically and geographically from *K. elegans*, and warrants recognition at the species level. Becoming popular horticulturally, and producing abundant seedlings near the planted specimens; potentially invasive, and established just south of our area in peninsular FL. [= *Koelreuteria elegans* (Seem.) A.C. Smith ssp. *formosana* (Hayata) F.G. Meyer – K, WH, Z]
* ***Koelreuteria paniculata*** Laxmann, Golden Rain Tree. Disturbed areas, roadsides, frequently cultivated as an ornamental tree, rarely escaped; native of n. China. June; September. [= RAB, C, F, G, K]

5. Sapindus Linnaeus 1753 (Soapberry)

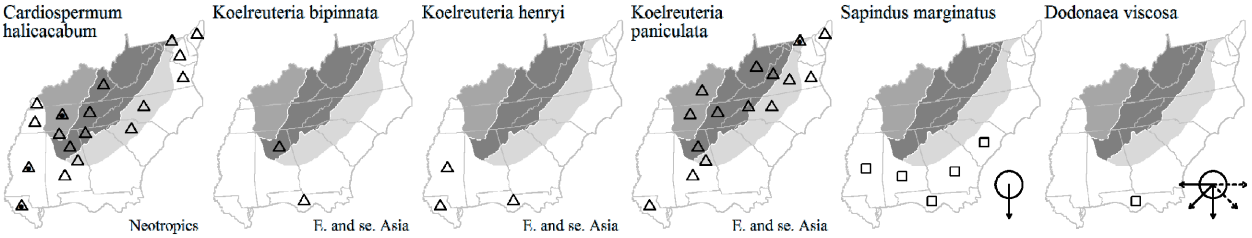
A genus of about 13 species, trees, of tropical and warm temperate regions of the Old and New World.

Sapindus marginatus Willdenow, Florida Soapberry. Coastal marsh hammocks, shell middens. May-June. Se. SC (?) and e. GA south to c. peninsular FL (Lee and Brevard counties), and on the Gulf Coast in s. MS. Small (1933) reports this species from SC, but there is doubt whether this species was actually ever documented to occur in SC; there are no recent records. Although sometimes combined (as by K) with the tropical *Sapindus saponaria*, I follow most recent Florida authors (Clewell 1985, Tomlinson 1986, Godfrey 1988, Nelson 1994, Nelson 1996) in maintaining it as distinct. *S. marginatus* is a species of n. FL, e. GA, and possibly SC and has wingless rachises, acuminate leaflets, and globose fruits; *S. saponaria* is a species of s. FL and tropical America and has winged rachises, rounded leaflet tips, and ovoid to globose fruits. [= RAB, S; < *S. saponaria* Linnaeus var. *saponaria* – K]

6. Dodonaea P. Miller 1754 (Varnishleaf, Hopbush)

A genus of about 65 species, shrubs, mainly Australian.

Dodonaea viscosa (Linnaeus) Jacquin, Varnishleaf, Hopbush. {hábitat}. Widespread in the Old World and New World tropics, north in FL to St. Johns County. [= S, WH; < *D. viscosa* – K]



241. RUTACEAE A.L. de Jussieu 1789 (Citrus Family) [in SAPINDALES]

A family of about 156 genera and 1800 species, trees, shrubs, vines, and rarely herbs, cosmopolitan.

1 Leaves unifoliolate (appearing simple); [subfamily *Aurantioideae*] ..... ***Citrus***
1 Leaves pinnately or palmately compound.
2 Leaves 2-pinnatifid; suffrutescent herb or shrub to 1.5 m tall; [subfamily *Rutoideae*, tribe *Ruteae*] ..... ***Ruta***
2 Leaves palmately 3-foliolate or 1-pinnate (5-19-foliolate); shrub or tree, usually over 1.5 m tall (potentially to 20 m in *Zanthoxylum*).
3 Leaves pinnately 5-19-foliolate
4 Leaves opposite; [subfamily *Toddalioideae*] ..... ***Phellodendron***
4 Leaves alternate; [subfamily *Rutoideae*, tribe *Zanthoxyleae*] ..... ***Zanthoxylum***
3 Leaves palmately 3-foliolate.
5 Branches conspicuously armed with stout spines; [subfamily *Aurantioideae*] ..... ***Citrus***
5 Branches not armed with spines; [subfamily *Toddalioideae*] ..... ***Ptelea***

Citrus Linnaeus 1753
(Citrus, Orange, Grapefruit, Lemon, Lime, Citron, Pummelo, Kumquat, Trifoliate Orange)

A genus of about 27-35 species, trees, of s. and se. Asia. The circumscription has been controversial, but Araújo, Queiroz, & Machado (2003) provide compelling arguments in favor of a broad circumscription (followed here), including *Poncirus*, based on DNA analyses and other considerations. The recognition of *Poncirus* and other segregate genera would render *Citrus* paraphyletic because of the position of *Citrus medica* (the type species of *Citrus*) as basal to these genera and the rest of *Citrus*. References: Mabberley (1997)=Z; Araújo, Queiroz, & Machado (2003)=Y; Pfeil & Crisp (2008).

Identification notes: *Citrus* has simple to trifoliolate, evergreen, coriaceous, acuminate, glossy green leaves, and the familiar spherical fruits. *Citrus* ×*limon* (Linnaeus) Burmann f., Lemon, *C.* ×*paradisi* Macfadyen in Hooker (pro sp.), Grapefruit, and *C. sinensis* (Linnaeus) Osbeck, Orange, have been grown on the Outer Banks of North Carolina in Buxton, Dare County, NC (Brown 1959). They are apparently not naturalized, being killed outright or severely damaged by occasional colder winters, and are not keyed or otherwise treated here.

1 Leaves trifoliolate; fruit densely pubescent, 3-6 cm long ..... ***C. trifoliata***
1 Leaves unifoliolate; fruit glabrous, 4.5-25 cm long.
2 Petiole winged, and with an articulation at the juncture with the blade; fruit 4.5-15 cm long ..... ***C.* ×*aurantium***
2 Petiole not winged, and lacking an articulation at the juncture with the blade; fruit 15-25 cm long ..... ***C. medica***

* ***Citrus* ×*aurantium*** Linnaeus (pro sp.), Sour Orange, Grapefruit, Sweet Orange. Cultivated horticulturally, sometimes persistent; native of se. Asia. Reported from several counties in s. and e. GA (Jones & Coile 1988). [= WH, Z; = *C. aurantium* – K (as species)]

* ***Citrus medica*** Linnaeus, Citron. Disturbed hammocks; native of se. Asia. Apparently naturalized in the FL Panhandle (Franklin County) (Wunderlin & Hansen 2003). [= K, S, WH]

* ***Citrus trifoliata*** Linnaeus, Trifoliate Orange, Hardy Orange. Woodlands, thickets, bottomlands, and streambanks, especially in suburban areas; native of temperate China. March-April; September-October. Planted in our area as an ornamental, as a "living fence," and also used as a grafting stock for citrus, *C. trifoliata* is a small tree or shrub that seems to be made up almost entirely of "thorns" (actually, stipular spines). The fruits closely resemble an orange, but are small (ca. 4 cm in diameter), densely pubescent, and sour. *Citrus trifoliata* is often placed in a separate genus, *Poncirus*, but differs very little from *Citrus* morphologically, and has been shown to be phylogenetically nested within *Citrus* (Araújo, Queiroz, & Machado 2003), and thus seems best included in *Citrus*. [= Y; = *Poncirus trifoliata* (Linnaeus) Rafinesque – RAB, F, G, K, S, WH]

Phellodendron Ruprecht 1857 (Cork-tree)

A genus of about 10 species, trees, native of e. Asia.

* ***Phellodendron japonicum*** Maximowicz, Japanese Cork-tree. Pd (DE), Mt (WV): suburban woodlands; uncommon (rare in WV), native of Japan. [= C, K1; ? *P. amurense* Ruprecht – K2]

Ptelea Linnaeus 1753 (Hop-tree, Wafer-ash, Stinking Ash)

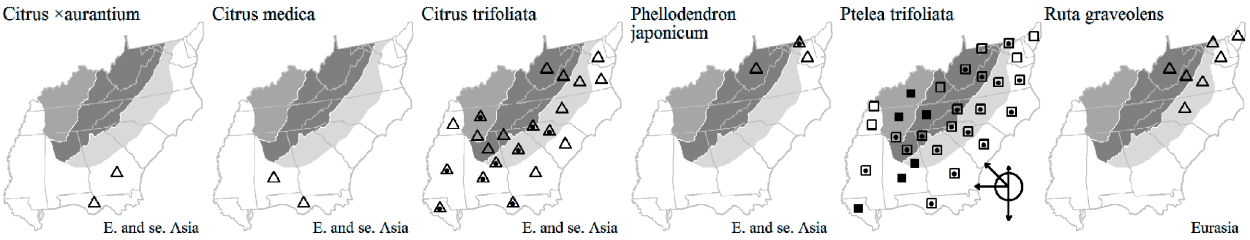
A genus of about 11 species, of North America (south into Mexico). References: Bailey (1962)=Z.

Ptelea trifoliata Linnaeus, Hop-tree. Cp (FL, GA, NC, SC, VA), Pd (DE, GA, NC, SC, VA), Mt (GA, NC, SC, VA, WV): rocky bluffs, especially calcareous or mafic, open woodlands, calcareous Coastal Plain river bluffs, granitic domes; uncommon. April-June; June-August. NJ, w. NY, MI, s. WI, and NE south to c. peninsular FL, c. AL, c. MS, e. and s. TX. Bailey (1962) treats two varieties in our areas, doubtfully distinguishable; they need additional study. [= RAB, WH; > *P. trifoliata* var. *mollis* – F, WV; > *P. trifoliata* var. *trifoliata* – F, WV; > *P. trifoliata* ssp. *trifoliata* var. *mollis* Torrey & A. Gray – C, K, Z; > *P. trifoliata* ssp. *trifoliata* var. *trifoliata* – C, K, Z; = *P. trifoliata* var. *trifoliata* – G; > *P. trifoliata* – S; > *P. serrata* Small – S; > *P. microcarpa* Small – S; > *P. baldwinii* Torrey & A. Gray – S]

Ruta Linnaeus 1753 (Rue)

A genus of about 7 species, of the Old World.

* ***Ruta graveolens*** Linnaeus, Rue. Pd (NC, VA), Mt (VA, WV): cultivated in gardens as a medicinal herb, persistent and rarely escaping, sometimes locally abundant in pastures over limestone or gravelly floodplains; rare, native of Eurasia. May-August; June-September. This plant causes dermatitis in some people, apparently by removing the skin's sun-resistance. *Ruta* has a disagreeable smell, and has toxic properties. [= RAB, C, F, G, K, S, WV]



Zanthoxylum Linnaeus 1753 (Prickly-ash, Toothache Tree)

A genus of about 250 species, of America, Africa, Asia, and Australia. References: Porter (1976)=Z.

1 Leaves thin in texture, pubescent; flowers in small axillary clusters ..... ***Z. americanum***
1 Leaves coriaceous in texture, glabrous and waxy; flowers in large terminal compound cymes ..... ***Z. clava-herculis***

Zanthoxylum americanum P. Miller, Prickly-ash, Toothache Tree, Northern Prickly-ash. Woodlands and forests over calcareous or mafic rocks, often forming extensive colonies near outcrops. March-April; July-August. S. QC west to e. ND, south to e. SC, c. GA, Panhandle FL, e. TN, c. TN, and OK. Sometimes planted. There is only a single known site in SC. [= RAB, C, K, W, S, WH, WV, Z; = *Xanthoxylum americanum* – F, orthographic variant]

Zanthoxylum clava-herculis Linnaeus, Toothache Tree, Hercules'-club, Sea-ash, Southern Prickly-ash, Pepper-bark, Tickle-tongue. Maritime forests, dunes, shell middens, shell hammocks, maritime scrub, inland (in FL and GA) in hammocks. April-May; July-September. A Southeastern Coastal Plain endemic: se. VA south to FL and west to TX, AR, and OK. The compound leaves are armed with stout prickles along the rachis. The twigs are also spiny. On the larger branches and trunks, the spines become elevated on conical, pyramidal, or cylindrical corky bases up to 5 cm long and 4 cm in diameter, giving the trunk a very peculiar appearance. Many of the common names come from the numbing effect on the mouth of chewing the leaf or twig, the flavor, smell, and effect being very similar to *Ctenium aromaticum*, Toothache Grass. In the northern part of its distribution, it is restricted to the outer Coastal Plain, nearly entirely on the barrier islands. Although normally a small tree, it can reach considerable size, up to about 60 cm DBH. In the 5 km immediately north of Buxton, Dare County, NC one can see several hundred individuals growing on open, *Uniola*-dominated dunes. Because of salt-pruning, the trees often have 5 times as wide a spread as they are tall. Some trees have a basal diameter of 30-40 cm, a short trunk less than a meter tall, a total height of 2-3 m, and a spread of 10 m. [= RAB, C, G, K, S, WH, Z; = *Xanthoxylum clava-herculis* – F, orthographic variant]

242. SIMAROUBACEAE A.P. de Candolle 1811 (Quassia Family) [in SAPINDALES]

A family of about 13 genera and 111 species, trees and shrubs of primarily tropical areas of the New World and Old World. The Leitneriaceae has been traditionally considered to be a monotypic family, endemic to se. North America; a variety of recent studies have suggested its inclusion in the Simaroubaceae (Angiosperm Phylogeny Group 1998, 2003, 2009; Bogle in FNA 1997). References: Angiosperm Phylogeny Group (1998, 2003). [including *LEITNERIACEAE*]

1 Leaves compound; [species alien, aggressively naturalizing in upland sites]..... ***Ailanthus***
1 Leaves simple; [species native, in wetland sites]..... ***Leitneria***

Ailanthus Desfais 1788 (Tree-of-Heaven)

A genus of 5 species, trees, native to Asia and Australia. References: Hu (1979).

* ***Ailanthus altissima*** (P. Miller) Swingle, Tree-of-Heaven, Copal Tree, Stink-tree. Roadsides, forests, disturbed areas, including cities, especially in moist, fertile soils; native of e. Asia. Late May-early June; July-October. In our area, this tree is now an aggressive and noxious weed, colonizing even undisturbed forests and outcompeting the native vegetation. As serious a weed as it is here, it is (at the time of this writing, at least), much worse to the north, now the dominant tree in fencerows, woodlots, and forests in the urbanized, suburbanized, and even rural Northeast. It can be recognized vegetatively by its large pinnately compound leaves, very stout twigs (over 1 cm thick), and the characteristic and unpleasant odor of the crushed foliage. [= RAB, C, F, G, K, S, W]

Leitneria Chapman 1860 (Corkwood)

A monotypic genus, endemic to se. North America. References: Bogle in FNA (1997); Channell & Wood (1962).

Leitneria floridana Chapman, Corkwood. Swamps and cabbage palm / sawgrass marshes. February-March. Sw. GA and Panhandle FL west to e. TX, and north in the Mississippi Embayment to AR and MO, very scattered in occurrence. [= FNA, GW, K, S, WH]

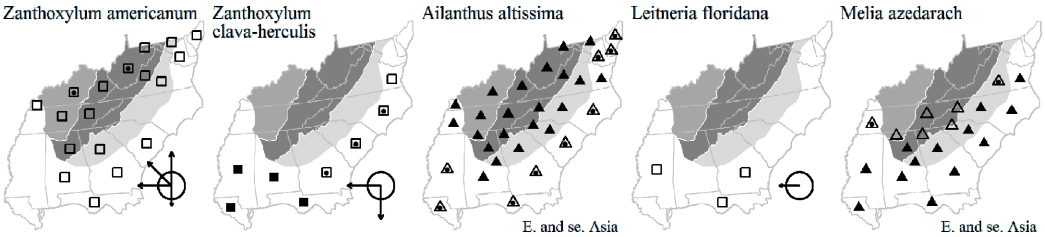
243. MELIACEAE A.L. de Jussieu 1789 (Mahogany Family) [in SAPINDALES]

A family of about 50 genera and 565 species, trees and shrubs, of tropical and subtropical areas. The only native member of the family in e. North America is *Swietenia mahogani* (Linnaeus) Jacquin (West Indian Mahogany), a very valuable timber tree which ranges north to s. FL. References: Miller (1990)=Z in the synonymy.

Melia Linnaeus 1753 (Chinaberry)

A genus of 3 species, trees, of the Old World tropics.

* ***Melia azedarach*** Linnaeus, Chinaberry, Carolina Mahogany, Umbrella-tree, Pride-of-India. Disturbed areas, abandoned rural yards and fields; native to se. Asia, commonly cultivated in our area (mainly in the Coastal Plain) and commonly escaped. April-May; September-October. [= RAB, C, F, G, K, S, WH, Z]



250. MALVACEAE A.L. de Jussieu 1789 (Mallow Family) [in MALVALES]

Malvaceae has always been difficult to circumscribe cleanly, relative to members of such families as Sterculiaceae and Tiliaceae. Molecular evidence now adds to morphologic evidence that traditional circumscriptions of these families are highly polyphyletic. Bayer et al. (1999) present a new classification of an expanded Malvaceae, with 9 subfamilies recognized. If circumscribed broadly (as here) to include Sterculiaceae and Tiliaceae, a family of about 243 genera and 4000-4500 species, herbs, shrubs, and trees, of cosmopolitan distribution, but especially diverse in the tropics and subtropics. This family includes several economically important species, including cotton (*Gossypium* spp.), cacao or chocolate, *Theobroma cacao* Linnaeus, and cola, *Cola acuminata* R. Brown. References: Bayer et al. (1999); Bayer & Kubitzki in Kubitzki & Bayer (2003); Fryxell (1988). [including *STERCULIACEAE* and *TILIACEAE*]

1 Petals absent; carpels 5, whorled, each expanding into a stalked and papery structure which bears 1-4 pea-sized seeds along its margins; tree; leaves 10-40 cm wide, 3-5 lobed, the lobes acute, the margins entire; [subfamily *Sterculioideae*] ..... ***Firmiana***

1 Petals present; carpels 1, 5, or many, united or separate, but not as above; tree, shrub, or herb; leaves< 15 cm wide, lobed or unlobed, but if lobed then also serrate.

2 Epicalyx of bracts (immediately subtending the calyx) absent.

3 Stamens 5; [subfamily *Byttnerioideae*].

4 Ovary with 5 carpels and 5 styles; capsule with 5-10 seeds; corolla pink, purple, or white ..... ***Melochia***
4 Ovary with 1 carpel and 1 style; capsule with 1 seed; corolla orange to yellow ..... ***[Waltheria]***
3 Stamens >10.
5 Stamens free.
6 Tree; fruit a woody drupe; [subfamily *Tilioideae*] ..... ***Tilia***
6 Herb or shrub; fruit a capsule; [subfamily *Grewioideae*].
7 Leaves rounded or subcordate at base, acute at apex; fruit much longer than broad, unarmed ..... ***Corchorus***
7 Leaves cuneate at base, acuminate at apex; fruit subglobose, with hooked spines ..... ***Triumfetta***
5 Stamens united into a staminal column adnate to the corolla at its base; [subfamily *Malvoideae*; tribe *Malveae*].
8 Seeds 2 or more per carpel ..... ***Abutilon***
8 Seed 1 per carpel.
9 Leaves palmately and deeply cleft (> 9/10s of the way to the midrib) into linear segments ..... ***Callirhoe***
9 Leaves unlobed or lobed (if lobed , < 4/5's of the way to the midrib and the lobes broad).
10 Flowers many in a terminal panicle; corolla white; style branches filiform, the stigmatic surface elongate along the inner side of the branches; leaves >10 cm wide, deeply 5-9-lobed; plants 1-2 m tall ..... ***Napaea***
10 Flowers solitary or a few in leaf axils (or many in a terminal panicle in *Sida hermaphrodita*); corolla blue-purple, yellow, or white; style branches truncate, the stigmatic surface terminal and capitate; leaves < 2cm wide, unlobed (or leaves >10 cm wide and deeply 3-7-lobed in *Sida hermaphrodita*); plants < 1 m tall (or 1-4 m tall in *Sida hermaphrodita*).
11 Corolla blue to purple; lateral walls of the carpels disintegrating at maturity of the fruit ..... ***Anoda***
11 Corolla yellow or white; lateral walls of the carpels persistent ..... ***Sida***
2 Epicalyx of bracts (immediately subtending the calyx) present.
12 Fruit a loculicidal capsule or fleshy and berry-like.
13 Fruit fleshy and berry-like; [subfamily *Malvoideae*; tribe *Hibisceae*] ..... ***Malvaviscus***
13 Fruit a loculicidal capsule.
14 Calyx spathe-like, soon falling after anthesis; [subfamily *Malvoideae*; tribe *Hibisceae*] ..... ***Abelmoschus***
14 Calyx radially symmestrical, 5-lobed.
15 Style branches short, erect, the stigmas nearly sessile; epicalyx bracts 3, large, foliaceous, and incised; seeds bearing long white fibers; [subfamily *Malvoideae*; tribe *Gossypiae*] ..... ***Gossypium***
15 Style branches elongate, spreading; epicalyx bracts 6-15, linear to lanceolate and untoothed; seeds sometimes pubescent but not wityh long white fibers; [subfamily *Malvoideae*; tribe *Hibisceae*].
16 Locules of the fruit several-seeded; capsule longer than broad, the apex pointed or rounded; petals yellow, white, red, or pink (if pink, then > 4 cm long, or the plant a shrub) ..... ***Hibiscus***
16 Locules of the fruit 1-seeded; capsule depressed-globose, indented at the apex; petals pink, 2-4 cm long ..... ***Kosteletzkya***
10 Fruit of radially disposed, 1- to several-seeded, dry carpels that split apart at maturity.
17 Bracts of the epicalyx 5 or more.
18 Shrubs or woody herbs, with leaves not basally disposed; flowers in axils of well-developed leaves; fruit spiny (or lacking spines in *Pavonia hastata*); [of SC southward]; [subfamily *Malvoideae*; tribe *Hibisceae*].
19 Bracts of the epicalyx 5-15, distinct; fruit with 0-3 spines per carpel; leaves lacking foliar nectaries ..... ***Pavonia***
19 Bracts of epicalyx 5, fused basally; fruit covered with numerous glochidiate spines; leaves with 1-3 foliar nectaries (glands) on undersurface near base ..... ***Urena***
18 Herbs, with leaves basally disposed; flowers in terminal bracteates spikes or racemes; fruit lacking spines; [collectively widespread]; [subfamily *Malvoideae*; tribe *Malveae*].
20 Plant 1.5-3 m tall, usually unbranched; flowers 6-10 cm across ..... ***Alcea***
20 Plant 0.5-1.2 m tall, branched; flowers 2-3 cm across ..... ***Althaea***
17 Bracts of the epicalyx 2-3; [subfamily *Malvoideae*; tribe *Malveae*].
21 Ovules and seeds 2 or more per carpel.
22 Herb 0.5-2.5 m tall, upright; petals 2-3 cm long, pink-purple; carpels not beaked at the tip ..... ***Iliamna***
22 Herb to 0.5 m tall, prostrate to ascending; petals 0.3-0.5 cm long, orange-red; carpels beaked at the tip ..... ***Modiola***
21 Ovules and seeds 1 per carpel.
23 Leaf blades 1.5-8× as long as wide.
24 Style branches filiform, the stigmatic surface elongate along the inner side of the branches ..... ***Callirhoe***
24 Style branches truncate, the stigmatic surface terminal and capitate ..... ***Malvastrum***
23 Leaf blades orbicular, about as wide as long.
25 Leaves deeply palmately cleft ..... ***Callirhoe***
25 Leaves unlobed or shallowly lobed ..... ***Malva***

Abelmoschus Medikus 1787 (Okra, Gumbo)

A genus of about 15 species, herbs, of the Old World tropics. Perhaps better included in a broadly circumscribed *Hibiscus* (Pfeil & Crisp 2005). References: Bates in FNA (in prep.); Bayer & Kubitzki in Kubitzki & Bayer (2003).

* ***Abelmoschus esculentus*** (Linnaeus) Moench, Okra, Gumbo. Cp (FL, GA, NC, SC, VA), Pd (GA, NC, SC, VA): frequently cultivated in gardens, rarely persistent or self-seeding the year following; common (in cultivation), rare (as an escape), native of Africa. The young capsules are a famous component of southern cooking. [= FNA, K, S, WH; = ***Hibiscus esculentus*** Linnaeus – F]

Abutilon P. Miller 1754 (Indian-mallow, Indian-hemp)

A genus of about 100-160 species, herbs, of tropical and warm temperate areas. References: Fryxell (2002)=Z; Bayer & Kubitzki in Kubitzki & Bayer (2003).

* ***Abutilon theophrasti*** Medikus, Velvetleaf, Pie-marker, Butterprint. Cp (DE, FL, GA, NC, VA), Pd (DE, NC, SC, VA), Mt (GA, NC, SC, VA, WV): fields, roadsides, disturbed areas; common (uncommon in DE, rare in FL), native of s. Asia. June-October. [= F, G, K, W, WH, Z; = *A. theophrastii* – RAB, orthographic variant; = *Abutilon abutilon* (Linnaeus) Rusby – S]

Alcea Linnaeus 1753 (Hollyhock)

A genus of about 50-60 species, warm temperate Eurasian (Mediterranean Europe to c. Asia). References: Hill in FNA (in prep.); Bayer & Kubitzki in Kubitzki & Bayer (2003).

* ***Alcea rosea*** Linnaeus, Hollyhock. Cp (NC, VA), Pd (DE, NC, VA), Mt (NC, VA, WV) {GA}: roadsides, dumps, frequently cultivated, less commonly escaped or persistent; uncommon (rare in GA, NC, VA, and WV), native of Eurasia. Late May-August (rarely later). [= FNA, K; = *Althaea rosea* (Linnaeus) Cavanilles – RAB, C, F, G]

* *Alcea rugosa* Alefeld, Russian Hollyhock. Reported for MD. [= FNA] {not yet keyed}

Althaea Linnaeus 1753 (Marsh-mallow)

A genus of about 12 species, herbs, Eurasian. References: Hill in FNA (in prep.); Bayer & Kubitzki in Kubitzki & Bayer (2003).

* ***Althaea officinalis*** Linnaeus, Marsh-mallow. Cp (VA): marshes; rare, native of Europe. The roots of this plant were the original source of the mucilaginous paste used to make marshmallows (which are now made with a synthetic mucilage). [= C, F, FNA, G, K]

Anoda Cavanilles 1785 (Anoda)

A genus of about 24 species, herbs, of sw. North America, Central America, and South America. References: Bayer & Kubitzki in Kubitzki & Bayer (2003).

* ***Anoda cristata*** (Linnaeus) Schlechtendahl, Spurred Anoda. Cp (VA), Pd (GA, NC, SC, VA), Mt (WV): disturbed areas; rare, native of sw. United States, Central and South America. July-October. [= G, K; = *A. crista* – C, orthographic variant; > *A. cristata* var. *cristata* – F; > *A. cristata* var. *brachyanthera* (Reichenbach) Hochreutiner – F]

Callirhoe Nuttall 1821 (Poppy-mallow)

A genus of about 9 species, herbs, of North America. References: Dorr (1990)=Z; Bayer & Kubitzki in Kubitzki & Bayer (2003).

1 Calyx not subtended by an epicalyx.
  2 Inflorescence racemose, corymbose, or nearly umbellate; petals white, pink, or mauve; plants ascending, 1.5-8.5 dm tall; mericarps pubescent with simple, appressed hairs ..... ***C. alcaeoides***
  2 Inflorescence paniculate; petals deep red, with a white basal spot; plants erect, 5-20 dm tall; mericarps glabrous ..... ***C. pedata***
1 Calyx subtended by an epicalyx of 3 bractlets.
  3 Calyx lobes distinct and divergent in bud; stems decumbent ..... ***C. involucrata*** *var.* ***involucrata***
  3 Calyx lobes valvate in bud, forming a point; stems erect, ascending, or decumbent.
    4 Bractlets of the epicalyx linear, 0.1-1.7 mm wide; peduncles 1-flowered; calyx lobes lanceolate, 7-15.4 mm long; mericarps indehiscent; leaves cordate or ovate in outline, palmately deeply divided into 5-7 lobes ..... ***C. papaver***
    4 Bractlets of the epicalyx obovate, 2.5-4.6 mm wide; peduncles several-flowered; calyx lobes deltoid, 2-5 (-6.5) mm long; mericarps dehiscent; leaves triangular, not lobed or only slightly so ..... ***C. triangulata***

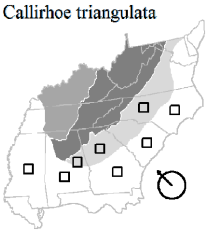
Callirhoe alcaeoides (Michaux) A. Gray, Pale Poppy-mallow. Calcareous prairies, glades, and other open habitats. E. NE south through e. and OK to c. TX; disjunct and scattered eastwards in IA, MO, AR, nw. LA, IL, s. IN, c. KY, c. TN, and c. AL (Dorr 1990). [= C, F, G, K, Z; = *Callirrhoë alceoides* – S, orthographic variant]

* ***Callirhoe involucrata*** (Torrey & A. Gray) A. Gray *var.* ***involucrata***, Purple Poppy-mallow. Pd (VA): disturbed areas; rare, adventive from its native range in the midwestern United States. [= C, G, K, Z; < *C. involucrata* var. *involucrata* – F

Callirhoe papaver (Cavanilles) A. Gray, Woods Poppy-mallow. Cp (FL, GA): longleaf pine woodlands, dry hammocks, forest openings; rare. N. peninsular FL, Panhandle FL, and sw. GA (Carter, Baker, & Morris 2009) west to e. TX and s. AR (Dorr 1990). [= F, G, K, WH, Z; = *Callirrhoë papaver* – S, orthographic variant]

* ***Callirhoe pedata*** (Nuttall ex Hooker) A. Gray, Palmleaf Poppy-mallow. Mt (GA): occasionally mowed roadside and adjacent powerline right-of-way, with other species of calcareous prairie habitats, one occurrence recorded to date; rare, plausibly native, but perhaps only adventive from a native range in prairies and glades of the sc. United States (w. AR and e. OK, south to c. TX). Previously misidentified as *C. digitata* Nuttall. [= K, Z]

Callirhoe triangulata (Leavenworth) A. Gray, Sand Poppy-mallow, Clustered Poppy-mallow. Sandhills, sandy scrub, and other dry, open habitats. Sc. NC south to GA and west to ec. MA (upper Coastal Plain and lower Piedmont); also sw. WI and ne. IA south to s. IN, s. IL, and se. MO. [= C, F, G, K, Z; = *Callirrhoë triangulata* – S, orthographic variant]



Corchorus Linnaeus 1753 (Jute)

A genus of 40-100 species, shrubs, and herbs, broadly tropical and subtropical in distribution. References: Bayer & Kubitzki in Kubitzki & Bayer (2003).

Corchorus aestuans Linnaeus, Jute. Cp (FL, GA): roadsides, other disturbed ground; rare, native of Asia. Reported for Thomas County, GA (Carter, Baker, & Morris 2009). [= WH] {add synonymy}

Firmiana Marsili 1786 (Chinese Parasol-tree, Phoenix Tree)

A genus of about 12 species, trees, of Africa and Asia. References: Whetstone (1983)=Z; Brizicky (1966)=Y; Bayer & Kubitzki in Kubitzki & Bayer (2003).

* ***Firmiana simplex*** (Linnaeus) W. Wight, Chinese Parasol-tree, Phoenix Tree. Cp (FL, GA, NC, SC, VA), Pd (GA, NC, SC, VA): planted and occasionally naturalized nearby; rare, native of se. Asia, probably China. [= C, K, WH, Y, Z; = *F. platanifolia* (Linnaeus f.) Schott & Endlicher – RAB, S]

Gossypium Linnaeus 1753 (Cotton)

A genus of about 40-50 species, herbs, shrubs, and trees, of warm temperate to tropical areas. References: Fryxell (1969, 1979)=Z; Bayer & Kubitzki in Kubitzki & Bayer (2003).

Identification notes: Agricultural cotton is now a complex set of cultivars, some involving cross-breeding between the two species treated below, and some plants may not be readily identifiable to species.

1 Capsule 3-6 cm long, narrowly ovoid to elongate, its surface deeply pitted with oil glands; leaves 3-7-lobed, the central lobe usually > 1.5× as long as wide; stipules 1-5 cm long; corolla deep yellow; long fibers of the seed completely separable from the seed; short fibers of the seed absent or present ..... ***G. barbadense***

1 Capsule 2-3 cm long, ovoid to subglobose, its surface smooth; leaves 3-5-lobed, the central lobe usually 1.0-1.5× as long as wide; stipules 0.5-1.5 (-2.0) cm long; corolla pale yellow; long fibers of the seed firmly attached to the seed; short fibers of the seed present ..... ***G. hirsutum***

* ***Gossypium barbadense*** Linnaeus, Sea-island Cotton, Egyptian Cotton, Pima Cotton, Extra-long-staple Cotton. Cp (GA, NC, SC): formerly cultivated, perhaps no longer present in our area; rare, native of South America, Central America, and the West Indies. Probably first domesticated about 5000-5500 years b.p. in coastal Peru and Ecuador. [= K, S, Z]

* ***Gossypium hirsutum*** Linnaeus, Upland Cotton. Cp (FL, GA, NC, SC, VA): frequently cultivated crop, especially in sandy soils of the Coastal Plain, rarely adventive or a waif; common (as a crop), rare (as an adventive), native of Central America, South America, the West Indies, and s. FL. Probably first domesticated in the Yucatan Peninsula. [= C, G, WH, Z; > *G. hirsutum* var. *hirsutum* – K; = *G. herbaceum* Linnaeus – F, misapplied; > *G. herbaceum* – S; > *G. hirsutum* – S, misapplied]

Hibiscus Linnaeus 1753 (Hibiscus, Rose-mallow)

A genus of about 200-300 species, trees, shrubs, and herbs, of tropical to warm temperate areas. References: Blanchard in FNA (in prep.); Blanchard (2008)=Z; Wise & Menzel (1971); Bayer & Kubitzki in Kubitzki & Bayer (2003).

1 Woody shrub, the stems usually solitary from a creeping rhizome; [section *Hibiscus*] ..... ***H. syriacus***
1 Herb (sometimes robust and to as tall as 3.5 m), often several from ground level, from a crown or taproot.
2 Annual from a taproot, to 0.5 m tall; calyx inflated at maturity; capsule 1.0-1.3 cm long; petals 1.5-3 (-4) cm long; leaves 2-6 cm long, deeply cleft; [section *Trionum*]..... ***H. trionum***
2 Perennial from a crown, usually 0.7-3.5 m tall; calyx not inflated at maturity; capsule 1.7-3.5 cm long; petals 4-14 cm long; leaves 4-25 cm long, deeply cleft, hastate-lobed, or not at all lobed or cleft.
3 Leaves and stems harshly scabrous; calyx lobes each with an elongate purplish nectary on the back; [of pine savannas and dry sandy soils of maritime forest edges, from se. NC southward]; [section *Furcaria*]..... ***H. aculeatus***
3 Leaves and stems glabrous, softly pubescent, or slightly scabrous; calyx lobes lacking nectaries; [of marshes and swamps (sometimes cultivated in drier soils), collectively widespread in our area]; [section *Muenchhusia*].
4 Stem glabrous; leaves glabrous; leaves either palmately 3-5-lobed, or prominently halberd-lobed at the base (uncommonly unlobed).
5 Leaves either palmately 3-5-lobed; petals bright scarlet ..... ***H. coccineus***
5 Leaves halberd-lobed at the base (uncommonly unlobed); petals pink or white with a purplish base..... ***H. laevis***
4 Stem pubescent at least when young; leaves pubescent on at least one surface; leaves unlobed or slightly lobed toward the tip (except *H. grandiflorus*).
6 Staminal column 6.2-9.5 cm long, > ⅔ × as long as the petals; petals 8.5-14 cm long; [e. GA southwards] ..... ***H. grandiflorus***
6 Staminal column 1.2-5 cm long, < ½× as long as the petals; petals 4-12 cm long; [widespread].
7 Capsule pubescent (the dark surface largely or completely obscured); bracts of the involucel usually ciliate; upper leaf surface usually densely stellate-pubescent..... ***H. lasiocarpos***
7 Capsule glabrous and dark brown to black; bracts of involucel eciliate; upper leaf surface glabrous or nearly so .... ***H. moscheutos***

Hibiscus aculeatus Walter, Savanna Hibiscus, Comfort-root. Cp (FL, GA, NC, SC): pine savannas, dry sandy or loamy soils of maritime forest edges; common (uncommon in GA and SC, rare in NC). June-August; July-September. Se. NC south to sc. peninsular FL, west to LA. [= RAB, FNA, GW, K, S, WH]

Hibiscus coccineus Walter, Scarlet Hibiscus. Cp (GA, *NC, *SC, *VA), *Pd (*NC): marshes, swamp forests, roadside swales, cultivated as an ornamental in yards; uncommon (rare north of FL), in much of our area presumably introduced from further south, but sometimes appearing native. S. GA and s. AL south to s. FL. [= FNA, GW, K, S, WH]

Hibiscus grandiflorus Michaux, Large-flowered Hibiscus. Cp (FL, GA): tidal marshes, lakeshores, wet flatwoods and savannas; rare. E. GA (Chatham Co., adjacent to the SC border) (Jones & Coile 1988) south to s. FL, west to e. LA; e. Cuba. [= FNA, GW, K, S, WH]

Hibiscus laevis Allioni, Smooth Rose-mallow, Halberd-leaved Marsh-mallow, Showy Hibiscus. Cp (FL, GA, NC, SC, VA), Pd (GA, NC, SC, VA), Mt (VA, WV): freshwater marshes, exposed riverbanks, sandbars; common (rare in Mountains) . June-August; August-October. S. PA south to FL Panhandle, west to TX; north in the interior to around the Great Lakes. [= C, FNA, K, W, WH; = *H. militaris* Cavanilles – RAB, F, G, GW, S, WV]

Hibiscus lasiocarpos Cavanilles, Western Rose-mallow. Cp (FL, GA): marshes, swamps; uncommon. KY, IN, IL, MO, KS, and NM south to Panhandle FL, AL, MS, LA, and TX. [= F, GW, S; = *H. moscheutos* Linnaeus var. *occidentalis* Torrey – C; = *H. moscheutos* Linnaeus ssp. *lasiocarpos* (Cavanilles) O.J. Blanchard – FNA, K, Z; = *H. lasiocarpus* – G, orthographic variant; < *H. moscheutos* – WH]

Hibiscus moscheutos Linnaeus, Eastern Rose-mallow. Cp (GA, NC, SC, VA), Pd (GA, NC, SC, VA), Mt (GA, NC, SC,VA, WV): marshes, swamps, river sandbars; common. June-September; July-October. E. MA west to MI, south to c. peninsular FL and e. TX. [> *H. moscheutos* Linnaeus ssp. *moscheutos* – RAB, GW, W; > *H. moscheutos* Linnaeus ssp. *incanus* (Wendland f.) Ahles – RAB, GW; > *H. moscheutos* Linnaeus ssp. *palustris* (Linnaeus) R.T. Clausen – RAB, GW, W; = *H. moscheutos* var. *moscheutos* – C; > *H. incanus* Wendland f. – G, S; = *H. moscheutos* ssp. *moscheutos* – FNA, K, Z; > *H. moscheutos* Linnaeus – F, G, W; > *H. oculiroseus* Britton – S; > *H. palustris* Linnaeus – F, G; > *H. moscheutos* – S; < *H. moscheutos* – WH]

* ***Hibiscus syriacus*** Linnaeus, Rose-of-Sharon, Althaea. Pd (DE, GA, NC, SC, VA), Cp (DE, NC, SC, VA), Mt (NC, SC, VA, WV): escaped or persistent after cultivation, often spreading by rhizomes; uncommon (rare in DE), native of e. Asia. June-September; August-October. [= RAB, C, F, FNA, G, K, S, W, WV]

* ***Hibiscus trionum*** Linnaeus, Flower-of-an-hour. Pd (DE, GA, NC, SC, VA), Mt (NC, SC, VA, WV), Cp (DE, FL, GA, VA): fields, roadsides, railroad yards, disturbed areas; common (uncommon in DE and WV, rare in FL), native of Europe. Reported for Ware County, GA (Carter, Baker, & Morris 2009). [= RAB, C, FNA, G, K, W, WH, WV; = *Trionum trionum* (Linnaeus) Wooton & Standley – S]

Iliamna Greene 1906 (Globe-mallow)

A genus of 7 species, perennial herbs, of North America. Some authors include *Iliamna* in *Sphaeralcea*. References: Bodo Slotta & Porter (2006)=Y; Porter & Wieboldt in Terwilliger (1991)=Z; Bayer & Kubitzki in Kubitzki & Bayer (2003).

1 Leaves 5-7-lobed, the lobes narrowly triangular, the sinuses acute; flowers odorless; plant to ca. 1 m in height; [sandstone outcrops on ridgetop]..... ***I. corei***
1 Leaves 5-7-lobed, the lobes broadly triangular or deltoid, the sinuses obtuse; flowers fragrant; plant to ca. 2.5 m in height; [of river shores and along railroads]..... ***I. remota***

Iliamna corei Sherff, Peters Mountain Mallow. Mt (VA): in shallow soil in crevices of outcroppings of Clinch sandstone, near the summit of Peters Mountain; rare (US Endangered, VA Endangered). June-August; July-October. Endemic to the

summit of Peters Mountain, Giles County, VA. The validity of *I. corei* as a species distinct from *I. remota* is supported by Bodo Slotta & Porter (2006). [= F, Y, Z; < *I. remota* – C, G, W; < *I. rivularis* (Douglas ex Hooker) Greene var. *rivularis* – K]

Iliamna remota Greene, Kankakee Globe-mallow. Mt (VA): shores and gravel bars along rivers, and along railroad embankments; rare. June-August; July-October. W. VA; nw. IN and ne. IL. Considered by some to be introduced only in our area, however, the VA populations are genetically different than those in IN and IL (Bodo Slotta & Porter 2006). [= F, Y, Z; < *I. remota* – C, G, W (also see *I. corei*); < *I. rivularis* (Douglas ex Hooker) Greene var. *rivularis* – K; ? *Sphaeralcea remota* (Greene) Fernald]

Kosteletzkya K. Presl 1835 (Seashore-mallow)

A genus of about 15-30 species, herbs, of North America, sub-Saharan Africa, and Madagascar. Perhaps better included in a broadly circumscribed *Hibiscus* (Pfeil & Crisp 2005). References: Alexander (2010)=Y; Blanchard in FNA (in prep.); Blanchard (2008)=Z; Bayer & Kubitzki in Kubitzki & Bayer (2003).

Kosteletzkya pentacarpos (Linnaeus) Ledebour, Seashore-mallow, Saltmarsh-mallow, Fen-rose. Cp (FL, GA, NC, SC, VA): brackish to freshwater tidal marshes; common. July-October. NY (Long Island) south to s. FL, west to TX; West Indies. Several varieties have often been recognized on thye basis of length of hairs and of parts of the flower and inflorescence (see synonymy). While geographic trends are readily apparent, the recognition of infraspecific taxa is made problematic by the non-correlation of various characters. In recent studies, neither Blanchard (2008) nor Alexander (2010) recognize varieties in our flora area. *K. smilacifolia* A. Gray, of peninsular FL, appears to warrant specific status, as treated by Small (1933). It also appears that the Eurasian *K. pentacarpos* represents an early introduction of North American *Kosteletzkya* to the Old World (probably via ship's ballast) and is conspecific; *K. pentacarpos* (based on European material) has nomenclatural priority over *K. virginica* (Blanchard 2008). [< WH, Z; < *K. pentacarpa* – FNA, orthographic variant; = *Kosteletskya virginica* – RAB, orthographic variant; > *Kosteletzkya virginica* var. *aquilonia* Fernald – C, F, G; > *Kosteletzkya virginica* var. *virginica* – C; > *Kosteletzkya virginica* var. *virginica* – F, G; > *Kosteletzkya virginica* var. *althaeifolia* Chapman – F, G; > *Kosteletzkya virginica* (Linnaeus) K. Presl ex A. Gray – GW, K; > *Kosteletzkya althaeifolia* (Chapman) Rusby – S; > *Kosteletzkya virginica* – S; = *Kosteletzkya pentacarpos* var. *pentacarpos* – Y; = ***Hibiscus pentacarpos*** Linnaeus]

Malva Linnaeus 1753 (Mallow)

A genus of about 40 species, herbs, of temperate Eurasia and montane Africa. References: Hill in FNA (in prep.); Bayer & Kubitzki in Kubitzki & Bayer (2003). Key based in part on FNA.

1 Upper leaves deeply 5-7-lobed, the sinuses cut over halfway to the middle; petals 20-35 mm long; erect perennial ..... ***M. moschata***
1 Upper leaves less deeply lobed, rarely to as deep as halfway to the middle; petals 5-30 (-45) mm long; prostrate to erect annual or biennial.
  2 Epicalyx of 3 oblong-ovate bractlets; petals reddish purple, (12-) 16-30 (-45) mm long; biennial, erect, usually not branched at the base ..... ***M. sylvestris***
  2 Epicalyx of 3 linear or linear to narrowly lanceolate bractlets; petals white or pink, 3-15 mm long; annual, sprawling, usually branched at the base (except *M. verticillata*).
    3 Bractlets of the epicalyx linear; petals to 3-5 mm long, white to pale lilac ..... ***M. parviflora***
    3 Bractlets of the epicalyx broadly linear to narrowly lanceolate; petals (3-) 5- mm long, pink or purple (rarely white).
      4 Stems erect, usually > 5 dm long; leaf blades 3-8 (-17) cm long ..... ***M. verticillata***
      4 Stems prostrate to ascending, to 5dm long; leaf blades 1.5-5 cm long.
        5 Petals 6-13 mm long, about 2× as long as the sepals; mature mericarps slightly roughened or obscurely reticulate ..... ***M. neglecta***
        5 Petals 3-6 mm long, about 1× as long as the sepals; mature mericarps strongly rugose-reticulate ..... ***M. pusilla***

* ***Malva moschata*** Linnaeus, Musk Mallow, Rose Mallow. Mt (NC, VA, WV), Pd (DE, VA): pastures, roadsides, barnyards; rare, native of Europe. Late May-August. [= RAB, C, F, FNA, G, K, W, WV]

* ***Malva neglecta*** Wallroth, Common Mallow, Cheeses. Mt (GA, NC, VA, WV), Pd (DE, GA, NC, VA), Cp (DE, VA) {SC}: pastures, roadsides, barnyards; common (uncommon in DE, rare in GA, NC, and VA), native of Europe. April-November. [= RAB, C, F, FNA, G, K, W, WV; = *M. rotundifolia* – S, misapplied]

* ***Malva parviflora*** Linnaeus, Little Mallow. Cp (FL, GA, SC): disturbed areas; rare, native of Mediterranean Europe. [= C, F, FNA, G, K, WH]

* ***Malva pusilla*** Smith, Small Mallow, Dwarf Mallow, Cheeses. Mt (VA): pastures, roadsides, barnyards; rare, native of Europe. [= FNA; = *M. rotundifolia* Linnaeus – C, F, G, K, S, rejected because of uncertain application]

* ***Malva sylvestris*** Linnaeus, Common Mallow, High Mallow, Cheeses. Cp (NC, SC, VA), Pd (DE, NC, SC, VA), Mt (VA, WV): pastures, roadsides, barnyards; uncommon (rare in NC, SC, VA, and WV), native of Europe. May-July. [= RAB, C, FNA, K, S, W; > *M. sylvestris* var. *sylvestris* – F, G; > *M. sylvestris* var. *mauritiana* (Linnaeus) Boissier – F, G]

* ***Malva verticillata*** Linnaeus, Whorled Mallow. Pd (DE), Mt (WV): disturbed areas, rare, native of e. Asia. Reported as an introduction as far south as s. PA (Rhoads & Klein 1993), MD, WV (Strausbaugh & Core 1978), DE, and DC. [= K, WV; > *M. verticillata* var. *verticillata* – C, F, FNA, G; > *M. verticillata* var. *crispa* Linnaeus – C, F, FNA, G]

Malvastrum A. Gray 1849 (False-mallow)

A genus of 14 species, herbs, of tropical and warm temperate areas. References: Hill in FNA (in prep.); Bates (1967); Bayer & Kubitzki in Kubitzki & Bayer (2003).

1 Leaves linear-lanceolate to lanceolate, 3.5-8× as long as wide; plant 1-5 (-8) dm tall; [of inland calcareous habitats] ..... ***M. angustum***
1 Leaves broadly lanceolate to broadly ovate, 1.5-2.5× as long as wide; plant (5-) 10-20 dm tall; [of near coastal habitats, mainly FL, waifs elsewhere].
2 Hairs of the stems stellate with 5-12 ascending rays; leaves often shallowly 3-lobed ..... ***M. americanum***
2 Hairs of the stems stellate with 2-5 appressed rays; leaves unlobed.
3 Mericarps with minute cusps, none longer than 0.1-0.4 mm long ..... ***M. corchorifolium***
3 Mericarps with well-developed sharp cusps, the larger 1-2 mm long ..... ***M. coromandelianum***

Malvastrum angustum A. Gray, Hairy False-mallow. Mt (VA): limestone barrens; rare (VA Rare). July-August; August-October. KY, w. VA (Lee Co.), and c. TN, west to IA, KS, and OK. Discovered in our area in 1994 by J.C. Ludwig (Fleming & Ludwig 1996). [= FNA; = *Malvastrum hispidum* (Pursh) Hochreutiner – C, K, epithet mispplied; = *Malvastrum angustum* A. Gray – G, S; ? *Sphaeralcea angusta* (A. Gray) Fernald – F; = *Sidopsis hispidum* (Pursh) Rydberg, epithet misapplied; = *Sida hispida* Pursh, misapplied]

Malvastrum americanum (Linnaeus) Torrey. Cp (FL): disturbed areas; rare. January-December. FL, TX south through Central America to South America; West Indies; also in the Old World tropics. [= FNA, K, WH]

Malvastrum corchorifolium (Desrousseaux) Britton ex Small. Cp (FL): coastal hammocks; rare. January-December. FL and AL south to Central America; West Indies. [= FNA, K, WH]

* ***Malvastrum coromandelianum*** (Linnaeus) Garcke, Cp (FL): coastal hammocks, waif on ballast; rare, native of tropical America (TX to Argentina). January-December. Northern occurrences, such as in PA (Rhoads & Klein 1993) and NJ (Kartesz 1999), represent old records of ballast waifs. [= FNA, K, WH]

Malvaviscus Fabricius 1759 (Wax-mallow)

A genus of 3-4 species, herbs, of tropical and subtropical areas. Perhaps better included in a broadly circumscribed *Hibiscus* (Pfeil & Crisp 2005). References: Turner & Mendenhall (1993)=Z; Bayer & Kubitzki in Kubitzki & Bayer (2003).

1 Leaves pubescent on the lower surface ..... ***M. drummondii***
1 Leaves glabrous or nearly so on the lower surface ..... ***M. penduliflorus***

* ***Malvaviscus drummondii*** Torrey & A. Gray, Wax-mallow, Turk's-cap Mallow. Cp (FL, GA, NC, SC): disturbed areas; rare, native of TX and n. Mexico. July-October. First reported for NC and SC by Leonard (1971b). Although Turner & Mendenhall (1993) cite Leonard's specimens as *M. arboreus* var. *arboreus*, they were correctly determined by Leonard as *M. drummondii*. Therefore the attribution of *M. arboreus* var. *arboreus* to NC by Kartesz (1999) is an error. [= S; = *M. arboreus* Dillenius ex Cavanilles var. *drummondii* (Torrey & A. Gray) Schery – K, WH, Z; **= *Hibiscus drummondii*** (Torrey & A. Gray) M.J. Young]

Malvaviscus penduliflorus DC., Turk's-cap Mallow, Mazapan. Cp (FL): disturbed areas; rare, native of tropical America. April-November. [= K, WH; = *M. arboreus* Dillenius ex Cavanilles var. *penduliflorus* (DC.) Schery; ***Hibiscus***]

Melochia Linnaeus 1753 (Chocolate-weed)

A genus of about 54 species, of tropical regions, especially America. References: Brizicky (1966)=Y; Bayer & Kubitzki in Kubitzki & Bayer (2003).

1 Petioles >1.5 cm long; pubescence of the stem and leaves sparse, of stellate, forked, and/or simple hairs; cymes terminal on primary and secondary branches ..... ***M. corchorifolia***
1 Petioles < 1 cm long; pubescence of the stem and leaves dense (tomentose), of stellate hairs; cymes in upper leaf axils ..... ***M. spicata***

* ***Melochia corchorifolia*** Linnaeus, Chocolate-weed. Cp (FL, GA, NC, SC): sandy fields, especially in low, wet places; uncommon, native of the Old World tropics. [= RAB, GW, K, S, WH, Y, Z]

*? ***Melochia spicata*** (Linnaeus) Fryxell, Bretonica-peluda. Cp (FL, GA*): disturbed areas; rare, native of tropical America, the original distribution uncertain. In GA (Kartesz 1999) and FL (Brizicky 1966). [= K, WH; = *Riedlea hirsuta* (Cavanilles) Alphonse de Candolle – S; = *Melochia villosa* (P. Miller) Fawcett & Rendle – Y]

Modiola Moench 1794 (Bristly-mallow)

A monotypic genus, an herb, of North America, Central America, and South America. References: Hill in FNA (in prep.); Bayer & Kubitzki in Kubitzki & Bayer (2003).

Modiola caroliniana (Linnaeus) G. Don, Bristly-mallow. Cp (FL, GA, NC*, SC, VA*), Pd (GA, NC*, SC*, VA*): lawns, roadsides, disturbed areas, pondshores; uncommon (rare in DE), adventive in part of its range in our area. Late March-June

(sometimes later). The original distribution unclear: sometimes considered as ranging as a native from SC south to FL, west to TX, south into the tropics, and adventive northwards, but sometimes suggested to be wholly introduced in the southeastern United States. [= RAB, C, F, G, GW, K, S, WH]

Napaea Linnaeus 1753 (Glade-mallow)

A monotypic genus, an herb, of temperate c. North America. References: Bayer & Kubitzki in Kubitzki & Bayer (2003).

Napaea dioica Linnaeus, Glade-mallow. Mt (VA): floodplains; rare. June-August. PA and IA south to sw. VA and s. IL. The original distribution of this scarce species is difficult to determine. See the interesting discussion of this species' occurrence in VA in Wieboldt et al. (1998). [= C, F, G, K]

Pavonia Cavanilles 1787

A genus of about 150 species, of tropical and subtropical areas. Perhaps better included in a broadly circumscribed *Hibiscus* (Pfeil & Crisp 2005). References: Bayer & Kubitzki in Kubitzki & Bayer (2003).

1 Leaves hastate; calyx lobes broadly ovate; carpels un-awned; [introduced species of disturbed habitats] ..... ***P. hastata***
1 Leaves ovate; calyx lobes lanceolate; carpels with 3 apical awns up to 10 mm long; [rare native] ..... ***P. spinifex***

* ***Pavonia hastata*** Cavanilles, Swampmallow. Cp (GA): mesic flatwoods, disturbed areas; rare, native of tropical America. In se. GA (Jones & Coile 1988). [= K, S, WH]

Pavonia spinifex (Linnaeus) Cavanilles, Gingerbush. Cp (FL, SC): hammocks; rare. Reported for the vicinity of Charleston, SC on the basis of a specimen collected by Bachman (Chapman 1878). Small (1933) considers this species as likely native, at least in FL. [= K, S, WH]

Sida Linnaeus 1753 (Sida)

A genus of about 100 species, shrubs and herbs, of tropical, subtropical, and warm temperate areas. References: Fryxell (1985)=Z; Fuertes, Fryxell, & Jansen (2003); Siedo (1999)=Y; Verdcourt (2004)=X; Bayer & Kubitzki in Kubitzki & Bayer (2003). Key adapted in part from Z.

1 Leaves deeply palmately lobed; plants 1-2 (-4) m tall; petals white; [section *Pseudonapaea*, to be removed from *Sida*] ..... ***S. hermaphrodita***
1 Leaves unlobed; plants 0.2-1 m tall; petals yellow.
  2 Mericarps, styles, and stigmas 5; stem with a spine subtending each leaf; leaves usually truncate to subcordate at the base; [section *Spinosae*] ..... ***S. spinosa***
  2 Mericarps, styles, and stigmas (6-) avg. 10 (-14); stem lacking spines subtending the leaves; leaves usually cuneate to rounded (cordate to subcordate in *S. cordata*) at the base.
    3 Leaves cordate to subcordate at the base; flowers clustered into a terminal panicle ..... ***S. cordata***
    3 Leaves cuneate to rounded at the base; flowers solitary in leaf axils.
      4 Leaves narrowly elliptic to linear, (3-) 4-20× as long as wide; [section *Ellipticifoliae*] ..... ***S. elliottii*** *var.* ***elliottii***
      4 Leaves elliptic-rhombic, mostly 2-3× as long as wide; [section *Sidae*].
        5 Leaves and branches borne distichously; stipules usually falcate, several-veined ..... ***S. acuta***
        5 Leaves and branches borne spirally; stipules linear, 1 (-3)-veined ..... ***S. rhombifolia*** *var.* ***rhombifolia***

Sida acuta Burman f., Broomweed. Cp (GA, SC): disturbed areas; uncommon (rare in GA and SC), native of the Tropics, the original northern limit uncertain. June-October. [= K, WH, Z; *? S. carpinifolia* Linnaeus f. – RAB, S; = *S. ulmifolia* P. Miller – WH, a barely later name]

* ***Sida cordifolia*** Linnaeus. Cp (AL, FL): disturbed sandhills, disturbed hammocks; rare, native of tropical America. [= K, S, WH, Z]

Sida elliottii Torrey & A. Gray *var.* ***elliottii***, Coastal Plain Sida. Cp (GA, NC, SC, VA), Pd (NC), Mt (GA): stream banks, sandy openings, pineland pond margins, limestone glades and barrens, mesic hammocks; uncommon (GA Special Concern). July-October. Var. *elliottii* ranges from se. VA south to n. FL, west to LA and north in the interior to c. TN and se. MO. A second variety, var. *parviflora* Chapman, occurs in Peninsular FL, se. TX, and through montane e. Mexico to Guatemala. *S. inflexa*, of se. VA and ne. NC, is alleged to differ as follows: *S. inflexa* with calyx 7-10 mm long, leaves elliptic to narrowly elliptic, 4-20 mm wide, (3-) 4-10× as long as wide (vs. *S. elliottii* var. *elliottii* with calyx 5-7 mm long; leaves narrowly lanceolate to linear, 1.5-7 mm wide, 10-20× as long as wide). [= Y; < *S. elliottii* – RAB, C, F, G, K, S, WH, Z; > *S. inflexa* Fernald – F, K, Z]

Sida hermaphrodita (Linnaeus) Rusby, Virginia Sida, Virginia-mallow. Mt (VA, WV), Pd (VA): sandy or rocky areas along riverbanks; rare. July-August. C. PA and MD west to s. OH, south to DC, WV, w. VA, and ne. TN; disjunct in nw. OH, ne. IN, and s. MI (where presumably native) and with additional collections from e. MA, NY (Long Island), and s. NJ (where probably adventive) (Spooner et al. 1985). Fryxell (1985) comments that this species is so different from the rest of the genus that "one might plausibly argue that it be elevated to generic rank." A molecular phylogenetic analysis suggests that its affinities

are not with *Sida*, but with the South American *Sidasodes* (Fuertes, Fryxell, & Jansen 2003). Spooner et al. (1985) provide a detailed review of the species. [= C, F, G, K, S, W, WV, Z]

* ***Sida rhombifolia*** Linnaeus *var.* ***rhombifolia***, Arrowleaf Sida. Cp (GA, NC, SC, VA), Pd (GA, NC, SC), Mt (GA, SC): roadsides, fields, gardens, disturbed areas; common. April-October. Verdcourt (2004) discusses variation in this taxon, and suggests that "studies throughout the entire range of the species will necessitate recognition of more than one species." He recognizes 6 varieties in e. Africa, aside from the Linnaean var. *rhombifolia* (with type in Jamaica). [= X; < *S. rhombifolia* – RAB, C, F, G, K, S, W, WH, Z]

* ***Sida spinosa*** Linnaeus, Prickly Sida, Prickly-mallow, False-mallow. Cp (GA, NC, SC, VA), Pd (DE, GA, NC, SC, VA), Mt (GA, NC, SC, VA, WV): disturbed areas, wet fields; common, (uncommon in FL, rare in DE), native of the Tropics. June-November. [= RAB, C, F, G, K, S, W, WH, WV, Z]

Tilia Linnaeus 1753 (Basswood, Whitewood, Linden, Linn)

A genus of about 25-45 species, trees, of temperate regions of North America, Europe and Asia. Hardin's (1990) treatment of American *Tilia* seems a practical and reasonable approach; it gives taxonomic status to the more distinctive (and geographically based) elements of variation, while recognizing the intergradational nature of the variation. Further investigation of this complex group is, however, warranted. References: Hardin (1990)=Z; Bayer & Kubitzki in Kubitzki & Bayer (2003). Key adapted from Hardin (1990).

Identification notes: While the varieties treated below are broadly distinctive and have definite geographic distributions across e. North America, they are imperfectly distinct in geographic areas of overlap. In our area, their identification is particularly problematic in Virginia, where individuals in many parts of the state show intergradation between the northern var. *americana* and the Southern and Central Appalachian var. *heterophylla*.

1 Lower leaf surfaces puberulent with bulbous glands, acicular trichomes, and (rarely) sparsely scattered stellate trichomes; fruiting peduncles and pedicels glabrous or sometimes puberulent; [generally northern, south to VA and w. NC]..... ***T. americana*** *var.* ***americana***

1 Lower leaf surfaces usually tomentose or becoming puberulent, with bulbous glands, acicular trichomes, and a predominance of stellate or fasciculate trichomes; fruiting peduncles and pedicels stellate-tomentulose (becoming puberulent in age); [collectively widespread in our area].

2 Lower leaf surfaces pale or whitish, densely stellate tomentose with appressed, sessile-stellate trichomes obscuring the surface (rarely becoming puberulent with age but with some stellate trichomes persisting along major veins, the margin, and/or the apex; lateral buds 5-8 mm long; pericarp 0.8-1.0 mm thick; [widespread in our area]..... ***T. americana*** *var.* ***heterophylla***

2 Lower leaf surfaces grayish or brownish, loosely but densely tomentose with fasciculate and/or stipitate-stellate trichomes, either remaining tomentose or becoming puberulent, or puberulent from emergence and green beneath; lateral buds 3-5 mm long; pericarp 0.5-0.6 mm thick; [generally southern, Coastal Plain and Piedmont of NC, SC, GA and southward and westward]..... ***T. americana*** *var.* ***caroliniana***

Tilia americana Linnaeus *var.* ***americana***, Northern Basswood. Mt (NC, VA, WV), Pd (DE, VA), Cp (DE, VA): rich coves, rocky slopes, metabasalt boulderfileds, rich north-facing river bluffs, calcareous Coastal Plain ravines; common (rare in NC, rare in DE Coastal Plain). June; August-September. NB and MB south to e. VA, w. NC, and OK. In VA, var. *americana* occurs throughout the northern half of the state, with scattered populations southward in the mountains. [= C, K, Z; = *T. americana* – RAB, G, W, WV; > *T. americana* – F; > *T. neglecta* Spach – F, S; > *T. glabra* Ventenat – S; > *T. truncata* Spach – S]

Tilia americana Linnaeus *var.* ***caroliniana*** (P. Miller) Castiglioni, Southern Basswood, Carolina Basswood. Cp (FL, GA, NC), Pd (GA, NC, SC): mesic forests, in the outer Coastal Plain usually associated with shell deposits, Indian shell middens, or underlying coquina limestone ("marl"); uncommon. June-July; July-August. NC south to c. peninsular FL and west to OK and c. TX. [= K, WH, Z; > *T. caroliniana* P. Miller – RAB, S; > *T. floridana* Small – RAB, F, S; > *T. georgiana* Sargent – S; > *T. littoralis* Sargent – S]

Tilia americana Linnaeus *var.* ***heterophylla*** (Ventenat) Loudon, Mountain Basswood, White Basswood, Linn. Mt (GA, NC, SC, VA, WV), Pd (GA, NC, SC, VA), Cp (FL, GA, NC, SC, VA): rich coves and mesic to dry slopes (the drier sites usually on limestone), often one of the most abundant trees in Southern Appalachian cove forests; common (rare in Coastal Plain). June; July-August. Centered in the Southern Appalachians: sw. PA and WV south to c. NC, wc. GA, FL Panhandle, and westward as disjunct populations to the Ozarkian Highlands of s. MO and n. AR. In VA, var. *heterophylla* dominates in sw. VA and along southern Piedmont river bluffs, with disjunct populations in calcareous ravines in the upper Coastal Plain (Surry County); it also extends less commonly into the northern VA mountains and foothills, where var. *americana* is more prevalent, but seems to be absent (or very uncommon) in the Potomac valley east of the Blue Ridge. [= C, K, WH, Z; = *T. heterophylla* Ventenat – RAB, F, W, WV; > *T. heterophylla* – G, S; > *T. monticola* Sargent – G; > *T. australis* Small - S; > *T. eburnea* Ashe – S; > *T. lasioclada* Sargent – S; > *T. michauxii* Nuttall – S; > *T. venulosa* Sargent]

Tilia ×europaea Linnaeus (pro sp.) [*Tilia cordata* × *platyphyllos*], European Linden. Mt (NC, WV): suburban woodlands; uncommonly planted, rarely naturalizing, native of Europe. [= *T.* ×*vulgaris* Hill.] {not yet keyed}

Several additional European species, *T. platyphyllos* Scopoli and *T. cordata* P. Miller, are planted as street or yard trees; they differ from the native species in having smaller leaves (usually 4-12 cm long vs. 8-25 cm long) and lacking staminodes. Planted material should be identified by using appropriate manuals of cultivated species.

Triumfetta Linnaeus 1753

A genus of about 70-150 species, trees, shrubs, and herbs, of tropical regions. References: Bayer & Kubitzki in Kubitzki & Bayer (2003).

1 Capsule hispid; lower leaf surface not velutinous ..... ***T. pentandra***
1 Capsule glabrous; lower leaf surface velutinous ..... ***T. semitriloba***

* ***Triumfetta pentandra*** A. Richard. Cp (FL): disturbed areas; rare, native of tropical America. [= K, WH]
* ***Triumfetta semitriloba*** Jacquin, Mosote, Burweed. Cp (GA): disturbed areas; rare, native of tropical America. In sw. GA (Jones & Coile 1988) and s. peninsular FL. [= K, S, WH]

Urena Linnaeus 1753 (Caesarweed)

A genus of about 6 species, of tropical and subtropical regions. Perhaps better included in a broadly circumscribed *Hibiscus* (Pfeil & Crisp 2005). References: Hill in FNA (in prep.); Bayer & Kubitzki in Kubitzki & Bayer (2003).

* ***Urena lobata*** Linnaeus, Caesarweed, Bur Mallow, Congo Jute. Cp (FL, LA, SC): roadsides and vacant lots; rare, native of se. Asia. Introduced to se. SC via landscaping plantings, spreading to vacant lots and roadsides (P. McMillan, pers. comm., 2005). [= FNA, GW, K, S, WH]

Waltheria Linnaeus 1753 (Raichie)

A genus of ca. 60 species, herbs and shrubs, pantropical. References: Saunders in FNA (in prep.); Bayer & Kubitzki in Kubitzki & Bayer (2003).

* *Waltheria indica* Linnaeus, Sleepy Morning. Cp (AL): on ballast; rare. January-December. Pantropical, native north to c. peninsular FL. [= K, WH; > *W. americana* Linnaeus – S]

252. THYMELAEACEAE A.L de Jussieu 1789 (Mezereum Family) [in MALVALES]

A family of about 45-53 genera and 500-800 species, mostly trees and shrubs, of cosmopolitan distribution, but especially diverse in Africa (Van der Bank, Fay, & Chase 2002). *Dirca, Edgeworthia*, and *Thymelaea* are all in subfamily Thymelaeoideae (Van der Bank, Fay, & Chase 2002). References: Van der Bank, Fay, & Chase (2002); Herber in Kubitzki & Bayer (2003).

1 Annual herb, annual; leaf blades < 2 cm long; fruits capsular, indehiscent ..... ***Thymelaea***
1 Perennial shrub; leaf blades> 2 cmlong; fruits drupaceous or berrylike.
  2 Stems jointed; leaves scattered; stamens exserted ..... ***Dirca***
  2 Stems not jointed; leaves clustered toward apex of stems; stamens included ..... ***Edgeworthia***

Dirca Linnaeus 1753 (Leatherwood, Leatherbark)

A genus of 4 species, shrubs, of North America (including Mexico). Our species is most closely related to *D. mexicana* Nesom & Mayfield (of the Sierra Madre Oriental, Tamaulipas, Mexico) and *D. decipiens* Floden (of e. MS, nw. AR, and sw. MO); the other species is *D. occidentalis* A. Gray of California (Schrader & Graves 2004; Floden, Mayfield, & Ferguson 2009). References: Nevling (1962)=Z; Floden, Mayfield, & Ferguson (2009)=Y.

Dirca palustris Linnaeus, Leatherwood, Leatherbark, Wicopee, Rope-bark. Pd (DE, GA, NC, SC, VA), Mt (GA, NC, VA, WV), Cp (FL, GA, VA): very rich forests, on slopes or bottomlands, limited to calcareous or mafic rocks such as limestone, calcareous siltstone, calcareous shale, gabbro, or amphibolite, in marl ravine bottoms in the Coastal Plain of VA, in Ashe County NC ascending to 1500 meters elevation; uncommon (rare in DE, FL, GA, NC, and SC, rare in VA Coastal Plain). March-April; June-July. Widespread in e. North America, from NS and s. QC, south to Panhandle FL, AL, and OK. The curiously flexible twigs and swollen nodes are distinctive. The common names refer to the extraordinary toughness of the tan-brown bark, which was used by native Americans for cordage. [= RAB, C, F, G, K, S, W, WH, WV, Y, Z]

Edgeworthia Meisner 1841 (Paperbush)

A genus of 3 species, shrubs, of e. Asia.

* *Edgeworthia papyrifera* Siebold & Zuccarini, Paperbush. Reported for Rabun County, GA by Jones & Coile (1988). [= K; = *E. chrysantha* Lindley] {not yet keyed}

Thymelaea P. Miller 1754 (Mezereon)

References: Nevling & Barringer in FNA (in prep.).

* ***Thymelaea passerina*** (Linnaeus) Lange in Willkomm & Lange, Mezereon. Disturbed areas. AL and MS. [= K]

255. CISTACEAE A.L. de Jussieu 1789 (Rockrose Family) [in MALVALES]

A family of about 8 genera and 180 species, shrubs and herbs, of warm temperate and subtropical areas, centered in Mediterranean Europe. References: Arrington & Kubitzki in Kubitzki & Bayer (2003).

1 Shrub, usually much branched from the lower stem; flowers solitary, terminal on the branches; leaves 1-3 mm long and scalelike, or 3-7 mm long and acicular; capsule cylindric, > 2× as long as wide ..... ***Hudsonia***
1 Suffrutescent herb, usually little branched from the lower stem (often much branched above, and in *Lechea* with specialized short basal shoots at ground level); flowers axillary or terminal in branching inflorescences; leaves 4-50 mm long, mostly linear, lanceolate, oblong, or elliptic; capsule globose, subglobose, ellipsoid, ovoid, or obovoid, < 2× as long as wide.
  2 Flowers of 2 types, the chasmogamous with 5 showy yellow petals, the cleistogamous lacking petals; pubescence of the stem stellate; leaves 10-50 mm long, alternate; plants with shoots of one type only, not producing short basal shoots; capsules 1.3-12.5 mm long, the larger capsules of chasmogamous flowers at least 2.0 mm long ..... ***Crocanthemum***
  2 Flowers of 1 type, with 3 inconspicuous, dark red petals; pubescence of the stem simple; leaves 4-15 mm long (to 30 mm long in *L. pulchella* and *L. mucronata*), linear to linear-elliptic, 0.5-4 mm wide (to 13 mm wide in *L. mucronata*), alternate, opposite, or whorled; plants with shoots of two types, the short, prostrate to ascending basal shoots produced late in the season and overwintering; capsules 0.9-1.7 mm long ..... ***Lechea***

Crocanthemum Spach 1836 (Frostweed, Rockrose)

A genus of about 24 species, of eastern North America, California, Mexico, and s. South America. The eastern North American species previously attributed to *Helianthemum* are in a clade distinct from the Old World *Helianthemum*, and should be recognized as *Crocanthemum*. References: Daoud & Wilbur (1965)=Z; Wilbur & Daoud (1964)=Y; Arrington & Kubitzki in Kubitzki & Bayer (2003).

Identification notes: The identification of most of our species of *Crocanthemum* requires an understanding of the 2 types of flowers produced. Chasmogamous flowers have showy yellow petals and larger sepals, the distinct portion of the 2 linear outer sepals usually linear, (0.7-) 1.3-5.5 mm long, the distinct portion of the 3 broader inner sepals 2.5-12 (-14) mm long. Cleistogamous flowers lack petals and have smaller sepals, the distinct portion of the 2 linear outer sepals 0.2-3 mm long, the distinct portion of the 3 broader inner sepals 1.5-4.8 mm long. In some species (*C. canadense*, *C. bicknellii*, *C. propinquum*) the chasmogamous flowers open earlier (April-July) than the cleistogamous (June-September). In others (*C. corymbosum*, *C. georgianum*, *C. nashii, C. rosmarinifolium*), the two types of flowers open at the same time (March-June) or cleistogamous flowers are nearly always absent (*C. carolinianum*). Capsules from chasmogamous flowers are larger and contain more seeds than those from cleistogamous flowers.

1 Leaves 1-4 (-7) mm wide, (5-) 7-15× as long as wide; capsules from chasmogamous flowers 2-3 mm long, with 1-3 (-6) seeds; capsules from cleistogamous flowers 1.3-1.7 mm long, with 1 (-2) seeds ..... ***C. rosmarinifolium***
1 Leaves 2-20 mm wide, 2-6 (-8)× as long as wide; capsules from chasmogamous flowers (2.4-) 3-9 (-10.5) mm long, with 6-92 (-135) seeds; capsules from cleistogamous flowers 1.5-4.2 mm long, with 1-20 seeds.
  2 Leaves basally disposed, the largest and most prominent leaves in a basal rosette; stem leaves 2-5 below those subtending flowers or fruits; stem with spreading trichomes to 2.5 mm long; lower surface of leaves sparsely pubescent, the surface readily visible; cleistogamous flowers usually never produced; capsules 6-9 (-10.5) mm long, with 80-92 (-135) papillate seeds ..... ***C. carolinianum***
  2 Leaves predominantly cauline (in some species a rosette of closely spaced smaller and caducous leaves present at the ground's surface); stem leaves 5-20 below those subtending flowers or fruits; stem glabrate to densely puberulent (the pubescence not long and spreading); lower surface of leaves densely pubescent, hiding the surface; cleistogamous flowers regularly produced, either intermixed with the chasmogamous or in separate inflorescences; capsules 1.3-7 (-8.5) mm long, with 1-46 papillate, reticulate, or smooth seeds (pebbled to somewhat papillate in *H. nashii*).
    3 Ovary and capsule densely stellate pubescent
      4 Inflorescence a terminal umbellate cluster; fruit 2-valved ..... ***C. arenicola***
      4 Inflorescence a thyrse, the flowers borne in clusters the axils of leaves; fruit 3-valved ..... ***C. nashii***
    3 Ovary and capsule glabrous.
      5 Chasmogamous flowers usually solitary, terminal or subterminal, later overtopped by lateral branches; seeds papillate, 35-46 per chasmogamous capsule, 5-9 (-12) per cleistogamous capsule; chasmogamous capsules (4-) 6-7 (-8.5) mm long, cleistogamous capsules (2-) 2.3-3.0 (-3.8) mm long; upper surface of cauline leaves with some long simple trichomes mixed with the shorter stellate trichomes ..... ***C. canadense***

5 Chasmogamous flowers usually (1-) 2-18, rarely overtopped by lateral branches (often 1-3 in cymes in *H. georgianum*); seeds smooth or reticulate, 12-35 per chasmogamous capsule, 1-20 per cleistogamous capsule; chasmogamous capsules (2.4-) 3.5-5.7 mm long, cleistogamous capsules 1.5-4.2 mm long; upper surface of cauline leaves with the shorter stellate trichomes only.
6 Chasmogamous and cleistogamous flowers borne together, the two types of flowers open at the same time (March-June); seeds smooth, 15-35 per chasmogamous capsule, 4-20 per cleistogamous capsule; outer sepals of the cleistogamous flowers 1.4-3.0 mm long; inner sepals of the cleistogamous flowers 2.0-4.8 mm long; [of the outer Coastal Plain (primarily barrier islands) of NC and SC].
7 Flowers borne in dense many-flowered flat-topped cymes terminating the stem and sometimes also the main branches; capsules of the cleistogamous flowers 1.6-3.8 mm long, with 4-8 (-10) seeds; pedicels and calyx with 0.5-1.5 mm long simple trichomes mixed with the shorter stellate trichomes; outer sepals of both chasmogamous and cleistogamous flowers with an expanded, obtuse, spatulate tip, 0.3-1.2 mm wide ..... ***C. corymbosum***
7 Flowers borne in loose 1-7-flowered cymes or racemes at the ends of the main branches; capsules of the cleistogamous flowers 3.0-4.2 mm long, with 12-20 seeds; pedicels and calyx with short stellate pubescence only; outer sepals of both chasmogamous and cleistogamous flowers linear, 0.2-0.5 mm wide ..... ***C. georgianum***
6 Chasmogamous and cleistogamous flowers borne in separate inflorescences, the chasmogamous flowers opening earlier (April-July) than the cleistogamous flowers (June-September); seeds reticulate, 12-26 per chasmogamous capsule, 1-2 (-3) per cleistogamous capsule; outer sepals of the cleistogamous flowers 0.2-1.2 (-1.8) mm long; inner sepals of the cleistogamous flowers 1.7-2.5 (-3.0) mm long; [of the Mountains and less commonly the Piedmont of NC and VA, and very rarely the Coastal Plain of VA].
8 Stems mostly 20-50 cm tall, clustered, arising from an upright caudex; distinct portion of the outer sepals of the cleistogamous flowers linear, (0.3-) 0.6-1.2 (-1.8) mm long, about 3-5× as long as wide; distinct portion of calyx of the chasmogamous flowers (2.4-) 3.5-4.5 (-8) mm long; cleistogamous capsules sharply 3-angled in cross-section; leaf with broadly cuneate base ..... ***C. bicknellii***
8 Stems mostly 10-30 cm tall, scattered, arising from horizontal elongate rootstocks; distinct portion of the outer sepals of the cleistogamous flowers rudimentary, knob-like, 0.2-0.5 mm long, 1-2× as long as wide; distinct portion of calyx of the chasmogamous flowers (0.7-) 1.5-3.0 (-4.0) mm long; cleistogamous capsules somewhat rounded in cross-section; leaf with narrowly cuneate to attenuate base ..... ***C. propinquum***

Crocanthemum arenicola (Chapman) Barnhart, Gulf Coast Frostweed. Cp (FL): sandhills, dunes, scrub; rare. Panhandle FL west to s. MS. [= S; = *Helianthemum arenicola* Chapman – K, WH, Y, Z]

Crocanthemum bicknellii (Fernald) Barnhart, Hoary Frostweed, Plains Frostweed, Plains Sunrose, Bicknell's Hoary Rockrose. Mt (GA, NC, VA, WV), Pd (DE, NC, VA): woodlands, glades, barrens, rock outcrops, and grassy balds, to at least 1500m in elevation; rare. June-July (chasm.), July-September (cleist.); August-October. ME and s. ON west to MN and s. MB, south to ne. GA, e. TN, AR, KS, and CO. [= S; = *Helianthemum bicknellii* Fernald – RAB, C, F, G, K, W, Y, Z; *Halimium*]

Crocanthemum canadense (Linnaeus) Britton, Canada Frostweed, Canada Sunrose. Cp (GA, NC, SC, VA), Pd (NC, SC, VA), Mt (GA, NC, VA, WV): fields, woodlands, forest edges, roadsides, disturbed areas; common (uncommon in VA Mountains, uncommon in VA Piedmont, uncommon in DE Coastal Plain, rare in GA and WV, rare in DE Piedmont). April-May (chasm.), May-August (cleist.); June-October. NS and ME west to MI and MN, south to e. GA, e. AL, e. TN, KY, and MO. [= S; = *Helianthemum canadense* (Linnaeus) Michaux – RAB, C, F, G, K, W, WV, Y, Z; > *Helianthemum canadense* var. *canadense* – F; > *Helianthemum canadense* var. *sabulonum* Fernald – F; = *Halimium canadense* (Linnaeus) Grosser]

Crocanthemum carolinianum (Walter) Spach, Carolina Sunrose. Cp (FL, GA, NC, SC): fields, savannas, dry pine flatwoods; common (uncommon in GA and SC, rare in NC). April-May; July-August. E. NC south to s. FL, west to AR and e. TX. [= S; = *Helianthemum carolinianum* (Walter) Michaux – RAB, K, WH, Y, Z; = *Halimium carolinianum* (Walter) Grosser]

Crocanthemum corymbosum (Michaux) Britton, Pinebarren Sunrose. Cp (FL, GA, NC, SC): openings in maritime forests; uncommon (rare in NC). April-May; July-October. E. NC south to s. FL, east to s. MS. [= S; = *Helianthemum corymbosum* Michaux – RAB, K, WH, Y, Z; = *Halimium corymbosum* (Michaux) Grosser]

Crocanthemum georgianum (Chapman) Barnhart, Georgia Sunrose, Georgia Frostweed. Cp (FL, GA, NC, SC): openings in maritime forests, sandy disturbed areas; uncommon (rare in GA, NC, and SC). April-May; May-October. E. NC south to n. FL, west to c. TX and AR. [= S; = *Helianthemum georgianum* Chapman – RAB, K, WH, Y, Z; = *Halimium georgianum* (Chapman) Grosser]

Crocanthemum nashii (Britton) Barnhart, Florida Scrub Sunrose, Nash's Sunrose. Cp (NC): xeric sandhills; rare. Endemic to peninsular FL; disjunct in se. NC (New Hanover County). May-June; July-September. [= S; = *Helianthemum nashii* Britton – K, WH, Y, Z; *Halimium nashii* (Britton) Grosser]

Crocanthemum propinquum (Bicknell) Bicknell, Low Frostweed, Creeping Sunrose. Mt (NC, VA, WV), Pd (NC, VA), Cp (DE, VA): woodlands, rock outcrops, sandy barrens and fields (in VA); uncommon (rare in NC, VA, and WV). June-July (chasm.), July-September (cleist.); August-October. Se. MA and se. NH south to w. NC and e. and c. TN. [= *Helianthemum propinquum* Bicknell – RAB, C, F, G, K, W, Y, Z; *Halimium*]

Crocanthemum rosmarinifolium (Pursh) Barnhart, Rosemary Sunrose. Cp (FL, GA, NC, SC): sandy roadsides, fields; common (uncommon in FL, rare in NC). May-June; July-October. S. NC south to Panhandle FL, west to c. TX; also disjunct in the West Indies. [= S; = *Helianthemum rosmarinifolium* Pursh – RAB, K, WH, Y, Z; = *Halimium rosmarinifolium*]

Hudsonia Linnaeus 1767 (Sand-heather, Golden-heather, Beach-heather)

A genus of 3 species, dwarf shrubs, of ne. North America. Molecular systematics suggests that *H. tomentosa* may warrant generic status separate from *H. ericoides* and *H. montana*. References: Morse (1979)=Z; Skog & Nickerson (1972)=Y; Arrington & Kubitzki in Kubitzki & Bayer (2003). Key based in part on Morse (1979).

1 Pedicels 0-1 (-3) mm long; leaves 1-3 mm long, ovate, densely tomentose, appressed to the stem and overlapping; stamens 8-20; [of the outer Coastal Plain of VA and ne. NC northward] ..... ***H. tomentosa***
1 Pedicels 4-10 mm long; leaves 3-7 mm long, subulate, slightly pubescent, spreading; stamens 10-30; [collectively of the Mountains of NC and inner Coastal Plain of SC].
2 Sepals obtuse to acute, lacking long-acuminate apices; stamens 10-20; leaves 3-4.5 (-6) mm long, sparsely villous; fruits cylindric; [of the inner Coastal Plain of SC (in our area)] ..... ***H. ericoides***
2 Sepals acuminate, with attenuate apices 1-2 mm long; stamens 20-30; leaves 5-7 mm long, glabrate to sparsely villous; fruits urceolate to campanulate; [of the Mountains of NC] ..... ***H. montana***

Hudsonia ericoides Linnaeus, Northern Golden-heather. Cp (DE, SC): sandy flats in longleaf pine sandhills (SC) or Coastal Plain pitch pine barrens (DE); rare. May; August. NL (Newfoundland) south to ME, NH, MD (Sipple 2002), and DE; disjunct in nc. SC. The disjunct occurrence in SC has every appearance of being native; it is discussed by Bozeman & Logue (1968). [= RAB, C, F, G, K, S, Z; = *H. ericoides* Linnaeus ssp. *ericoides* – Y]

Hudsonia montana Nuttall, Mountain Golden-heather. Mt (NC): shallow sandy soils on ledges of quartzite or other felsic rocks in the Blue Ridge Escarpment, at various sites along the eastern side of Linville Gorge, Burke County, NC, and disjunct further south in McDowell County, NC; rare. June-early July; mid-July-September. This species is endemic to w. NC; it is almost certainly a southern sibling of the more northern *H. ericoides*. As well as being a very narrowly distributed endemic, *H. montana* is endangered by fire suppression in its habitat. [= RAB, K, S, W, Z; = *H. ericoides* Linnaeus ssp. *montana* (Nuttall) Nickerson & J. Skog – Y]

Hudsonia tomentosa Nuttall, Woolly Beach-heather. Cp (DE, NC, VA), Mt (WV): dunes, sand flats, blowouts (in DE, NC, VA), high elevation quartzitic sandstone outcrops (in WV); common (rare in NC and WV). May-July; August-September. NL (Labrador) west to MB and NT, south to WV (Panther Knob), WI, and MN, and south along the Atlantic Coast from ME to VA and ne. NC (where it reaches its southern limit in Dare County). [= RAB, C, F, G, S, WV, Z; > *H. tomentosa* var. *tomentosa* – K; = *H. ericoides* Linnaeus ssp. *tomentosa* (Nuttall) Nickerson & J. Skog – Y]

Lechea Linnaeus 1753 (Pinweed)
(contributed by Bruce A. Sorrie)

A genus of about 18 species, herbs, of North America, the West Indies, and Central America. References: Hodgdon (1938)=Z; Wilbur & Daoud (1961)=Y; Sorrie & Weakley (2007b, c); Arrington & Kubitzki in Kubitzki & Bayer (2003).

Identification notes: *Lechea* is recognizable by its production of numerous basal shoots (usually prostrate) in the late summer and fall. These are evergreen and overwinter, and the fertile stems (usually erect or ascending) are produced from renewed growth of the basal shoots in the spring and summer.

1 Pubescence of the stems strongly spreading, not at all appressed; inner sepals carinate (U- or V-shaped in cross-section); plant tall, often > 5 dm tall ..... ***L. mucronata***
1 Pubescence of the stems more or less appressed, usually strongly so; inner sepals shallowly curved in cross section, not carinate; plants variable in height.
2 Outer (slender) sepals equaling or exceeding the inner (broad) sepals.
3 Base of the fruiting calyx clearly differentiated into a hardened, shiny, yellowish, obconic base 0.4-0.6 mm long, contrasting in color and texture with the rest of the calyx; pedicels averaging > 2 mm long ..... ***L. racemulosa***
3 Base of the fruiting calyx not conspicuously differentiated in texture and color; pedicels averaging < 1.5 (-2) mm long.
4 Capsule completely enclosed by the sepals, subglobose; leaves averaging > 10× as long as wide; plant short and usually densely bushy, < 3 dm tall ..... ***L. tenuifolia***
4 Capsule exserted, usually conspicuously so, the sepals not enclosing the summit of the fruit, ellipsoid to ovate; leaves < 8× (usually < 6×) as long as wide; plant usually taller, 1-7 dm tall.
5 Outer sepals distinctly longer than the inner sepals, usually also longer than the capsule; stem leaves usually whorled, 2 mm wide; plant erect, with short, ascending branches ..... ***L. minor***
5 Outer sepals shorter than to barely longer than the inner sepals, shorter than the capsule; stem leaves alternate, rarely wider than 1.5 mm wide; plant ascending (sometimes erect or spreading, branches spreading ..... ***L. sessiliflora***
2 Outer (slender) sepals shorter than the inner (broad) sepals.
6 Capsules ellipsoid to narrowly pyriform, normally about 2× as long as wide (or even longer in *L. racemulosa*).
7 Stigmas not persistent; pedicels averaging about 2 mm long; base of the fruiting calyx clearly differentiated into a hardened, shiny, yellowish, obconic base 0.4-0.6 mm long, contrasting in color and texture with the rest of the calyx ..... ***L. racemulosa***
7 Stigmas persistent, reddish-brown, conspicuous on the summit of the capsule; base of the fruiting calyx not conspicuously differentiated in texture and color ..... ***L. sessiliflora***
6 Capsules of a broader shape, ovoid, broadly ellipsoid, or subglobose, normally < 1.5× as long as wide.
8 Capsules obviously longer than the sepals.
9 Seeds 3 (-4), relatively narrow and 3-sided, like the sections of an orange; fruiting stems 2.5-5.5 dm tall; panicle ovoid to subcylindric, the principal branches subequal and relatively short; capsulesclustered at branch tips, or in a dense row ..... ***L. pulchella*** *var.* ***pulchella***
9 Seeds 2 (-3), broad and compressed, or obscurely 3-sided; fruiting stems 3.5-8.5 dm tall; panicle subcylindric to subglobose, the principal branches diminishing upward, relatively long; capsules in a sparse row (rarely more dense) ..... ***L. pulchella*** *var.* ***ramosissima***
8 Capsules almost completely enveloped by the sepals.
10 Leaves sparsely pubescent on the midrib and margin only beneath; branches and stems sparsely subappressed-pilose; seeds 4-6 .....

..... ***L. intermedia*** *var.* ***intermedia***

10 Leaves appressed pubescent on the surface beneath; branches and stems moderately to densely gray-canescent; seeds 2-3.
11 Leaves 1.5-3.0 (-4.0) mm wide; seeds 2-4 (-5); [of coastal dunes, from ne. NC northwards].
12 Seeds 3-4 (-5), obscurely 3-sided and more-or-less resembling sections of an orange, or 2-sided and convex ventrally; main stems 1.0-2.5 mm diameter, strongly ascending-erect to subprocumbent; sepals strongly tinged maroon, occasionally dull brown; [s. ME and c. NH south to DE] ..... ***L. maritima*** *var.* ***maritima***
12 Seeds 2 (-3), 2-sided and flattish, concave ventrally; main stems 2.0-4.0 mm diameter, procumbent to ascending; sepals dull brown, occasionally tinged maroon; [se. DE south to ne. NC] ..... ***L. maritima*** *var.* ***virginica***
11 Leaves 0.5-1.0 mm wide; seeds **either** 3 **or** 4-6; [of sandhills and flatwoods, of se. NC southwards].
13 Seeds 3; fruiting stems 2-4 dm tall; panicles densely congested; mature calyx lobes strongly rusty-colored; [of se. NC south to s. FL and west to s. MS] ..... ***L. torreyi*** *var.* ***congesta***
13 Seeds 4-6; fruiting stems 3-5 dm tall; panicles open and loose; mature calyx dark brown; [of ne. FL and Panhandle FL south to s. FL] ..... ***L. torreyi*** *var.* ***torreyi***

Lechea intermedia Leggett ex Britton *var.* ***intermedia***, Pinweed. Mt (VA), Pd (VA): dry areas; rare. July-August; August-October. *L. intermedia* ranges from NB west to ON, MN, and SK, south to VA, n. OH, n. IL, and nw. NE. Only var. *intermedia* ranges south of New England; 3 other varieties occur in New England and Canada. [= F, K; < *L. intermedia* – C, G, W; = *L. intermedia* var. *typica* – Z]

Lechea maritima Leggett ex Britton, Sterns, & Poggenburg *var.* ***maritima***. Cp (DE): coastal dunes; common. S. ME and c. NH south to DE, and disjunct in n. NB (reports of this species south to GA are apparently based on misidentifications). [= C, F, G, K, Z]

Lechea maritima Leggett ex Britton, Sterns, & Poggenburg *var.* ***virginica*** Hodgdon. Cp (DE, NC, VA): sandy dunes, flats, and blowouts, often associated with *Hudsonia tomentosa*; rare. June-August; August-September. var. *virginica* is endemic from se. DE, e. MD, e. VA, and ne. NC. [= C, F, G, K, Z; < *L. maritima* – S]

Lechea minor Linnaeus, Thymeleaf Pinweed. Cp (DE, FL, GA, NC, SC, VA), Pd (DE, GA, NC, SC, VA), Mt (WV): savannas, sandhills, pine-oak woodlands, sandy disturbed places; common (rare in VA Piedmont, rare in WV Mountains). July-August; August-October. MA and VT west to s. ON and n. IN, south to c. peninsular FL and LA (primarily Coastal Plain and around the Great Lakes). [= RAB, C, F, G, K, S, W, WH, Y, Z; ? *L. thymifolia* Michaux]

Lechea mucronata Rafinesque. Pd (GA, NC, SC, VA), Mt (GA, NC, SC, WV), Cp (DE, VA): open dry habitats, sandhills, dunes, dry hammocks, woodlands; common (uncommon in VA Coastal Plain, rare in Piedmont and Mountains, rare in DE Coastal Plain). June-August; July-October. NH west to MI and OK, south to c. peninsular FL, TX, and n. Mexico. [= C, K, W, WH; = *L. villosa* Elliott – RAB, F, G, S, Y; > *L. villosa* var. *typica* – Z]

Lechea pulchella Rafinesque *var.* ***pulchella***. Mt (VA, WV), Pd (DE, VA), Cp (DE): dry woodlands, disturbed places; common (uncommon in VA). June-August; August-October. Var. *pulchella* ranges from e. MA west to ne. OH, south to c. VA. [< *L. leggettii* Britton & Hollick – RAB, C; = *L. leggettii* var. *leggettii* – F, G, Y; < *L. pulchella* var. *pulchella* – K; < *L. pulchella* – W; = *L. leggettii* var. *typica* – Z]

Lechea pulchella Rafinesque *var.* ***ramosissima*** (Hodgdon) Sorrie & Weakley. Cp (FL, GA, NC, SC, VA): pine-oak woodlands, savannas, flatwoods, sandhills, openings in maritime forests, sometimes in wet, almost peaty soils; common. June-August; August-October. Se. VA south to n. FL and west to e. LA; disjunct in sc. TN (Coffee County). [< *L. leggettii* Britton & Hollick – RAB, C, G, S; = *L. leggettii* Britton & Hollick var. *ramosissima* Hodgdon – F, G, Y, Z; < *L. pulchella* var. *pulchella* – K; < *L. pulchella* – WH]

Lechea racemulosa Michaux. Mt (GA, NC, SC, VA, WV), Pd (GA, NC, SC, VA), Cp (DE, NC, SC, VA): dry pine woodlands, other woodlands, forest edges, old fields; common. June-Augsut; July-October. Se. NY west to s. OH and s. IL, south to se. VA, NC, c. GA, and AL, with a few disjunct occurrences west to MO; the range is centered on the Appalachian Mountains. [= RAB, C, F, G, K, S, W, WV, Y, Z]

Lechea sessiliflora Rafinesque. Cp (FL, GA, NC, SC): sandhills and dry flatwoods; common. July-August; August-October. A Southeastern Coastal Plain endemic: s. NC south to s. FL and west to s. MS. [= K, WH; = *L. patula* Leggett – RAB, Y, Z; > *L. patula* – S]

Lechea tenuifolia Michaux. Pd (GA, NC, SC, VA), Cp (GA, NC, SC, VA), Mt (WV): dry oak-pine forests and openings; common (rare in WV Mountains). June-August; August-October. S. ME south to SC (mostly inner Coastal Plain and Piedmont), and from s. IN n. IL, s. MN, and NE south to e. LA and c. TX. [= RAB, K, S, W, WV, Y; > *L. tenuifolia* var. *tenuifolia* – C, F, G; > *L. tenuifolia* var. *typica* – Z]

Lechea torreyi Leggett ex Britton *var.* ***congesta*** Hodgdon. Cp (FL, GA, NC, SC): sandhills and pine flatwoods; rare. June-July; August-October. As interpreted by Hodgdon, *L. torreyi* consists of 2 varieties, the more widespread var. *congesta* ranging from se. NC south to s. FL and west to s. MS (disjunct in Belize), and the more restricted var. *torreyi* restricted to FL. Wilbur & Daoud (1961) express doubt about the validity of the 2 varieties, but present little evidence for or against their recognition. Var. *congesta* may indeed prove to be no more than a form. [= Z; < *L. torreyi* – RAB, K, S, WH, Y]

Lechea torreyi Leggett ex Britton *var.* ***torreyi***. Cp (FL): sandhills and pine flatwoods; rare. June-July; August-October. Ne. FL and Panhandle FL south to s. peninsular FL. [= Z; < *L. torreyi* – K, S, WH, Y]

Lechea deckertii Small, Deckert's Pinweed. Cp (FL, GA): xeric sands of scrub; rare (GA Special Concern). Sc. GA (Jones & Coile 1988) south to s. FL and e. Panhandle FL. [= K, S, WH, Y, Z] {not yet keyed}

Lechea pulchella Rafinesque var. *moniliformis* (Bicknell) Seymour. Coastal Plain from Nantucket Island, MA south to s. NJ, and disjunct along the Great Lakes (a common phytogeographic pattern, lending credence to the validity of the variety). [= K; < *L. leggettii* Britton & Hollick – C; = *L. leggettii* var. *moniliformis* (Bicknell) Hodgdon – F, G, Y, Z] {not yet keyed}

258. TROPAEOLACEAE A.L de Jussieu ex A.P. de Candolle 1824 (Nasturtium Family) [in BRASSICALES]

A family of 1-3 genera and about 90 species, herbs, of Central and South America. References: Tucker in FNA (2010); Sparre & Andersson (1991)=Z; Bayer & Appel in Kubitzki & Bayer (2003).

Tropaeolum Linnaeus 1753 (Nasturtium)

A genus of about 85-90 species, herbs, of tropical Central America and South America (s. Mexico to Peru). References: Tucker in FNA (2010); Sparre & Andersson (1991)=Z.

* *Tropaeolum majus* Linnaeus, Nasturtium, is cultivated and rarely persistent or present around refuse areas, as in se. PA (Rhoads & Klein 1993). *T. majus* is considered by Sparre & Andersson (1991) to be a taxon of hybrid origin, not known from wild populations. It is probably not truly established in our area. [= FNA, K, Z] {not mapped; not keyed; rejected as a component of our flora}

261. LIMNANTHACEAE R. Brown 1838 (False-mermaid Family, Meadow-foam Family) [in BRASSICALES]

A family of 2 genera and 8 species, herbs, of temperate North America. References: Tucker in FNA (2010); Bayer & Appel in Kubitzki & Bayer (2003).

Floerkea Willdenow 1801 (False-mermaid)

A peculiar and monotypic genus, an annual herb, endemic to North America. References: Tucker in FNA (2010).

Floerkea proserpinacoides Willdenow, False-mermaid. Moist, rich floodplain forests. April-June. NS and QC west to BC, south to n. VA, TN, and CA. [= C, F, FNA, G, K, S, W, WV]

264. BATACEAE von Martius ex Meisner 1842 (Batis Family) [in BRASSICALES]

A monogeneric family, of 2 species, low shrubs, of tropical and subtropical shores of the Americas, New Guinea, the Pacific, and Australia. References: Thorne in FNA (2010); Rogers (1982b); Bayer & Appel in Kubitzki & Bayer (2003).

Batis P. Browne 1756 (Saltwort, Beachwort, Batis)

A genus of 2 species, low shrubs, of tropical and subtropical shores of the Americas, New Guinea, the Pacific, and Australia. The only other member of the family and genus is *B. argillicola*, of New Guinea and Australia. References: Thorne in FNA (2010); Rogers (1982b)=Z; Goldblatt (1976); Bayer & Appel in Kubitzki & Bayer (2003).

Batis maritima Linnaeus, Saltwort, Beachwort, Batis, Turtleweed, Vidrillos. Brackish marshes. June-July; October. Se. SC south to s. FL, west to TX, and in Central and South America; West Indies; HI (where apparently introduced). *B. maritima* is alleged (as by FNA and S) to occur as far north as NC, but the documentation is unknown; there is no twentieth century evidence to place *Batis* in NC. [= RAB, FNA, GW, K, S, WH, Z]

270. RESEDACEAE A.P. de Candolle ex Gray 1821 (Mignonette Family) [in BRASSICALES]

A family of about 6 genera and 75-85 species, herbs and shrubs, of the northern hemisphere. References: Martín-Bravo, Tucker, & Daniel in FNA (2010); Kubitzki in Kubitzki & Bayer (2003).

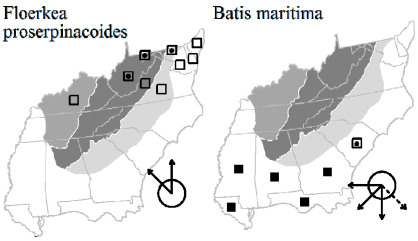
Reseda Linnaeus 1754 (Mignonette)

A genus of about 55-60 species, herbs, of Europe, Mediterranean region, and c. Asia. References: Martín-Bravo, Tucker, & Daniel in FNA (2010).

1 Upper and middle leaves deeply pinnately lobed.
  2 Carpels 4; petals white; seeds tuberculate ..... ***R. alba***
  2 Carpels 3; petals yellowish; seeds smooth ..... ***R. lutea***
1 Upper and middle leaves entire or finely toothed (sometimes with 1-2 lateral lobes).

3 Sepals and petals 4; seeds smooth; fruits < 7 mm long, crowded, erect to ascending..... ***R. luteola***
3 Sepals and petals 6; seeds rugose; fruits > 7 mm long, well-spaced, pendent.
4 Capsules 7-11 mm long; sepals (in fruit) < 5mm long ..... ***R. odorata***
4 Capsules (well-developed) 11-15 mm long; sepals (in fruit > 5 mm long) ..... ***[R. phyteuma]***

* ***Reseda alba*** Linnaeus, White Mignonette. Pd (DE): disturbed areas, rare, native of the Mediterranean region. Naturalized in ne. North America, south to DE and se. PA (Rhoads & Klein 1993). [= C, F, FNA, G, K]
* ***Reseda luteola*** Linnaeus, Weld, Dyer's Rocket, Yellow-weed. Formerly cultivated as a dye plant; native of Eurasia. Reported from se. and sc. PA (Rhoads & Klein 1993) and elsewhere mainly north of our area. [= C, F, FNA, G, K]
* ***Reseda lutea*** Linnaeus, Yellow Mignonette, Wild Mignonette. Mt (WV): disturbed areas; rare, native of Europe. South to DE, se. PA, and sc PA (Rhoads & Klein 1993). [= C, F, FNA, G, K, WV]
* ***Reseda odorata*** Linnaeus, Garden Mignonette. Cp (SC), Pd (NC): gardens, garden borders, and disturbed areas; rare, doubtfully established, native of Mediterranean Europe. Reported for scattered locations in eastern North America (Kartesz 1999). [= C, FNA, G, K]
* ***Reseda phyteuma*** Linnaeus, Corn Mignonette. Disturbed areas; native of Europe. Reported from se. PA (Rhoads & Klein 1993). [= K] {no definite report for our area; not mapped; rejected as a component of our flora}



272. CLEOMACEAE Horaninow 1834 (Cleome Family) [in BRASSICALES]

The Cleomaceae is here circumscribed to include the members of the Capparaceae, subfamily Cleomoideae, following phylogenetic analyses which show this group to be a monophyletic clade more closely related to Brassicaceae than to the rest of Capparidaceae (Hall, Sytsma, & Iltis 2002). References: Rucker & Vanderpool in FNA (2010); Hall, Sytsma, & Iltis (2002); Judd, Sanders, & Donoghue (1994); Sanders & Judd (2000). Key based on FNA.

1 Stamens (8-) 10-27; petals notched or irregularly lacerate at the apex; gynophore (stipe of the pistil, above the calyx) 2-6 mm long; leaflets (1-) 3 ..... ***Polanisia***
1 Stamens 6 (except 14-25 in *Arivela*); petals obtuse or acute at the apex; gynophore (stipe of the pistil, above the calyx) 1-80 mm long; leaflets 5-7.
2 Plants with nodal spines (and sometimes with prickles on petioles and leaf veins).
3 Petals 5-10 mm long; gynophore 1-4 mm long; petioles and leaf blades unarmed ..... ***[Hemiscola]***
3 Petals 10-30 mm; gynophore 45-80 mm; petioles and sometimes leaf blades prickly ..... ***Tarenaya***
2 Plants lacking nodal spines and lacking prickles on petioles and leaf veins.
4 Filaments fused to lower half of gynophore (evident from scars near the midpoint of the gynophore of fruiting specimens) ..... ***Gynandropsis***
4 Filaments free from gynophore
5 Bracts subtending the pedicels minute ..... ***Cleoserrata***
5 Bracts subtending the pedicels with expanded blades, sometimes even trifoliolate.
6 Style 0.2-0.8 mm long; gynophore 3-12 mm; stamens 6; sepals fused ¼-½ their length ..... ***Cleome***
6 Style 1-1.2 mm long; gynophore obsolete; stamens 14-25; sepals free ..... ***Arivela***

Arivela Rafinesque 1838

A genus of about 10 species, annual herbs, of Asia and Africa. References: Tucker in FNA (2010).

* ***Arivela viscosa*** (Linnaeus) Rafinesque, Wild Caia, Yellow Cleome. Cp (GA, SC, VA?): disturbed areas; rare, introduced, native of Asia (now pantropical). Reported for sc. GA (Carter, Baker, & Morris 2009; Jones & Coile 1988), se. PA (Rhoads & Klein 1993), and recently from Beaufort County, SC (J. Nelson, pers.comm. 2006). Reported from chrome ore piles in Newport News (Reed 1959); presumably a waif. [= FNA; = *Cleome viscosa* Linnaeus – K] {synonymy incomplete}

Cleome Linnaeus 1753 (Cleome, Spiderflower)

A genus of about 20 species, annual herbs, of the Old World. References: Tucker in FNA (2010); Iltis (1960)=Z; Kers in Kubitzki & Bayer (2003). [also see *Arivela*, *Cleoserrata*, *Gynandropsis*, *Hemiscola*, and *Tarenaya*]

1 Fruits (12-)15-25 mm long; bracts unifoliate; leaflets linear to elliptic .....***[C. ornithopodioides]***
1 Fruits 40-70 mm long; bracts trifoliate; leaflets oblanceolate to rhomboid-elliptic..... ***C. rutidosperma***

* ***Cleome rutidosperma*** DC. Cp (FL, SC?): disturbed areas; rare, native of tropical Asia and Africa. Reported for SC by FNA. [= FNA, WH] {add to synonymy}

* *Cleome ornithopodioides* Linnaeus, Bird Spiderflower. Reported for KY, MD, PA, OH. [= FNA; > *C. iberica* de Candolle] {add to synonymy}

Cleoserrata H.H. Iltis 2007

A genus of 5 species, annual herbs, of tropical America. References: Tucker in FNA (2010).

1 Petals white, tinged with pink or red; bracts at most 1 mm long, subulate; gynophore 1-2 mm long.....***C. serrata***
1 Petals brilliant pink to purple, fading to pink or white (rarely initially white); bracts 3-18 mm long, ovate-cordate; gynophore 30-85 mm long .....***C. speciosa***

* ***Cleoserrata serrata*** (Jacquin) H.H. Iltis. {GA}; disturbed areas; rare, native of tropical America Reported as introduced in GA (Kartesz 1999). [= FNA; = *Cleome serrata* Jacquin – K; = *Neocleome serrata* (Jacquin) Small – S] {not yet keyed; synonymy incomplete}
* ***Cleoserrata speciosa*** (Rafinesque) H.H. Iltis. Cp (FL): vacant lots, disturbed areas; rare, native of Mexico. [= FNA; = *Cleome speciosa* Rafinesque – K, WH]

Gynandropsis de Candolle 1824

A genus of 2 species, annual or short-lived perennial herbs, pantropical. References: Tucker in FNA (2010).

* ***Gynandropsis gynandra*** (Linnaeus) Briquet, Spiderwisp, Cat's-whiskers. Cp (FL, GA, NC, SC): fields, disturbed areas; rare, native of Africa. June-October. [= FNA; = *Cleome gynandra* Linnaeus – RAB, K, S, WH, Z]

Hemiscola Rafinesque 1838

A genus of 6 species, annuals, of tropical America. References: Tucker & Iltis in FNA (2010).

1 Leaflets ovate to rhomboidal; sepals lanceolate; anthers 0.9-1.0 mm long; silique 20-40 (-60) mm long.....***[H. aculeata var. aculeata]***
1 Leaflets obovate; sepals ovate; anthers 0.3-0.5 mm long; silique 15-20 mm long .....***[H. diffusa]***

* *Hemiscola aculeata* (Linnaeus) Rafinesque var. *aculeata*, Prickly Spiderflower. Cp (AL): disturbed areas; rare, native of tropical America. Reported for AL. [= FNA; < *Cleome aculeata* Linnaeus – K]
* *Hemiscola diffusa* (Banks ex de Candolle) H.H. Iltis. Cp (AL): on ballast (Mobile, AL); rare, native of South America. [= FNA; = *Cleome diffusa* Banks ex de Candolle – K]

Polanisia Rafinesque 1819 (Clammy-weed)

A genus of about 6 species, of North America. References: Tucker in FNA (2010).

Identification notes: *Polanisia* has some resemblance to *Warea*.

1 Petals broadest toward the base, barely or not at all clawed; capsule valvate; [of xeric longleaf pine sandhills].....***P. tenuifolia***
1 Petals broadest toward the tip, narrowed to a long, distinct claw; capsule opening near the tip; [of floodplains and disturbed soils].
2 Larger petals 3.5-6.5 (-8) mm long; longest stamens 4-10 (-14) mm long..... ***P. dodecandra*** *var.* ***dodecandra***
2 Larger petals (7-) 8-13 (-16) mm long; longest stamens (9-) 12-30 mm long.....***P. dodecandra*** *var.* ***trachysperma***

Polanisia dodecandra (Linnaeus) A.P. de Candolle *var.* ***dodecandra***, Clammy-weed, Spider-weed. Mt (VA, WV*), Pd (VA): sandy or gravelly floodplains along the James River in VA, also introduced on railroad ballast; rare. June-September. VT west to MB, south to MD, w. VA, TN, AR, and OK. Apparently both native and introduced in our area. [= C; = *P. dodecandra* ssp. *dodecandra* – FNA, K; = *P. graveolens* Rafinesque – F, S, WV; = *P. dodecandra* – G; < *P. dodecandra* – W; = *Cleome graveolens* (Rafinesque) Sch. & Sch.]
* ***Polanisia dodecandra*** (Linnaeus) A.P. de Candolle *var.* ***trachysperma*** (Torrey & A. Gray) Iltis. Mt (WV), Cp (VA): disturbed areas; rare, apparently adventive from w. North America. June-September. [= C; = *P. dodecandra* ssp. *trachysperma* (Torrey & A. Gray) Iltis – FNA, K; = *P. trachysperma* Torrey & A. Gray – F, G, S, WV]

Polanisia tenuifolia Torrey & A. Gray, Slenderleaf Clammy-weed, Pineland Catchfly. Cp (AL, FL, GA, MS): sandhills; rare. E. GA (several counties from the SC border) (Jones & Coile 1988) south to s. FL, west to s. MS. [= FNA, K, WH; = *Aldenella tenuifolia* (Torrey & A. Gray) Greene – S]

Tarenaya Rafinesque 1838

A genus of about 33 species, annual herbs, of South America. References: Tucker & Iltis in FNA (2010). Key based on FNA.

1 Sepals, ovary, and fruit glabrous; fruit about as long as gynophore; petals deep pink or purple (infrequently white) ..... ***T. hassleriana***
1 Sepals, ovary, and fruit glandular-pubescent; fruit longer than gynophore; petals white or greenish-white ..... ***T. spinosa***

* ***Tarenaya hassleriana*** (Chodat) H.H. Iltis, Cleome, Spiderflower, Pinkqueen. Cp (FL, GA, NC, SC, VA), Pd (GA, NC, SC, VA), Mt (GA, NC, SC, VA, WV): gardens, disturbed areas, riverbanks, persistent and self-seeding from cultivation as an ornamental; rare, native of South America. June-November. The petals in bud are a pale pink to nearly white, they turn a deep pink upon opening late in the day; by morning the petals have once again faded to a pale pink or white. [= FNA; = *Cleome hassleriana* Chodat – C, K, WH; ? *C. houtteana* Schlechtendahl – RAB, misapplied; < *C. spinosa* Jacquin – F, G, misapplied; < *Neocleome spinosa* (Jacquin) Small – S]

* ***Tarenaya spinosa*** (Jacquin) Rafinesque. Cp (FL): disturbed areas; rare, native of South America. Also in AL. [= FNA; < *Neocleome spinosa* (Jacquin) Small – S; = *Cleome spinosa* Jacquin – WH]

273. BRASSICACEAE Burnett 1835 ***or CRUCIFERAE*** A.L. de Jussieu 1789 (Mustard Family) [in BRASSICALES]

A family of about 340 genera and 3400 species, annuals, perennials, shrubs, and rarely trees and vines, of cosmopolitan distribution (but most diverse in the temperate Northern Hemisphere). References: Al-Shehbaz in FNA (2010); Rollins (1993); Al-Shehbaz (1984, 1985a, 1985b, 1986, 1987, 1988a, 1988b); Appel & Al-Shehbaz in Kubitzki & Bayer (2003).

Tribe a. Alysseae: Alyssum, Berteroa
Tribe b. Anchonieae: Matthiola
Tribe d. Arabideae: Arabis, Draba
Tribe e. Boechereae: Boechera
Tribe f. Brassiceae: Brassica, Cakile, Coincya, Diplotaxis, Eruca, Erucastrum, Orychophragmus, Raphanus, Rapistrum, Sinapis
Tribe g. Buniadeae: Bunias
Tribe h. Calepineae: Calepina
Tribe i. Camelineae: Arabidopsis, Camelina, Capsella, Turritis
Tribe j. Cardamineae: Armoracia, Barbarea, Cardamine, Iodanthus, Leavenworthia, Nasturtium, Planodes, Rorippa
Tribe k. Chorisporeae: Chorisporeae
Tribe m. Conringeae: Conringia
Tribe n. Descurainieae: Descurainia
Tribe o. Erysimeae: Erysimum
Tribe p. Euclidieae: Braya
Tribe s. Hesperideae: Hesperis
Tribe t. Iberideae: Iberis, Teesdalia
Tribe v. Isatideae: Isatis, Myagrum
Tribe w. Lepidieae: Lepidium
Tribe x. Lunarieae: Lunaria
Tribe y. Malcolmieae: Lobularia
Tribe z. Noccaeeae: Microthlaspi
Tribe aa. Physarieae: Paysonia, Physaria
Tribe bb. Sisymbrieae: Sisymbrium
Tribe dd. Thelypodieae: Warea
Tribe ee. Thlaspideae: Alliaria, Thlaspi

Alliaria Heister ex Fabricius 1759 (Garlic Mustard)

A genus of 2 species, annual or biennial herbs, of Eurasia and n. Africa. References: Al-Shehbaz in FNA (2010); Rollins (1993)=Z; Al-Shehbaz (1988b)=Y.

* ***Alliaria petiolata*** (Bieberstein) Cavara & Grande, Garlic Mustard, Hedge Garlic. Mt (NC, VA, WV), Pd (DE, VA), Cp (DE, VA) {GA, SC}: moist forests in bottomlands and on slopes; common (uncommon in VA Piedmont, rare in NC, rare in VA Coastal Plain), native of Europe. April-May; May-June. This species has become a noxious weed in ne. United States, invading undisturbed moist forests. Dhillion & Anderson (1999) report on physiological characteristics that make *Alliaria* a successful invader in shaded situations. [= RAB, C, FNA, K, W, Y, Z; = *Alliaria officinalis* Andrzejowski ex Bieberstein – F, G]

Alyssum Linnaeus 1753 (Alyssum, Madwort)

A genus of 170-190 species, herbs, of Eurasia. References: Al-Shehbaz in FNA (2010); Rollins (1993)=Z; Al-Shehbaz (1987)=Y.

* ***Alyssum alyssoides*** (Linnaeus) Linnaeus, Yellow Alyssum. Mt (VA, WV), Pd (VA), Cp (VA): roadsides, disturbed areas, especially in dry, barren soil; uncommon (rare in WV), native of Europe. June-September. [= C, F, FNA, G, K, W, Z; > *A. alyssoides* var. *alyssoides* – Y]

Arabidopsis Heynhold (Mouse-ear Cress)

A genus of about 9 species, annual and perennial herbs, circumboreal and most diverse in Eurasia. References: Al-Shehbaz in FNA (2010); Rollins (1993)=Z, Al-Shehbaz (1988a)=Y; O'Kane & Al-Shehbaz (1997)=X; O'Kane & Al-Shehbaz (2003); Koch, Bishop, & Mitchell-Olds (1999); Koch & Al-Shehbaz (2002). Key based in part on O'Kane & Al-Shehbaz (1997).

1 Fruit strongly flattened; petals 6-10 mm long; [native perennial, of calcareous and mafic rock outcrops] ..... ***A. lyrata*** *ssp.* ***lyrata***
1 Fruit terete; petals 2-4 mm long; [alien annual, of disturbed, weedy sites] ..... ***A. thaliana***

Arabidopsis lyrata (Linnaeus) O'Kane & Al-Shehbaz *ssp.* ***lyrata***, Lyreleaf Rockcress, Dwarf Rockcress. Mt (GA, NC, VA, WV), Pd (DE, NC, VA), Cp (DE, NC, VA): rock crevices in or thin soil around calcareous or mafic rock outcrops; uncommon (rare in DE, GA, and NC). March-June; April-September. The species is widespread in n. North America and e. Asia, south in e. North America to NC, e. TN, and n. GA; ssp. *lyrata* is strictly North American, from NY west to AK, south to NC, GA, TN, MS, MB, SK, AB, and BC. The GA record is an old and indefinite collection ("northern Georgia") by Vasey. [= FNA, X; < *Arabis lyrata* Linnaeus – RAB, C, F, G, K, S, W, X; = *A. lyrata* var. *lyrata* – Y, Z]

* ***Arabidopsis thaliana*** (Linnaeus) Heynhold, Mouse-ear Cress. Cp (DE, GA, NC, SC, VA), Pd (DE, GA, NC, SC, VA), Mt (GA, NC, SC, VA, WV): disturbed areas, fields, roadsides, lawns; common (rare in DE Piedmont), native of Eurasia. March-May. *Arabidopsis thaliana* has sometimes been referred to as the white mouse of the vascular plant world, having been very extensively used as an experimental plant; a journal, the Arabidopsis Information Service, publishes annual bibliographies of studies using this plant. [= RAB, C, F, FNA, G, K, S, W, X, Y, Z]

Arabis Linnaeus 1753 (Rockcress)

The circumscription of *Arabis* is in flux; there is increasing evidence that the broad circumscription traditionally employed in most North American floras includes discordant elements. Based on molecular phylogenetic studies and morphology, *Arabis* in our area should be divided into 4 genera, as follows: *Arabidopsis (A. lyrata); Arabis* sensu stricto (n=8) (*A. hirsuta var. adpressipilis, A. hirsuta var. pycnocarpa, A. georgiana*); *Boechera* Löve & Löve (n=7) (*A. canadensis, A. drummondii, A. laevigata var. burkii, A laevigata var. laevigata, A. missouriensis, A. patens, A. perstellata var. ampla, A. serotina, A. shortii*); and *Turritis* (*A. glabra var. glabra*). References: Al-Shehbaz in FNA (2010); Hopkins (1937)=Z; Rollins (1993)=Y; Al-Shehbaz (1988a)=X; Al-Shehbaz (2003)=Q; Koch, Bishop, & Mitchell-Olds (1999); Koch & Al-Shehbaz (2002). [also see *Arabidopsis, Boechera, Turritis*]

1 Plants matted from a branching caudex, perennial; [cultivated and rarely persistent or escaped] ..... ***[A. caucasica]***
1 Plants unbranched, biennial; [native to our area].
  2 Petals 6-9 mm long; siliques 2.5-7 cm long.
    3 Siliques (4.5-) 5-7 cm long; [endemic to w. GA and c. AL] ..... ***A. georgiana***
    3 Siliques 2.5-4 cm long; [of se. PA, c. PA, and IN south to NC, e. TN, and AL] ..... ***A. patens***
  2 Petals 3-5 mm long; siliques 3-6 cm long; [collectively known from NC, TN, VA, and northward and westward from those states].
    4 Stem pubescence primarily appressed and of 2-armed or dolabriform hairs ..... ***A. pycnocarpa*** *var.* ***adpressipilis***
    4 Stem pubescence primarily spreading and of simple hairs ..... ***A. pycnoacrpa*** *var.* ***pycnocarpa***

Arabis georgiana R.M. Harper, Georgia Rockcress. Mt (GA), Pd (GA), Cp (GA): nutrient-rich streambanks and rock outcrops; rare. April-May; May-early July. Endemic to n. and sw. GA and c. AL. It differs from our other species by the following combination of characters: fruits 5-7 cm long, borne appressed to ascending, leaves with bifurcate, trifurcate, or stellate hairs. See Patrick, Allison, & Krakow (1995). [= FNA, K, Y, Z]

Arabis patens Sullivant, Spreading Rockcress. Mt (GA, NC, VA, WV), Pd (VA): thin soils around calcareous or dolomitic outcrops, very rarely in nutrient-rich seepage from mafic rocks; rare. May-June; June-August. Irregularly distributed, primarily in the sedimentary rock Appalachians, from se. PA, c. PA, and IN south to NC, e. TN, and AL. In NC, this species occurs over marble at Blowing Spring, Nantahala River Gorge, Swain County, at various sites over calcareous sedimentary rocks in the Hot Springs Window, near Hot Springs, Madison County, and in nutrient-rich seepage from amphibolite at Chimney Rock, Rutherford County. [= RAB, C, F, FNA, G, K, S, W, X, Y, Z; = *Boechera patens* (Sullivant) Al-Shehbaz – Q]

Arabis pycnocarpa M. Hopkins *var.* ***adpressipilis*** M. Hopkins, Slender Rockcress, Hairy Rockcress. Pd (NC), Mt (NC, VA): thin soils near outcrops of mafic or other rock weathering to nutrient-rich soils; rare. April-May; May-June. Var.

adpressipilis ranges from OH to IL, south to AR, c. TN, and LA; disjunct east of the mountains in NC. Related to, but specifically distinct from, *A. hirsuta* (Linnaeus) Scopoli of Europe and *A. eschscholtziana* Andrzejowski in Ledebour of w. North America. [= FNA, Z; = *A. hirsuta* (Linnaeus) Scopoli var. *adpressipilis* (M. Hopkins) Rollins – C, F, G, X, Y; < *A. hirsuta* var. *pycnocarpa* (M. Hopkins) Rollins – K; > *A. ovata* Michaux – S]

Arabis pycnocarpa M. Hopkins *var.* ***pycnocarpa***, Slender Rockcress. Mt (WV): thin soils near outcrops of calcareous soils; rare. QC west to AK, south to e. and sw. PA (Rhoads & Klein 1993), AR, and AZ, primarily west of the Blue Ridge. Reports of this taxon from GA (Fernald 1950, Kartesz 1999, Hopkins 1937) are based on material collected by A.W. Chapman near Rome, and later described as *Arabis georgiana*. See discussion under *A. pycnocarpa* var. *adpressipilis*. [= FNA; = *A. hirsuta* (Linnaeus) Scopoli var. *pycnocarpa* (M. Hopkins) Rollins – C, F, G, X, Y; < *A. hirsuta* (Linnaeus) Scopoli var. *pycnocarpa* – K (also see var. *adpressipilis*); = *A. pycnocarpa* M. Hopkins var. *typica* – Z]

* *Arabis caucasica* Willdenow, Gray Rockcress. Introduced in KY and TN (Kartesz 1999). [= FNA, K, Y; *? A. alpina* (Linnaeus) var. *albida* (Steven ex Jacquin) Paoletti]

Armoracia Gaertner, B. Meyer, & Scherbius 1800 (Horseradish)

A genus of 3 species, perennial herbs, of Eurasia. References: Al-Shehbaz in FNA (2010); Rollins (1993)=Y; Al-Shehbaz (1988a)=X.

1 Plant aquatic; stem submersed or prostrate; fruit unilocular .....*[*see ***Rorippa aquatica****]*
1 Plant terrestrial; stem erect; fruit bilocular .....***A. rusticana***

* ***Armoracia rusticana*** P. Gaertner, B. Meyer, & Scherbius, Horseradish. Mt (NC, VA, WV), Pd (DE), Cp (DE): persistent after cultivation, sometimes spreading (generally only very locally, but sometimes greater distances, probably by water transport of rhizomes); uncommon (rare south of DE), native of Europe. May-July. The root is grated to provide the condiment. [= RAB, C, G, K, X, Y, Z; =*? A. lapathifolia* Gilibert – F; = *A. armoracia* (Linnaeus) Britton – S]

Barbarea R. Brown 1812 (Winter-cress, Creasy Greens)

A genus of about 20 species, biennial and perennial herbs, semicosmopolitan. References: Al-Shehbaz in FNA (2010); Al-Shehbaz (1988a)=Y; Rollins (1993)=Z.

1 Basal leaves with 4-10 pairs of lateral lobes; siliques 4.5-7 cm long; pedicels 1.2-1.8 mm thick.....***B. verna***
1 Basal leaves with 1-4 pairs of lateral lobes; siliques 1.5-3 cm long; pedicels 0.5-1.0 mm thick.....***B. vulgaris***

* ***Barbarea verna*** (P. Miller) Ascherson, Early Winter-cress. Mt (GA, NC, SC, VA, WV), Pd (DE, GA, NC, SC, VA), Cp (DE, NC, SC, VA): fields, disturbed areas; common, native of Eurasia. March-June. Formerly a commonly used winter and spring green in rural parts of our area. [= RAB, C, F, FNA, G, K, W, Y, Z; = *Campe verna* (P. Miller) Heller – S]

* ***Barbarea vulgaris*** W. Aiton, Common Winter-cress, Yellow Rocket. Mt (GA, NC, SC, VA, WV), Pd (DE, GA, NC, SC, VA), Cp (DE, NC, SC, VA): fields, disturbed areas; common, native of Eurasia. April-June. Additional study is needed of the various infraspecific or specific taxa recognized by some authors (particularly Europeans) in what is here considered a variable species; see Stace (2010), for instance. [= RAB, C, FNA, K, W, Y, Z; > *B. vulgaris* var. *vulgaris* – F, G; > *B. vulgaris* var. *arcuata* (Opiz ex J. & K. Presl) Fries – RAB, F, G; > *Campe barbarea* (Linnaeus) W. Wight ex Piper – S; > *Campe stricta* (Andrzejowski) W. Wight ex Piper – S, misapplied; > *B. vulgaris* var. *sylvestris* Fries]

Berteroa A.P. de Candolle 1821 (Hoary Alyssum)

A genus of about 5 species, annual or perennial herbs, of Europe and the Middle East. References: Al-Shehbaz in FNA (2010); Rollins (1993)=Z; Al-Shehbaz (1987)=Y.

* ***Berteroa incana*** (Linnaeus) A.P. de Candolle, Hoary Alyssum. Mt (VA, WV), Pd (VA): disturbed areas; uncommon, native of Europe. [= C, F, FNA, G, K, Y, Z]

Boechera Löve & Löve 1975 (Rockcress)

Most of our native eastern North American "*Arabis*" are now in *Boechera*. References: References: Al-Shehbaz & Windham in FNA (2010); Windham & Al-Shehbaz (2007); Hopkins (1937) =Z; Rollins (1993)=Y; Wieboldt (1987); Al-Shehbaz (1988a)=X; Al-Shehbaz (2003)=Q; Koch, Bishop, & Mitchell-Olds (1999); Koch & Al-Shehbaz (2002).

1 Pedicels of flowers or fruits deflexed.....***B. canadensis***
1 Pedicels of flowers or fruits erect, ascending, or spreading.

2 Mature fruits < 4 cm long; stems branched or simple at the base.
3 Stem leaves (most of them) < 5 mm wide; stems branched at the base ..... ***[see Arabidopsis lyrata** ssp. **lyrata]***
3 Stem leaves (most of them) > 8 mm wide; stems simple at the base.
4 Lower cauline leaves glabrous or sparsely pubescent on the upper surface; fruits erect and appressed, 3-5 cm long ..... ***[see Arabis]***
4 Lower cauline leaves hirsute or strigose on the upper surface; fruits widely ascending or spreading. 1.5-4 cm long.
5 Petals 6-9 mm long; fruiting pedicels 10-16 mm long; mature fruits 2.5-4 cm long; pubescence of the lower leaf surface simple; seeds winged ..... ***[see Arabis patens]***
5 Petals 2-5 mm long; fruiting pedicels 2-10 (-13) mm long; mature fruits 1.5-3 cm long; pubescence of the leaf surface stellate; seeds wingless.
6 Petals 3-5 mm long, pink or purplish; fruiting pedicels 5-10 (-13) mm long; siliques 1.5-2 cm long; pubescence of the upper leaf surface stellate ..... ***[B. perstellata]***
6 Petals 2-3 mm long, white to cream; fruiting pedicels 2-3.5 mm long; siliques 1.5-3 cm long; pubescence of the upper leaf surface simple ..... ***B. shortii***
2 Mature fruits > 4 cm long; stems generally simple at the base.
7 Fruits erect, appressed against the stem, the fruiting inflorescence < 2 cm in diameter.
8 Mature fruits terete, (4-) 7-9.5 cm long; basal leaves 5-12 cm long, stellate pubescent; cauline leaves 4-12 cm long; pubescence of the stem mostly of spreading, simple hairs ..... ***[see Turritis]***
8 Mature fruits flat, 1.5-10 cm long; basal leaves 2-8 cm long, nearly glabrous; cauline leaves 1-4 cm long; pubescence of the stem mostly of appressed, forked hairs.
9 Mature fruits 4-10 cm long, 1.5-2.5 mm wide, with 2 rows of seeds in each locule ..... ***B. stricta***
9 Mature fruits 1.5-7 cm long, 0.7-1.1 mm wide, with 1 row of seeds in each locule ..... ***[see Arabis]***
7 Fruits ascending to spreading (not erect and appressed to the stem), the fruiting inflorescence > 4 cm in diameter.
10 Cauline leaves not at all auricled or sagittate-clasping at the base.
11 Calyx 2.9-4.8 mm long; flowering April-May; plant unbranched or with 1-3 branches (sometimes more if the main stem damaged), the inflorescence thus a raceme or slightly paniculate; mature fruits 5.2-9.8 cm long; seeds 64-80 per silique; seeds with wing 0.2-0.5 mm wide ..... ***B. burkii***
11 Calyx 2.0-3.3 mm long; flowering mid July-September; plant with numerous branches (well-developed plants usually with at least 10), the inflorescence thus a diffuse panicle; mature fruits 4.3-8.0 cm long; seeds 30-42 per silique; seeds with wing 0.1-0.2 mm wide ..... ***B. serotina***
10 Cauline leaves auricled or sagittate-clasping at the base.
12 Basal leaves subentire to serrate or sinuate-serrate; petals white, to 5 mm long, equaling or slightly surpassing the sepals; longest cauline leaves usually 8-18 cm long; plant glaucous ..... ***B. laevigata***
12 Basal leaves sharply serrate-dentate to strongly laciniate or lyrate-pinnatifid; petals creamy-white, to 8 mm long, about 2× the length of the sepals; longest cauline leaves usually 3-5 cm long; plant green or red-tinged ..... ***B. missouriensis***

Boechera burkii (Porter) Windham & Al-Shehbaz, Burk's Smooth Rockcress. Mt (NC, VA, WV): limestone barrens, shale barrens, and other dry, rocky habitats; rare. April-May. E. and c. PA south to e. WV, ne. TN, and w. NC in the sedimentary rock Appalachians. Windham & Al-Shehbaz (2007) {}… RAB assigns this plant (as *Arabis laevigata* var. *burkii*) to NC based on somewhat aberrant specimens from high elevation cove forests; these are better assigned to *B. laevigata* var. *laevigata*. Hopkins (1937), however cites a specimen from Hot Springs, Madison County, NC, an area with plausible habitats (dry sedimentary rock woodlands, shale barrens). [= FNA; = *Arabis laevigata* (Muhlenberg ex Willdenow) Poiret var. *burkii* Porter – C, K, W, X, Y; < *A. laevigata* var. *burkii* – F, G, Z (also see *A. serotina*); < *A. burkii* (Porter) Small – S, misapplied in part; < *Boechera laevigata* – Q]

Boechera canadensis (Linnaeus) Al-Shehbaz, Sicklepod, Canada Rockcress. Mt (GA, NC, SC, VA, WV), Pd (DE, GA, NC, SC, VA), Cp (DE, FL, GA, VA): thin soils around rock outcrops, especially mafic or calcareous, and in dry to mesic, nutrient-rich, often rocky woodlands over mafic or calcareous rocks; uncommon (rare in Coastal Plain, rare in DE Piedmont). May-July; June-August. QC and ND south to Panhandle FL and TX. [= FNA, Q, WH; = *Arabis canadensis* Linnaeus – RAB, C, F, G, K, S, W, X, Y, Z]

Boechera laevigata (Muhlenberg ex Willdenow) Al-Shehbaz, Common Smooth Rockcress. Mt (GA, NC, SC, VA, WV), Pd (DE, GA, NC, SC, VA), Cp (VA): rocky woodlands and forests, rock outcrops, especially mafic or calcareous, but also on more acidic substrates, rarely also in bottomlands; common (uncommon in VA Coastal Plain, rare in DE Piedmont). April-May; May-June. ME west to MN and SD, south to GA, AL, MS, AR, OK, and CO. Of our *Boechera*, *B. laevigata* is the most common, being the least limited to calcareous substrates. [= FNA; = *Arabis laevigata* (Muhlenberg ex Willdenow) Poiret *var. laevigata* – C, F, G, K, W, X, Y, Z; > *A. laevigata* var. *laevigata* – RAB; > *A. laevigata* var. *burkii* – RAB, misapplied; >< *A. burkii* (Porter) Small – S, misapplied in part; > *A. laevigata* – S; < *Boechera laevigata* – Q]

Boechera missouriensis (Greene) Al-Shehbaz, Missouri Rockcress. Pd (GA, NC, SC), Mt (NC): thin soil around outcrops of metamudstone, diabase, or granite (generally on mafic or rich granitic substrates); rare. April-May; May-June. ME to WI, south to KY, AR, and OK; disjunct eastward in NC, SC, and GA. [= FNA, Q; = *Arabis missouriensis* Greene – C, K, X, Y; = *A. laevigata* var. *missouriensis* – RAB; > *A. missouriensis* var. *missouriensis* – F; > *A. viridis* Harger var. *viridis* – G, Z]

Boechera serotina (Steele) Windham & Al-Shehbaz, Shale Barren Rockcress. Mt (VA, WV): shale barrens; rare. Mid-July-September. Endemic to Devonian and Ordovician shales of w. VA and e. WV. Wieboldt (1987) has clarified the taxonomy of this species and *A. laevigata* var. *burkii*. Also see Porter & Wieboldt (1991) for further discussion. [= FNA; = *Arabis serotina* Steele – C, K, X, Y; < *A. laevigata* var. *burkii* – F, G, Z; < *Boechera laevigata* – Q]

Boechera shortii (Fernald) Al-Shehbaz. Mt (WV), Pd (VA): nutrient-rich alluvial and river bluff forests (in VA, along the Potomac River); rare (VA Rare). April-May. NY west to MN, south to n. VA, nc. TN (Chester, Wofford, & Kral 1997), and AR. [= FNA, Q; = *Arabis shortii* (Fernald) Gleason – C, G, K, X, Y; = *A. perstellata* E.L. Braun var. *shortii* Fernald – F; = *A. dentata* (Torrey) Torrey & A. Gray – S, Z (name preoccupied); > *A. shortii* var. *phalacrocarpa* (M. Hopkins) Steyermark]

Boechera stricta (Graham) Al-Shehbaz. Pd (DE): {habitat}; rare. April-June. NL (Labrador) and AK south to NJ, DE, OH, IL, NM, AZ, and CA. [= FNA, Q; = *Arabis drummondii* A. Gray – C, F, G, K, Y; > *A. drummondii* A. Gray var. *typica* – Z; = *Boechera drummondii* (A. Gray) Löve & Löve, illegitimate name]

Boechera perstellata (E.L. Braun) Al-Shehbaz is apparently endemic to KY and c. TN (Chester, Wofford, & Kral 1997). [= FNA, Q; = *Arabis perstellata* – K, Y; > *Arabis perstellata* E.L. Braun var. *perstellata* – X; > *Arabis perstellata* E.L. Braun var. *ampla* Rollins – X]

Brassica Linnaeus 1753 (Mustard, Turnip, Rape, Cabbage, Collard Greens, Kale, Broccoli, Cauliflower, Kohlrabi, Rutabaga, Bok-Choy, Chinese Cabbage, Brussels Sprouts)

A genus of about 40 species, herbs, of the Old World. References: Warwick in FNA (2010); Rollins (1993)=Z; Al-Shehbaz (1985b)=Y. Key adapted from Z. [also see *Erucastrum, Sinapis*]

1 Upper cauline leaves petiolate, or sessile and cuneate.
  2 Pedicels and siliques widely spreading to divaricately ascending; siliques 2-4 cm long, terete or nearly so; [section *Rapa*] ..... ***Br. juncea***
  2 Pedicels and siliques erect and appressed to the rachis; siliques 1-2 cm long, more-or-less 4-angled; [section *Melanosinapis*] ..... ***Br. nigra***
1 Upper cauline leaves auriculate, slightly to strongly clasping the stem; [section *Rapa*].
  3 Petals mostly 18-25 mm long; beak of the silique (3-) 4-11 mm long ..... ***[Br. oleracea]***
  3 Petals mostly 6-16 mm long; beak of the silique (5-) 7-15 (-22) mm long.
    1 Petals 10-18 mm long, pale yellow; beak of the silique usually (5-) 7-10 (-16) mm long; plant usually glaucous; siliques 5-10 cm long ..... ***Br. napus***
    4 Petals 6-10 (-11) mm long, deep yellow; beaks of the silique usually (8-) 10-15 (-22) mm long; plant usually green; siliques 3-7 cm long ..... ***Br. rapa*** *var.* ***rapa***

* ***Brassica juncea*** (Linnaeus) Czernajew, Leaf Mustard, Brown Mustard, Indian Mustard, Mustard Greens, Chinese Mustard. Cp (DE, GA, SC, VA), Mt (NC, SC, VA, WV), Pd (DE, SC, VA): fields, disturbed areas; common (uncommon in GA, NC, SC, VA, and WV), native of Eurasia. April-June. This species is apparently a recently derived polyploid (n=18) of *B. nigra* (n=8) and *B. rapa* (n=10). The seeds of this species are one source of table mustard; other components include *B. nigra* and *Sinapis alba*. [= RAB, C, G, K, W, Y, Z; > *B. juncea* – S; > *B. japonica* (Thunberg) Siebold ex Miquel – S]

* ***Brassica napus*** Linnaeus, Rutabaga, Rape, Canola, Colza, Swede. Mt (GA, NC, SC, VA?, WV), Pd (GA, NC, SC, VA?), Cp (SC): fields, disturbed areas; uncommon (rare in GA, NC, SC, and VA), native of Eurasia. May-July. This species is apparently a recently derived polyploid (n=19) of *B. oleracea* (n=9) and *B. rapa* (n=10). The seeds of this species are the source of "canola" oil, the name recently coined by marketers from "**Can**adian" + "**o**il" + "**l**ow" + "**a**cid" to avoid the negative connotation of the ancient name "rape." [= K, W, Y, Z; < *B. napus* – RAB (also see *B. rapa*)]

* ***Brassica nigra*** (Linnaeus) W.D.J. Koch, Black Mustard, Charlock. Cp (DE, VA), Pd (DE, VA), Mt (VA, WV) {NC}: fields, disturbed areas; common (uncommon of DE), native of Eurasia. May-August. The seeds of this species are one source of table mustard; other species used include *B. juncea* and *Sinapis alba*. [= C, F, G, K, S, Y, Z; = *Sinapis nigra* Linnaeus]

* ***Brassica rapa*** Linnaeus *var.* ***rapa***, Turnip, Bird's-rape, Field Rape, Field Mustard, Bok-choy, Chinese Cabbage. Mt (GA, NC, SC, VA, WV), Pd (DE, NC, VA), Cp (DE, NC, SC, VA): fields, disturbed areas; common, native of Europe. March-June. *B. rapa* is cultivated in a variety of forms, *B. rapa* var. *chinensis* (Linnaeus) Kitam. (Bok-choy or Pak-choi) and *B. rapa* var. *amplexicaulis* Tanaka & Ono (Chinese Cabbage). [= K; < *B. rapa* – C, Y, Z; < *B. napus* – RAB; > *B. rapa* – G; > *B. campestris* Linnaeus – G, S]

* *Brassica oleracea* Linnaeus. Commonly cultivated in our area in a variety of forms, including *B. oleracea* var. *acephala* A.P. de Candolle (Collard Greens, Kale), *B. oleracea* var. *capitata* Linnaeus (Cabbage), *B. oleracea* var. *italica* Plenck (Broccoli), *B. oleracea* var. *botrytis* Linnaeus (Cauliflower), *B. oleracea* var. *gemmifera* Zenk (Brussels Sprouts), and *B. oleracea* var. *gongylodes* Linnaeus (Kohlrabi). [= FNA, K]

Braya Sternberg & Hoppe 1815

A genus of about 6 species, perennial herbs, of alpine and arctic Eurasia and North America. References: Harris in FNA (2010); Rollins (1993)=Z.

* ***Braya humilis*** (C. A. Meyer) B.L. Robinson *ssp.* ***humilis***. Mt (VA): pasture; rare, native of boreal and arctic North America and Asia. [= FNA; > *B. humilis* – C, K, Z; > *B. humilis* var. *leiocarpa* (Trautvetter) Fernald – F, G; < ***Neotorularia humilis*** (C.A. Meyer) Hedge & J. Léonard]

Bunias Linnaeus 1753 (Warty-cabbage)

A genus of 3 species, herbs, of Eurasia. References: Al-Shehbaz in FNA (2010); Rollins (1993)=Z.

1 Plant an annual; cauline leaves < 5 cm long; siliques 10-12 mm long, more-or-less straight, 4-winged, spiny; seeds 3-4 per silique ..... ***B. erucago***

1 Plant a perennial; cauline leaves > 10 cm long; siliques 5-10 mm long, usually curved, not winged, verrucose; seeds 1-2 per silique..... ***B. orientalis***

* ***Bunias erucago*** Linnaeus, Southern Warty-cabbage. Cp? (VA): disturbed areas; rare, native of Europe. April-June. [= C, FNA, K, Z]

* ***Bunias orientalis*** Linnaeus, Warty-cabbage, Turkish Rocket. Pd (VA): disturbed areas; rare, native of Europe. June-July. [= C, F, FNA, G, K, Z]

Cakile P. Miller 1754 (Sea Rocket)

A genus of about 7-8 species, annual herbs, primarily of coastal North America, Europe, and North Africa. References: Rodman in FNA (2010); Rollins (1993)=Z; Rodman (1974)=Y; Al-Shehbaz (1985b)=X.

Identification notes: The siliques of *Cakile* are divided near their middle by an abscission zone into two halves, each with a single seed: the upper abscises and disperses by water or wind, the lower remains attached to the parent plant. The size of the two segments and the contour of the abscised surface remaining on the lower segment are important taxonomic characters.

1 Lower silique segment with 2 opposite lateral horns or wings on the sides prolonged upward into sharp triangular wedges, concave in between; petals lavender (rarely white), 8-14 mm long, 3-6 mm wide; most of the leaves deeply pinnatifid into 6-9 lobes..... ***C. maritima*** *ssp.* ***maritima***

1 Lower silique segment without lateral horns, triangular wedges absent to 1.5 mm high; petals white (rarely lavender), 4-10 mm long, 1.4-3 mm wide; most of the leaves with a few to many irregular teeth (or pinnatifid in *C. lanceolata* ssp. *pseudoconstricta*).

2 Infructescences usually >20 cm long; [of the Gulf Coast]..... ***C. lanceolata*** *ssp.* ***pseudoconstricta***

2 Infructescences 10-20 cm long; [collectively widespread].

3 Siliques 3-4 mm wide, the beak conical and acute at the apex; [of the Gulf Coast]..... ***C. constricta***

3 Siliques 5-9 mm wide, the beak somewhat flattened and typically rather blunt; [of the Atlantic Coast].

4 Upper fruit segment 7-15 mm long, 4-angled (to weakly 8-ribbed); articulating surface of lower fruit segment flat to concave and with 2 (-6) small teeth projecting upward or the sides prolonged upward into 2 opposite triangular wedges; [of NC northward to NL (Labrador)]..... ***C. edentula***

4 Upper fruit segment 12-20 mm long, 8-ribbed; articulating surface of lower fruit segment flat (to slightly convex or concave) and without teeth; [of NC southward to St. Lucie County, FL] ..... ***C. harperi***

Cakile constricta Rodman, Gulf Coast Sea Rocket. Cp (AL, FL, LA, MS): beaches, coastal sands. February-October. Panhandle FL west to TX. [= FNA, GW, K, X, Y, Z; < *C. lanceolata* (Willdenow) O.E. Schulz – S, WH]

Cakile edentula (Bigelow) Hooker, Northeastern Sea Rocket. Cp (DE, MD, NC, VA): beaches, at or near the wrack line; common. May-June (-October). NL (Labrador) south to NC; introduced in various other shores around the world, including w. North America and Australia. See *C. harperi* for discussion of the relation between these taxa. [= RAB, S; = *C. edentula* var. *edentula* – C, F, G; = *C. edentula* ssp. *edentula* – GW; = *C. edentula* ssp. *edentula* var. *edentula* – FNA, K, X, Y, Z]

Cakile harperi Small, Southeastern Sea Rocket. Cp (FL, GA, NC, SC): beaches, at or near the wrack line; common. May-June (-October). A Southeastern Coastal Plain endemic: e. NC south to the east coast of c. peninsular FL. Rodman (1974) and most authors since have treated *C. harperi* as *C. edentula* ssp. *harperi* (Small) Rodman. Rodman further treats the Great Lakes and ne. United States coastal populations (respectively) as *C. edentula* ssp. *edentula* var. *lacustris* Fernald and *C. edentula* ssp. *edentula* var. *edentula*. Rodman points out the morphologic distinctions between the three taxa, the chemical differences between "*edentula*" and "*harperi*," and the rarity or absence of intermediates in areas of pairwise overlap between the 3 entities. The geographic / morphologic pattern is not clinal, but is rather a sharp step function, with an overlap in the distribution of (and rare hybridization between) two largely distinct taxa. The few intermediates can be interpreted as hybrids or very limited and local introgression between otherwise distinct (though related) taxa. *C. harperi* shows greater chemical similarity to *C. constricta* Rodman and *C. lanceolata* (Willdenow) O.E. Schultz than to *C. edentula*, and also shows some morphologic affinities with these more southern taxa. For these reasons I prefer the simplicity of treating the three taxa as binomial species. [= RAB, S; = *C. edentula* (Bigelow) Hooker ssp. *harperi* (Small) Rodman – FNA, GW, K, WH, X, Y, Z]

Cakile lanceolata (Willdenow) O.E. Schulz *ssp.* ***pseudoconstricta*** Rodman. Cp (AL, FL): beaches, coastal sands. January-December. FL, AL, LA, TX, Tamaulipas. [= FNA, K, X, Y, Z; < *C. lanceolata* – GW, S, WH]

* ***Cakile maritima*** Scopoli *ssp.* ***maritima***, European Sea Rocket. Cp (NC, VA): beaches, at or near the wrack line; uncommon, native of Europe. The other subspecies are also European but are apparently not introduced in our area. The NC location was on ballast at Wilmington, and is apparently not persistent. VA locations are, however, well-established. [= FNA, X, Y; < *C. maritima* – C, F, G, K, Z; = *C. cakile* (Linnaeus) Karstens – S]

Calepina Adanson 1763

A genus of 2 species, annual herbs, of c. and sw. Asia. References: Al-Shehbaz in FNA (2010); Rollins (1993)=Z; Al-Shehbaz (1985b)=Y.

* ***Calepina irregularis*** (Asso) Thellung. Mt (NC), Pd, Cp (VA): fields, disturbed areas; rare, native of Eurasia. April. [= RAB, C, FNA, K, Y, Z]

Camelina Crantz 1762 (Gold-of-pleasure, False-flax)

A genus of 6-8 species, herbs, of se. Europe and the Middle East. References: Al-Shehbaz & Beilstein in FNA (2010); Rollins (1993)=Z; Al-Shehbaz (1987)=Y.

1 Siliques 4-7 mm long; leaves and stem rough-hairy, the stellate trichomes exceeded by simple trichomes (which are 1-2 mm long) ..... ***C. microcarpa***
1 Siliques 7-12 mm long; leaves and stem glabrate to sparsely hairy, the stellate trichomes as long as the few simple trichomes ..... ***C. sativa***

* ***Camelina microcarpa*** Andrzejowski ex A.P. de Candolle, Lesser Gold-of-pleasure. Pd (DE, GA, NC, VA), Mt (NC, VA, WV), Cp (DE, NC, SC, VA): fields, disturbed areas; uncommon, native of Eurasia. April-May. [= RAB, C, F, FNA, G, K, S, W, Y, Z]

* ***Camelina sativa*** (Linnaeus) Crantz, Gold-of-pleasure, False-flax. Pd (DE, NC, VA), Cp (DE, SC), Mt (WV): fields, disturbed areas; rare, native of Eurasia. April-May. [= RAB, C, F, FNA, G, S, WV, Y, Z; > *C. sativa* ssp. *sativa* – K]

Capsella Medikus 1792 (Shepherd's Purse)

A genus of 1-4 species, annual or biennial herbs, of Europe. References: Al-Shehbaz in FNA (2010); Rollins (1993)=Z; Al-Shehbaz (1986)=Y; Stace (2010)=X.

* ***Capsella bursa-pastoris*** (Linnaeus) Medikus, Common Shepherd's Purse. Cp (DE, GA, NC, SC, VA), Pd (DE, GA, NC, SC, VA), Mt (GA, NC, SC, VA, WV): fields, roadsides, disturbed areas; common (uncommon in DE), native of Europe. March-June. *C. rubella* Reuter, Pink Shepherd's Purse, is sometimes distinguished (as by F, G, Stace 2010), and occurs in our area. It is alleged to be diploid (vs. tetraploid), to have pink petals 1-2 mm long (vs. white, 2-3 mm long), and lateral margins of the fruit concave (vs. straight to convex). Al-Shehbaz (1986) considered the character correlations to be poor, not warranting taxonomic recognition. [= RAB, C, FNA, K, W, Y, Z; > *C. bursa-pastoris* – F, G, X; > *C. rubella* Reuter – F, G, X; > *C. gracilis* Gren. – F; = *Bursa bursa-pastoris* (Linnaeus) Britton – S]

Cardamine Linnaeus 1753 (Bittercress, Toothwort)

A genus of about 200 species, herbs, cosmopolitan. *Dentaria* should apparently be included (Sweeney & Price 2000). References: Al-Shehbaz, Marhold, & Lihová in FNA (2010); Rollins (1993)=Z; Sweeney & Price (2001)=Y; Al-Shehbaz (1988a)=X; Sweeney & Price (2000); Franzke et al. (1998). Key based in part on Turrill, Evans, & Gilliam (1994) and Y.

1 Leaves palmately divided (if 1-ternate, then palmately so, the terminal leaflets on a petiolule the same length as the those of the lateral leaflets); [*Dentaria*].
  2 Plants entirely glabrous (including on the leaf margins); leaflets highly dissected with linear to filiform segments; [in our area known from Piedmont of NC and VA] ..... ***C. dissecta***
  2 Plants with marginal leaf trichomes, and often also pubescent on the stem, inflorescence, and petioles; leaflets entire, toothed, or deeply lobed; [collectively widespread in our area].
    3 Trichomes of leaf margins appressed and ca. 0.1 mm long; stem leaves 2 (-3), opposite; lateral leaflets of stem leaves very rarely incised, the leaf being (and appearing merely 3-foliolate, though teeth may be prominent and lacerate); basal leaves usually present at flowering.
      4 Rhizome with 2-3 cm long segments, each separated by a narrow and fragile connecting portion (which typically is broken on herbarium specimens), and lacking "teeth" (actually prominent reduced leaves); leaflets of the stem leaves (2.5×-) avg. 5× (-7×) as long as wide (thus proportionately much narrower than the leaflets of the basal leaves); central leaflet of stem leaves (2.5-) avg. 3.25 (-4) cm long × (0.5-) avg. 0.75 (-1.0) cm wide; taste of fresh plants relatively mildly mustardy ..... ***C. angustata***
      4 Rhizome elongate and of uniform diameter, lacking definite segments, but with periodic "teeth" (prominent reduced leaves) along it; leaflets of the stem leaves (2×-) avg. 3× (-4×) as long as wide (thus proportionately similar to the leaflets of the basal leaves); central leaflet of stem leaves (4-) avg. 6 (-8) cm long × (1.5-) avg. 2 (-2.5) cm wide; taste of fresh plant strong, like horseradish or wasabi ..... ***C. diphylla***
    3 Trichomes of leaf margins erect and 0.2-0.3 mm long; stem leaves 3, whorled; lateral leaflets of stem leaves usually incised into 2 main lobes, giving the leaf a superficially somewhat 5-parted appearance; basal leaves usually absent (or often present in *C. maxima*) at flowering.
      5 Rhizome with 2-3 cm long segments, each separated by a narrow and fragile connecting portion (which typically is broken on herbarium specimens); upper stem pubescent ..... ***C. concatenata***
      5 Rhizome elongate, with alternating thicker and thinner portions (but not fragile and easily separating); upper stem glabrous ..... ***[C. maxima]***
1 Leaves simple, pinnately lobed, or pinnately divided (if 1-ternate, then pinnately so, the terminal leaflet on a longer petiolule than those of the lateral leaflets); [*Cardamine* in the narrow sense].
  6 Cauline leaves simple, sometimes the lower to middle cauline leaves with 1-2 pairs of very small lateral lobes.
    7 Plant from a tuberous or bulbous base, erect and generally unbranched, not stoloniferous or rooting down from upper nodes after flowering; petals 7-20 mm long.

8 Stem glabrous; corolla white, rarely pink; stem leaves 4-12; silique 1.5-3 cm long, plus a 3-7 mm beak ..... ***C. bulbosa***
8 Stem cinereous-pubescent; corolla pink to lavender, rarely white; stem leaves 2-5; silique 1-2 cm long, plus a 2-4 mm beak ..... ***C. douglassii***
7 Plant from a fibrous root system, frequently much branched from the base, some of the branches becoming stoloniferous and rooting down at the upper nodes after flowering; petals 2-10 mm long or absent.
9 Petals absent or present, if present 0.7-2 mm long; silique 5-10 (-15) mm long, plus a 0.5-1.0 mm beak, on thick pedicels 1-3 (-6) mm long ..... ***C. longii***
9 Petals present, 2-10 mm long; silique 8-21 mm long, plus a 1-3 mm beak, on slender pedicels 10-20 mm long.
10 Petals 5-10 mm long, the tips spreading or ascending; anthers oblong, about 1 mm long; stylar beak of the silique 2-3 mm; mid-cauline and upper cauline leaves cordate, often clasping around the stem or branch; basal leaves with 0-1 pairs of lateral leaflets ..... ***C. rotundifolia***
10 Petals 3-5 mm long, the tips ascending or erect; anthers orbicular, ca. 0.3 mm across; stylar beak of the silique 1-1.5 mm; mid-cauline and upper cauline leaves cuneate, rounded, or truncate (rarely the mid-cauline leaves subcordate, but not clasping); basal leaves with 1-3 pairs of lateral leaflets ..... ***C. micranthera***
6 Cauline leaves 1-ternate or pinnatifid (if 1-ternate, the lateral leaflets about as large as the terminal leaflet).
11 Cauline leaves with 3-5 leaflets; petals 4-10 mm long; plant a perennial.
12 Stem glabrous at base; lower leaves green underneath; petioles auriculate at the base, the auricles 1-5 mm long, acute to acuminate; leaves 3 (-5)-foliolate; siliques 22-40 mm long ..... ***C. clematitis***
12 Stem pubescent at base; lower leaves purple underneath; petioles not auriculate at the base; leaves 3-5-foliolate; siliques 10-25 mm long.
13 Petals 6-9 mm long; stamens shorter than the petals by 1 mm or more; sepals 3-4 mm long; filaments obviously flattened ..... ***C. flagellifera*** *var.* ***flagellifera***
13 Petals 4-6 mm long; stamens equaling to slightly exceeding the petals; sepals 2.5-3.5 mm long; filaments terete to somewhat flattened ..... ***C. flagellifera*** *var.* ***hugeri***
11 Cauline leaves with 7-numerous leaflets; petals 1-4 mm long or absent (8-15 mm long in *C. pratensis* var. *palustris*); plant an annual, biennial, or perennial.
14 Petals 8-15 mm long ..... ***C. pratensis*** *var.* ***palustris***
14 Petals 1-4 mm long or absent.
15 Cauline leaves with prolonged sagittate-auriculate bases, the 13-19 leaflets acuminate ..... ***C. impatiens***
15 Cauline leaves without basal auricles, the 5-15 (-17) leaflets mostly obtuse.
16 Plant with many, persistent basal leaves forming a rosette; stem bases and petioles hirsute ..... ***C. hirsuta***
16 Plant with few or no basal leaves, not forming a rosette; stem bases and petioles glabrous (or sparsely hirsute).
17 Siliques <1 mm wide ..... ***C. debilis***
17 Siliques >1 mm wide.
18 Cauline leaves 2-4 cm long; terminal leaflet similar to the lateral leaflets in size and shape; leaflets neither decurrent along the rachis nor petiolulate; stem glabrous throughout ..... ***C. parviflora*** *var.* ***arenicola***
18 Cauline leaves 4-10 cm long; terminal leaflet broader than the lateral leaflets; leaflets either decurrent along the rachis or petiolulate; stem pubescent at base.
19 Leaflets petiolulate; stems flexuous; [alien weed] ..... ***C. flexuosa***
19 Leaflets decurrent on the rachis; stems typically erect; [native] ..... ***C. pensylvanica***

Cardamine angustata O.E. Schulz, Eastern Slender Toothwort. Pd (DE, GA, NC, SC, VA), Mt (GA, NC, SC, VA, WV), Cp (NC, SC, VA): rich, mesic forests; common (rare in VA Mountains, rare in VA Coastal Plain, rare in DE Piedmont). March-April; April-May. NJ and IN south to n. GA, c. TN, and ne. MS; disjunct in the Ouachita Mountains of AR. Var. *ouachitana* E.B. Smith, alleged to differ from var. *angustata* in its non-ciliate leaves (vs. leaves with margins ciliate with antrorse trichomes 0.1 mm long), is apparently not a valid taxon. [= C, FNA, K, X, Y, Z; = *C. angustata* var. *angustata* – RAB; = *Dentaria heterophylla* Nuttall – F, G, S, W]

Cardamine bulbosa (Schreber ex Muhlenberg) Britton, Sterns, & Poggenburg, Bulbous Bittercress. Cp (DE, GA, NC, SC, VA), Pd (DE, GA, NC, SC, VA), Mt (GA, NC, SC, VA, WV): swampy forests and bogs, primarily (but not strictly) in circumneutral soils over limestone or mafic rocks; common (uncommon in GA, NC, SC, VA, rare in DE Coastal Plain). March-May; April-May. ME west to MB, south to FL, LA, and TX. [= RAB, F, FNA, G, GW, K, S, W, Z; = *C. rhomboidea* (Persoon) A.P. de Candolle – C, X]

Cardamine clematitis Shuttleworth ex A. Gray, Mountain Bittercress. Mt (GA, NC, VA): shaded brookbanks, rock outcrops with seepage, at high elevations (1200m and above); rare. April-May; June-July. Endemic to the high elevation Southern Appalachians of w. NC, e. TN, sw. VA, and ne. GA (Brasstown Bald). [= C, FNA, K, S, W, X, Z; < *C. clematitis* Shuttleworth ex Gray – RAB, F, G, GW (also see *C. flagellifera*)]

Cardamine concatenata (Michaux) O. Schwarz, Cutleaf Toothwort. Mt (GA, NC, SC, VA, WV), Pd (DE, GA, NC, SC, VA), Cp (DE, GA, NC, SC, VA): rich, mesic forests; common (uncommon in DE and VA Coastal Plain). March-May; April-May. ME, QC and MN south to FL Panhandle, LA, OK, and TX. [= RAB, C, FNA, K, X, Y, Z; = *Dentaria laciniata* Muhlenberg ex Willdenow – G, GW, S, W; > *Dentaria laciniata* var. *laciniata* – F; > *D. laciniata* var. *coalescens* Fernald – F]

* ***Cardamine debilis*** D. Don. Cp (GA): disturbed areas; rare, native of Europe. This species is similar to *C. pensylvanica* and *C. flexuosa* and may be overlooked (Rollins 1993, Brown & Marcus 1998). It is reported for e. GA (Jones & Coile 1988). [= K, Z; < *C. flexuosa* Withering – FNA]

Cardamine diphylla (Michaux) A. Wood, Crinkleroot, Toothwort. Mt (GA, NC, VA, WV), Pd (DE, NC): rich, mesic forests; common (rare in DE). April-May; May-June. NB west to MN, south to n. GA, SC, and AL. [= RAB, C, K, X, Y, Z; = *Dentaria diphylla* Michaux – F, G, W; > *Dentaria diphylla* – S; > *Dentaria incisa* Small – S]

Cardamine dissecta (Leavenworth) Al-Shehbaz, Dissected Toothwort. Pd (NC, VA), Mt (GA): rich, mesic forests; rare. March-April; April-May. Al-Shehbaz (1988c) describes the range as separated into four areas: c. AL (3 counties); c. NC and sc.

VA (6 counties); nw. GA, c. TN, and s. KY (18 counties); and se. IN, ne. KY, and s. OH (6 counties). He states that *C. dissecta* is easily distinguished from its relatives "by its glabrous leaves that are divided into filiform to narrowly linear segments." See Al-Shehbaz (1988c) for additional discussion of the systematics, nomenclature, ecology, and distribution of this species. First reported for VA by Wieboldt et al. (1998). [= C, FNA, K, X, Y, Z; = *Cardamine angustata* var. *multifida* (Muhlenberg ex Elliott) Ahles – RAB; = *Dentaria multifida* Muhlenberg ex Elliott – F, G, W; > *Dentaria multifida* – S; > *Dentaria furcata* Small – S; = *Cardamine multifida* (Muhlenberg ex Elliott) Wood]

Cardamine douglassii Britton, Limestone Bittercress, Douglass's Bittercress, Purple Cress, Pink Spring-cress. Pd (NC, VA), Cp (VA), Mt (WV: nutrient-rich, mesic forests, especially alluvial bottomlands, and in nutrient-rich seepages, in NC in the drainages of the Neuse, Meherrin, and (rarely) Cape Fear rivers; uncommon (rare in NC). Mid March-early April; April-May. NY, ON, and MN south to c. NC, sc. TN, AL, and MO. [= RAB, C, F, FNA, G, K, GW, X, Z]

Cardamine flagellifera O.E. Schulz *var.* ***flagellifera***, Large-flowered Blue Ridge Bittercress. Mt (GA, NC, SC, VA), Pd (NC): in seepages, on streambanks, and in moist cove or bottomland forests, mainly at moderate to low elevations; uncommon (rare in GA, SC, VA, and WV). March-May; June-July. *C. flagellifera* is endemic to the Southern Appalachians of w. NC, SC, e. TN, GA, VA, and WV, and is quite distinct from *C. clematitis*, as pointed out by Dudley (1974). Rollins's division of this species into two varieties (following Small's recognition of two species) needs further evaluation. [= K, Z; < *C. flagellifera* – C, FNA, W, X; < *C. clematitis* – RAB, GW; = *C. flagellifera* – S]

Cardamine flagellifera O.E. Schulz *var.* ***hugeri*** (Small) Rollins, Small-flowered Blue Ridge Bittercress. Mt (NC, VA?), Pd (NC): in seepages, on streambanks, and in moist cove or bottomland forests, mainly at moderate to low elevations; rare. March-April; June-July. Endemic to the Southern Appalachians of NC and TN. [= K, Z; < *C. flagellifera* – C, FNA, W, X; < *C. clematitis* – RAB, GW; = *C. hugeri* Small – S]

* ***Cardamine flexuosa*** Withering, Woodland Bittercress. Mt (NC, VA, WV), Cp (NC, VA), Pd (NC, VA): disturbed sites; rare, native of Eurasia. February-May. Lihová et al. (2006) show that Asiatic "*C. flexuosa*" is a distinct taxon from European *C. flexuosa* and will need a new name; at least some of our material is the Asiatic species, whose proper name is unclear (Lihová et al. 2006). Both the European and Asiatic taxa are allotetraploids of unclear parentage. [= RAB, F, K, X, Z; < *C. flexuosa* Withering – FNA]

* ***Cardamine hirsuta*** Linnaeus, Hairy Bittercress. Mt (GA, NC, SC, VA, WV), Pd (DE, GA, NC, SC, VA), Cp (DE, GA, NC, SC, VA): disturbed areas, including fields and gardens; common, native of Europe. February-May (or irregularly earlier in response to mild winter weather). [= RAB, C, F, FNA, G, GW, K, S, W, X, Z]

* ***Cardamine impatiens*** Linnaeus, Narrowleaf Bittercress. Mt (NC, VA, WV), Pd (DE, NC), Cp (DE): alluvial floodplains (in the New River drainage in NC and VA); common (rare in NC and VA), native of Europe. June-July. See Poindexter (2006). [= C, F, K, X, Z]

Cardamine longii Fernald, Long's Bittercress. Cp (DE, NC, VA): tidal freshwater marshes and cypress-gum swamps; rare. June-September. Coastal in distribution, irregularly from ME south to SC (or FL). Difficult to distinguish from depauperate or submerged forms of *C. pensylvanica* with few leaflets; the short style (capsule beak) and short and thick pedicels appear to be the most reliable characteristics. [= C, F, FNA, K, X, Z]

Cardamine micranthera Rollins, Streambank Bittercress, Small-anthered Bittercress. Pd (NC, VA): sand and gravel bars in creeks, swampy floodplain woods, seepage over rocks; rare. April-May; May-June. A narrow endemic, known only from Stokes County, NC and Patrick County, VA; apparently extirpated from Forsyth County, NC. The description and key in RAB are partly in error, being based on the inadequate and unrepresentative material available at the time. *C. micranthera* is most closely related to *C. rotundifolia*, but also shows some affinities to *C. pensylvanica*. It can be distinguished from *C. rotundifolia* by the characters in the key; additionally, *C. micranthera* does not form proliferative branches from the upper nodes, generally branching from the base in vigorous plants, or unbranched in smaller plants. It can be distinguished from *C. pensylvanica* by its predominately simple leaves, especially those on the upper stem, the larger flowers, the petals 3-5 mm long (vs. 1.5-3 mm long), the fruiting pedicels thin, 10-20 mm long, spreading to ascending (vs. thick, 4-10 mm long, ascending). Wieboldt (1992) reasonably speculates that *C. micranthera* may be an in-breeding relative derived from *C. rotundifolia* in the Piedmont/Mountain interface. [= RAB, FNA, K, X, Z]

Cardamine parviflora Linnaeus *var.* ***arenicola*** (Britton) O.E. Schulz, Sand Bittercress. Mt (GA, NC, SC, VA, WV), Pd (DE, GA, NC, SC, VA), Cp (DE, GA, NC, SC, VA): various habitats, primarily seasonally wet areas with shallow soil or sand, also on mafic outcrop glades, as on greenstone, diabase, and nutrient-rich granites; common (rare in DE and WV). March-May. The typic variety is Eurasian; our variety is widespread in e. North America, also occurring in the Pacific Northwest. Our plant may warrant specific status. [= RAB, C, F, K, X, Z; < *C. parviflora* – FNA, G, GW, S, W; = *C. arenicola* Britton – S]

Cardamine pensylvanica Muhlenberg ex Willdenow, Quaker Bittercress. Mt (GA, NC, SC, VA, WV), Pd (DE, GA, NC, SC, VA), Cp (DE, GA, NC, SC, VA): various wet habitats, especially swampy depressions, streambanks, small woodland seeps; common. March-May. NL (Newfoundland), NL (Labrador), NT, and AK south to FL, TX, and CA. [= RAB, C, FNA, G, GW, K, S, W, X, Z; > *C. pensylvanica* var. *pensylvanica* – F; > *C. pensylvanica* var. *brittoniana* Farwell – F]

Cardamine pratensis Linnaeus *var.* ***palustris*** Wimmer & Graebner, American Cuckoo-flower, Lady's-smock. Mt, Cp (VA): bogs and swamps; rare. April-July. Var. *palustris* ranges from Canada south to NJ, VA, OH, IN, MN, and BC. The Eurasian var. *pratensis*, with pink (vs. white) flowers, is introduced in ne. North America and may occur in our area. These two varieties may not be distinguishable; Rollins combines var. *palustris* into var. *pratensis*. [= C, F, G; < *C. pratensis* – FNA; < *C. pratensis* var. *pratensis* – K, Z]

Cardamine rotundifolia Michaux, American Bittercress, Mountain Watercress. Mt (GA?, NC, VA, WV), Pd (DE, NC, VA): seepages, streambanks, swampy depressions; common (rare in DE, NC, and VA). April-May; June-July. Characteristically, *C. rotundifolia* branches from the upper nodes while in flower, the branches rooting down and proliferating

vegetatively. A Central/Southern Appalachian endemic: n. DE, PA, and w. NY, west to OH and KY, south to w. NC and n. GA. [= RAB, C, F, G, GW, K, S, W, X, Z]

Cardamine maxima (Nuttall) Wood, Large Toothwort. NB, ON, and MI south to NJ, PA, OH, WV (?), and KY (?). [= FNA, K, Y, Z; = *C.* ×*maxima* – C; = *Dentaria maxima* Nuttall – F, G]

Chorispora R. Brown ex A.P. de Candolle 1821 (Chorispora)

A genus of 11 species, herbs, of Central Asia and the Middle East. References: Al-Shehbaz in FNA (2010); Rollins (1993)=Z; Al-Shehbaz (1988d)=Y.

* ***Chorispora tenella*** (Pallas) A.P. de Candolle, Chorispora, Blue Mustard. Mt (WV): disturbed areas; rare, native of w. Asia. Well established in the w. United States, and occurs at scattered locations eastward, as in c. and w. TN (Chester, Wofford, & Kral 1997) and s. PA (Rhoads & Klein 1993). [= C, FNA, K, Y, Z]

Coincya Porta & Rigo ex Rouy 1891 (Wallflower-cabbage, Coincya)

A genus of 6 species, of c. and s. Europe and n. Africa. References: Warwick in FNA (2010); Rollins (1993)=Z; Leadlay & Heywood (1990)=Y; Al-Shehbaz (1985b)=X; Naczi & Thieret (1996)=Q.

* ***Coincya monensis*** (Linnaeus) Greuter & Burdet *ssp.* ***recurvata*** (Allioni) Leadlay, Wallflower-cabbage, Coincya. Mt (NC, VA, WV), Cp (DE): roadsides; uncommon (rare in NC and WV), native of Eurasia. May-July. Rollins (1961) discusses the occurrence of this species in w. NC. See Naczi & Thieret (1996) for an excellent discussion of this species' occurrence in North America. [= FNA, K, Q; ? *Brassica erucastrum* – RAB, misidentified; ? *Hutera cheiranthos* (Villars) Gomez-Campo – X; = *C. monensis* ssp. *recurvata* var. *recurvata* – Y, Z; ? *Rhynchosinapis cheiranthos* (Villars) Dandy; ? *C. cheiranthos* (Villars) Greuter & Burdet]

Conringia Adanson 1763 (Hare's-ear Mustard)

A genus of 6 species, herbs, of Europe and the Middle East. References: Warwick in FNA (2010); Rollins (1993)=Z; Al-Shehbaz (1985b)=Y.

* ***Conringia orientalis*** (Linnaeus) Andrzejowski, Hare's-ear Mustard, Treacle Mustard. Cp (NC), Pd (DE, GA, NC, VA), Mt (VA, WV): disturbed areas; rare, native of Eurasia. April-June. [= RAB, C, F, FNA, G, K, S, WV, Y, Z]

Descurainia Webb & Berthelot 1836 (Tansy-mustard, Flixweed)

A genus of ca. 40 species, primarily of North and South America. References: Goodson & Al-Shehbaz in FNA (2010); Rollins (1993)=Z, Al-Shehbaz (1988b)=Y; Detling (1939)=X.

1 Silique 10-25 (-30) mm long, acute to acuminate, the seeds mostly in 1 row ..... ***D. sophia***
1 Silique 5-10 (-13) mm long, obtuse or clavate, the seeds mostly in 2 rows.
  2 Leaves densely gray-canescent; angle between fruiting pedicels and rachis ca. 75 degrees; pedicels glandular-puberulent, 6-12 mm long; plants 2-5 dm tall; [primarily of the Coastal Plain] ..... ***D. pinnata*** *var.* ***pinnata***
  2 Leaves glabrous or glabrescent; angle between fruiting pedicels and rachis ca. 45 degrees; pedicels glabrous, 6-16 mm long; plants 3-7 dm tall; [primarily of the Mountains and Piedmont, rarely weedy in the Coastal Plain].
    3 Stems moderately to densely glandular and pubescent (but not canescent); siliques 5-10 (-12) mm long; pedicels 8-16 mm long ..... ***D. pinnata*** *var.* ***brachycarpa***
    3 Stems sparsely pubescent to glabrous; siliques 8-12 mm long; pedicels 6-12 mm long ..... ***D. pinnata*** *var.* ***intermedia***

Descurainia pinnata (Walter) Britton *var.* ***brachycarpa*** (Richardson) Fernald, Northeastern Tansy-mustard. Mt (VA, WV), Pd (VA), Cp (NC*): dry rocky openings and woodlands; rare. April-August. QC west to NT, south to VA, TN, and TX; introduced in the Coastal Plain of NC. [= C, F, G; = *D. brachycarpa* (Richardson) O.E. Schulz – RAB; = *D. pinnata* ssp. *brachycarpa* (Richardson) Detling – K, X, Y, Z; = *Sophia millefolia* Rydberg – S; < *D. pinnata* – W; > *D. pinnata* var. *brachycarpa* – WV; > *D. pinnata* var. *pinnata* – WV, misidentified; < *D. pinnata* ssp. *brachycarpa* – FNA]

* ***Descurainia pinnata*** (Walter) Britton *var.* ***intermedia*** (Rydberg) C.L. Hitchcock. Cp (SC): waste areas near wool-combing mills; rare, native of w. North America. Also reported for WV (Kartesz 1999). [= *Descurainia pinnata* ssp. *intermedia* (Rydberg) Detling – K, X, Y, Z; = *Sophia intermedia* Rydberg – S; < *D. pinnata* ssp. *brachycarpa* – FNA]

Descurainia pinnata (Walter) Britton *var.* ***pinnata***, Southeastern Tansy-mustard. Cp (GA, NC, SC): open sandy areas, especially roadsides; common. February-May. E. NC south to FL, west to TX and OK. [= C, F, G; = *D. pinnata* – RAB; = *D. pinnata* ssp. *pinnata* – FNA, K, X, Y, Z; = *Sophia pinnata* (Walter) T.J. Howell – S]

* ***Descurainia sophia*** (Linnaeus) Webb ex Prantl, Herb Sophia. Pd (DE, GA, NC, VA), Cp (NC, SC, VA), Mt (VA, WV): disturbed areas; rare, native of Eurasia. April-August. [= RAB, C, F, FNA, G, K, WV, X, Y, Z; = *Sophia sophia* (Linnaeus) Britton – S]

Diplotaxis A.P. de Candolle 1821 (Wall-rocket)

A genus of ca. 30 species, herbs, of Eurasia and Africa. References: Martínez-Laborde in FNA (2010); Rollins (1993)=Z; Al-Shehbaz (1985b)=Y.

1 Leaves mostly basal or very low-cauline; plant annual or biennial; siliques lacking a gynophore (stipe) between the sepal scars and the base of the valves; [section *Anocarpum*]..... ***D. muralis***
1 Leaves mostly cauline; plant perennial, becoming somewhat woody at the base; siliques with a 0.5-2 mm gynophore (stipe) between the sepal scars and the base of the valves; [section *Diplotaxis*]..... ***D. tenuifolia***

* ***Diplotaxis muralis*** (Linnaeus) A.P. de Candolle, Annual Wall-rocket, Sand-rocket, Stinking Wall-rocket. Cp (VA): disturbed areas; rare, native of Europe. June-September. The report of this species for NC by Ahles & Radford (1959) was based on a misidentification of *Coincya muralis* (Naczi & Thieret 1996). [= C, F, FNA, G, K, S, Y, Z]
* ***Diplotaxis tenuifolia*** (Linnaeus) A.P. de Candolle, Perennial Wall-rocket, Flixweed. Cp (DE, VA), Pd (VA): disturbed areas, ballast; rare, native of Europe. July-October. [= C, F, FNA, G, K, S, Y, Z]

Draba Linnaeus 1753 (Draba, Whitlow-grass)

A genus of about 350 species, herbs, of Northern Hemisphere and Andean South America, particularly in arctic and alpine habitats. Molecular phylogenetic studies show that *Erophila* should be included in *Draba* (Koch & Al-Shehbaz 2002). References: Al-Shehbaz, Windham, & Elven in FNA (2010); Rollins (1993)=Z; Al-Shehbaz (1987)=Y; Koch & Al-Shehbaz (2002).

1 Leaves all basal; petals deeply bifid (about 1/2 way to base)..... ***D. verna***
1 Leaves basal and cauline (the basal sometimes withering by fruiting); petals merely emarginate.
2 Silique twisted; petals 5-6 mm long; styles conspicuous, 1.5-3 mm long; perennial; [on calcareous rock outcrops]..... ***D. ramosissima***
2 Silique not twisted; petals 0-5 mm long; styles absent to inconspicuous, 0-0.25 mm long; winter-annuals; [mostly in open situations in sandy or clayey soils, not over limestone].
3 Silique 1-6 mm long; leaves extending upward into the lower branches of the inflorescence.
4 Pubescence of the lower leaves of stalked cruciform trichomes; siliques densely pubescent; fruiting branches congested, mostly < 1 cm long and appearing almost glomerate; seeds 4-8 per silique, each 1.0-1.5 mm long ..... ***D. aprica***
4 Pubescence of the lower leaves of sessile cruciform trichomes; siliques glabrous; fruiting branches elongate; seeds 8-15 per silique, each 0.5-0.8 mm long ..... ***D. brachycarpa***
3 Silique 8-14 mm long; leaves low-cauline, not extending upward into the lower branches of the inflorescence.
5 Inflorescence congested, the fruiting portion ca. 1.5 cm long; trichomes of the upper leaf surface simple or once-forked; pedicels glabrous..... ***D. reptans***
5 Inflorescence not congested, the fruiting portion mostly > 2.5 cm long; trichomes of the upper leaf surface dendritic; pedicels pubescent.
6 Silique ca. 3-6× as long as wide, 5-15 mm long, 1.2-2.2 (-2.8) mm wide, pubescent with simple or branched trichomes..... ***D. cuneifolia*** *var.* ***cuneifolia***
6 Silique ca. 2× as long as wide, 5-8 mm long, 2.5-3.7 mm wide, pubescent with simple trichomes ..... ***D. platycarpa***

Draba aprica Beadle, Flatrock Draba, Open-ground Whitlow-grass, Sun-loving Draba, Granite Whitlow-wort. Pd (GA, SC), Mt (GA): shallow soils around and under *Juniperus virginiana* on granitic flatrocks and amphibolite outcrops; rare. March-April; April-May. Ozark highlands of AR, MO, and OK; disjunct on granitic flatrocks in SC and GA. [= RAB, FNA, G, K, S, W, Y, Z]

Draba brachycarpa Nuttall ex Torrey & A. Gray, Short-fruited Draba. Pd, Cp (GA, NC, SC, VA), Cp (GA): granitic flatrocks, open places (fields, roadsides, woodland margins, disturbed areas); uncommon. February-April; March-May. VA west to IN and KS, south to FL and TX. [= RAB, C, F, FNA, G, K, S, W, Y, Z]

Draba cuneifolia Nuttall ex Torrey & A. Gray *var.* ***cuneifolia***. Cp (AL, GA, ?*NC, ?*SC): open blackland prairies, preferring rocky, bare soil, also waste areas around wool-combing mills, possibly other habitats; rare, in NC and SC perhaps only native of further west. February-March; March-April. All three varieties are primarily distributed in sw. United States, but the species extends as a native at least as far east as c. GA (Houston County) (Echols 2007) and AL, where it occurs in prairies and on limestone outcrops (Diamond & Woods 2009). [= FNA, K, Z; < *D. cuneifolia* – RAB, C, F, G, S]

Draba platycarpa Torrey & A. Gray. Cp (SC): waste areas around wool-combing mill; rare, perhaps not established, native of w. North America. [= FNA, K, Z]

Draba ramosissima Desvaux, Rocktwist, Appalachian Draba. Mt (NC, VA), Pd (VA): in crevices of rock outcrops, or in dry talus slopes, over a variety of rock types (including limestone, dolostone, schist, gneiss, shale); common (uncommon in NC and WV Moungtains, rare in NC and VA Piedmont). April-May; May-July. W. MD and e. WV south through w.VA and e. KY south to w. NC and e. TN. [= RAB, FNA, K, S, W, WV, Z]

Draba reptans (Lamarck) Fernald. Pd (NC), Cp (SC): dry soil; rare. February-March; March-April. MA and ON west to WA, south to NC, GA, TX and CA. The few occurrences in our area seem to make little ecological or phytogeographic sense; they may represent introductions. The first collection in our area was, however, by Walter. [= RAB, FNA, K, Z; > *D. reptans* var. *reptans* – C, F, G; > *D. caroliniana* Walter – S]

* ***Draba verna*** Linnaeus, Whitlow-grass Cp (DE, NC, SC, VA), Pd (DE, GA, NC, SC, VA), Mt (GA, NC, SC, VA, WV): disturbed areas, especially in dry, barren soils, including granitic flatrocks; common (uncommon in DE), native of Europe. February-April; March-May. [= RAB, C, FNA, K, S, W, WV, Z; > *D. verna* var. *verna* – F, G; > *D. verna* var. *boerhaavii* van Hall – F, G; = *Erophila verna* (Linnaeus) Besser]

Eruca P. Miller 1754 (Rocket-salad, Arugula)

A monotypic genus, an annual herb, native to Mediterranean Europe. References: Warwick in FNA (2010); Rollins (1993)=Z; Al-Shehbaz (1985b)=Y.

* ***Eruca vesicaria*** (Linnaeus) Cavanilles *ssp.* ***sativa*** (P. Miller) Thellung, Garden Rocket, Rocket-salad, Arugula. Pd (NC), Mt (WV): cultivated as a salad green, persistent around gardens or occurring as a waif; rare, native of Mediterranean Europe. [= FNA, K, Y, Z; = *E. sativa* P. Miller – C, F, WV; < *E. vesicaria* – G; < *E. eruca* (Linnaeus) Ascherson & Graebner – S]

Erucastrum K.B. Presl 1826 (Dog-mustard)

A genus of ca. 22 species, herbs, of Africa, Europe, and Arabia. References: Warwick in FNA (2010); Rollins (1993)=Z; Luken, Thieret, & Kartesz (1993); Al-Shehbaz (1985b)=Y.

* ***Erucastrum gallicum*** (Willdenow) O.E. Schulz, Dog-mustard, Rocket-weed, French Rocket. Mt (NC?, SC, VA, WV), Pd (DE): disturbed areas; rare, native of Europe. April-September. Luken, Thieret, and Kartesz (1993) discuss the introduction and spread of *E. gallicum* in North America. While only weakly naturalized in our area, *E. gallicum* seems likely to increase in abundance. The report of *Brassica erucastrum* for NC in RAB is apparently based on material of *Coincya muralis* (Naczi & Thieret (1996). [= C, F, FNA, G, K, Y, Z; = *Brassica erucastrum* Linnaeus]

Erysimum Linnaeus 1753 (Wallflower, Treacle Mustard)

A genus of ca. 150-180 species, of the Northern Hemisphere. References: Al-Shehbaz in FNA (2010); Al-Shehbaz (1988d)=Y; Rollins (1993)=Z.

1 Petals 13-25 (-30) mm long, 4-11 (-13) mm wide; seeds 2-3 mm long; biennial or perennial; [native, usually in thin rocky soil] ..... ***E. capitatum*** *var.* ***capitatum***

1 Petals 3.5-10 mm long, 1.5-3 mm wide; seeds ca. 1 mm long; annual or biennial; [introduced, usually in disturbed situations].

2 Sepals 1.8-3.5 mm long; petals 3.5-5.5 mm long; fruits (1-) 1.5-2.5 (-4) cm long; pedicels slender (much narrower than the fruit), 5-13 (-16) mm long ..... ***E. cheiranthoides***

2 Sepals 4.5-6 mm long; petals 6-9 (-11) mm long; fruits (2-) 3-8 (-10) cm long; pedicels thick (as wide as the fruit or nearly so), 2-9 (-15) mm long.

3 Biennial or perennial; fruit 3-5.8 (-7) cm long; fruiting pedicel somewhat narrower than the fruit ..... ***[E. inconspicuum]***

3 Annual; fruit (2-) 3-8 (-10) cm long; fruiting pedicel as wide as the fruit ..... ***E. repandum***

Erysimum capitatum (Douglas ex Hooker) E.L. Greene *var.* ***capitatum***, Western Wallflower. Mt (VA, WV): shale barrens and shale woodlands of Alleghany and Bath counties, VA, and Grant and Pendleton counties, WV; rare. April-July; June-August. Rollins (1993) interprets *E. capitatum* as including five varieties, all but the typic restricted to the Great Plains and west. Though most floras (including C, F, and G) give the impression that *Erysimum* is not native east of IL, MO, and AR ("rarely adventive farther east along railroads"), this taxon is native and relictual in w. VA, e. WV (Grant and Pendleton counties), as well as in ec. TN (Chester, Wofford, & Kral 1997). [= FNA, K, Z; = *E. asperum* var. *asperum* – C, misapplied; > *E. arkansanum* Nuttall – F; < *E. asperum* – G, misapplied; < *Cheirinia aspera* (Nuttall) Britton – S, misapplied; = *Erysimum capitatum* ssp. *capitatum* – Y]

* ***Erysimum cheiranthoides*** Linnaeus, Wormseed Mustard. Pd (DE, VA), Mt (NC, VA, WV), Cp (VA): disturbed areas; uncommon (rare in DE), native of Eurasia. June-July; July-August. [= RAB, C, F, FNA, G, K, W, WV, Y, Z; = *Cheirinia cheiranthoides* (Linnaeus) Link – S]

* ***Erysimum repandum*** Linnaeus, Treacle Mustard, Bushy Wallflower. Cp (NC, VA), Pd (NC, VA), Mt (NC, VA, WV): disturbed areas; uncommon, native of Eurasia. April-May; May-July. [= RAB, C, F, FNA, G, K, WV, Y, Z; = *Cheirinia repanda* (Linnaeus) Link – S]

* *Erysimum inconspicuum* (S. Watson) MacMillan, Shy Wallflower. NS, QC, YT, and AK, south to MD, PA, AR, OK, CO, UT, NV, and OR. [= F, FNA, G; = *E. inconspicuum* var. *inconspicuum* – K, Z; < *E. inconspicuum* – C, Y; = *E. inconspicuum* – F, FNA, G]

Hesperis Linnaeus 1753 (Dame's Rocket)

A genus of ca. 25 species, herbs, of Eurasia and n. Africa. References: Al-Shehbaz in FNA (2010); Al-Shehbaz (1988d)=Y; Rollins (1993)=Z.

* ***Hesperis matronalis*** Linnaeus, Dame's Rocket. Mt (NC, VA, WV), Pd (DE, VA), Cp (DE, VA), {GA}: bottomlands, roadsides, moist forests; common (uncommon in VA Piedmont, rare in Coastal Plain), native of Europe. April-August. The flowers are white or pink. [= RAB, C, F, FNA, G, K, S, W, WV, Y, Z]

Iberis Linnaeus 1753 (Candytuft)

A genus of ca. 40 species, herbs, of Eurasia and n. Africa. References: Al-Shehbaz in FNA (2010); Rollins (1993)=Z.

* ***Iberis amara*** Linnaeus, Annual Candytuft. Mt (WV): disturbed areas; rare, native of Europe. June-August. Reported from PA, WV, and KY (Kartesz 1999). [= C, FNA, K, Z]

* *Iberis sempervirens* Linnaeus, Evergreen Candytuft, is reported for NC and TN by Kartesz (1999), but the specimens he cites are from cultivated material. [= FNA, K] {rejected; not keyed}

Iodanthus Torrey & A. Gray 1840 (Purple Rocket)

A monotypic genus, a perennial herb, of e. North America. References: Al-Shehbaz in FNA (2010); Al-Shehbaz (1988a)=Y; Rollins (1993)=Z.

Identification notes: *Iodanthus pinnatifidus* somewhat resembles *Hesperis matronalis* in overall appearance, but differs in the following ways: petals 10-13 mm long (vs. 20-25 mm long), siliques 2-4 cm long (vs. 5-10 cm long), pubescence of the lower stem of simple trichomes (vs. branched trichomes).

Iodanthus pinnatifidus (Michaux) Steudel, Purple Rocket. Mt (WV): rich forests of bottomlands and lower slopes; rare. May-June. W. PA west to MN and IA, south through WV and e. and c. TN to AL and TX. [= C, F, FNA, G, K, S, WV, Y, Z]

Isatis Linnaeus 1753 (Woad)

A genus of about 50 species, herbs, of Eurasia and n. Africa. References: Al-Shehbaz in FNA (2010); Rollins (1993)=Z.

* ***Isatis tinctoria*** Linnaeus, Woad. Mt (VA, WV), Pd (VA): disturbed areas; uncommon (rare in WV), native of Eurasia. April-June. Formerly cultivated as an important source of a blue dye. [= C, F, FNA, G, K, W, WV, Z]

Leavenworthia Torrey 1837 (Glade Cress)

A genus of 8 species, annual herbs, endemic to e. North America. References: Al-Shehbaz & Beck in FNA (2010: Al-Shehbaz (1988a)=Y; Rollins (1993)=Z. Key adapted from Rollins (1993).

1 Petals entire, white, < 7 mm long; leaf lobes deeply dentate, the terminal lobe only slightly larger than the larger lateral lobes ..... ***L. uniflora***
1 Petals deeply to shallowly emarginate (notched at the tip), yellow, white, or lavender, 7-15 mm long; leaf lobes entire to shallowly dentate, the terminal lobe markedly larger than the largest lateral lobes.
  2 Siliques conspicuously torulose (constricted between the seeds), even when young ..... ***L. torulosa***
  2 Siliques not torulose (constricted between the seeds) (or slightly so in *L. stylosa*).
    3 Petals 7-10 mm long, shallowly emarginate; style 1-3 mm long; siliques flat; [of AL, GA, KY, and TN].
      4 Petals yellow; [of AL and TN] ..... ***L. exigua*** *var.* ***lutea***
      4 Petals white to pale lavender; [of KY, TN, and nw. GA].
        5 Styles 1-2 mm long; sepals pale lavender; [of TN and nw. GA] ..... ***L. exigua*** *var.* ***exigua***
        5 Styles 2-3 mm long; sepals green; [of KY] ..... ***L. exigua*** *var.* ***laciniata***
    3 Petals 10-16 mm long, deeply emarginate; styles 2.5-7 mm long; siliques thick or flat; [of AL and TN].
      6 Siliques thin, flat; styles 1.5-5.5 mm long; petals white to lavender; [of n. AL].
        7 Styles 2-5.5 mm long; mature siliques cuneate at the base and acute at the tip; [of Colbert, Franklin, and Lawrence counties, AL] ..... ***L. alabamica*** *var.* ***alabamica***
        7 Styles 1.5-2 (-3) mm long; mature siliques rounded at the basea nd at the tip; [of Morgan County, AL] ..... ***L. alabamica*** *var.* ***brachystyla***
      6 Siliques thick, fleshy; styles 2.5-7 mm long; petals yellow, white, or lavender; [of n. AL and c. TN].
        8 Siliques 12-15 mm long, 3-4 mm wide; seeds slightly elongate, cleft at one side of the long axis; [of Sumner, Smith, Wilson, Davidson, Rutherford, Bedford, and Maury counties, TN] ..... ***L. stylosa***

8 Siliques 6-12 mm long, 4-5 mm wide; seeds orbicular, cleft at the basal end; [of Lawrence and Morgan counties, AL].
9 Siliques 6-10 mm long; styles 3-6 mm long; petals white to yellow, 10-13 mm long; [of Lawrence and Morgan counties, AL] ... . ***L. crassa*** *var.* ***crassa***
9 Siliques 8-12 mm long; styles 1.5-3.5 mm long; petals yellow, 9-11 mm long; [of Morgan County, AL]..... ..... ***L. crassa*** *var.* ***elongata***

Leavenworthia alabamica Rollins *var.* ***alabamica***. Limestone glades. March-April. Endemic to n. AL (Colbert, Franklin, and Lawrence counties). [= K, Y, Z; < *L. alabamica* – FNA]

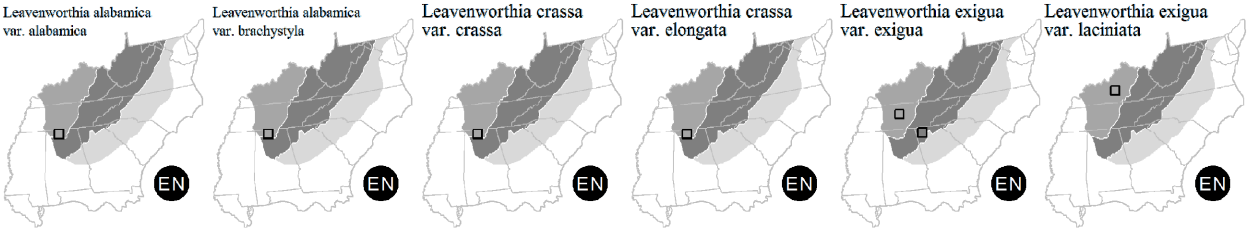
Leavenworthia alabamica Rollins *var.* ***brachystyla*** Rollins. Limestone glades, other calcareous sites. March-May. Endemic to n. AL (Morgan County). [= K, Y, Z; < *L. alabamica* – FNA]

Leavenworthia crassa Rollins *var.* ***crassa***. Limestone glades, disturbed calcareous soils nearby. March-May. Endemic to n. AL (Lawrence and Morgan counties). [= K, Y, Z; < *L. crassa* – FNA]

Leavenworthia crassa Rollins *var.* ***elongata*** Rollins. Limestone glades, disturbed calcareous soils nearby. March-April. Endemic to n. AL (Morgan County). [= K, Y, Z; < *L. crassa* – FNA]

Leavenworthia exigua Rollins *var.* ***exigua***. Limestone glades, disturbed calcareous sites nearby. Endemic to the Central Basin of c. TN (8 counties) (Chester, Wofford, & Kral 1997), western Highland Rim (Decatur and Perry counties), and the Ridge and Valley of nw. GA (Walker and Catoosa counties). [= K, Y, Z; < *L. exigua* – FNA]

Leavenworthia exigua Rollins *var.* ***laciniata*** Rollins. Limestone glades, disturbed calcareous sites nearby. April. Endemic to the Western Highland Rim and w. Knobs of c. KY (Bullitt and Jefferson counties). [= C, K, Y, Z; < *L. exigua* – FNA]

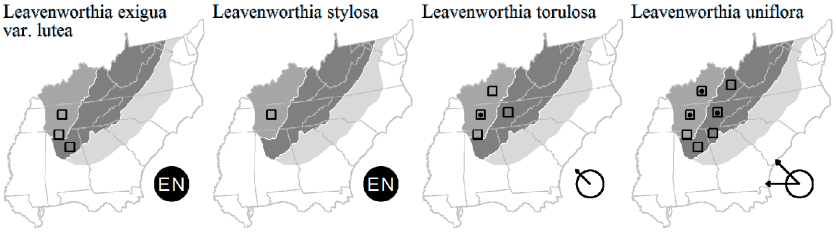


Leavenworthia exigua Rollins *var.* ***lutea*** Rollins. Limestone glades, disturbed calcareous sites nearby. March-April. Endemic to the Central Basin of n. AL (Jefferson County) and c. TN (Bedford and Maury counties) (Chester, Wofford, & Kral 1997). [= K, Y, Z; < *L. exigua* – FNA]

Leavenworthia stylosa A. Gray. Limestone glades, disturbed calcareous sites nearby. March-April. Endemic to the Central Basin of c. TN (Sumner, Smith, Wilson, Davidson, Rutherford, Bedford, and Maury counties) (Chester, Wofford, & Kral 1997). [= FNA, K, S, Y, Z]

Leavenworthia torulosa A. Gray. Limestone glades, disturbed calcareous sites nearby. March-April. Endemic to the Central Basin of c. TN (10 counties), the Ridge and Valley of e. TN (Bradley and Meigs counties), and the Western Highland Rim of KY (Logan, Simpson, Todd, and Warren counties). [= C, F, FNA, G, K, S, Y, Z]

Leavenworthia uniflora (Michaux) Britton. Limestone glades, disturbed calcareous sites nearby. Endemic to the Central Basin of c. TN (8 counties), the Ridge and Valley of e. TN (Hamilton, Meigs, Bledsoe, and Knox counties), nw. GA (Walker and Murray counties), and c. KY (15 counties). [= C, F, FNA, G, K, S, Y, Z]



Lepidium Linnaeus 1753 (Pepperwort, Peppergrass, Pepperweed)

A genus of ca. 220 species, herbs, cosmopolitan. Al-Shehbaz, Mummenhof, & Appel (2002) discuss the inclusion of *Cardaria* and *Coronopus* in *Lepidium*. References: Al-Shehbaz & Gaskin in FNA (2010); Rollins (1993)=Z; Al-Shehbaz (1986a, 1986b)=Y; Al-Shehbaz, Mummenhof, & Appel (2002)=X.

section *Lepidium*: perfoliatum, graminifolium
section *Cardamon*: sativum
section *Lepia*: campestre
section *Dileptium*: austrinum, densiflorum, oblongum, virginicum ssp. virginicum
??: didymum, draba, ruderale, africanum, bonariense, lasiocarpum, schinzii, coronopus

1Upper cauline leaves perfoliate or sagittate.
1

* ***Lepidium campestre*** (Linnaeus) R. Brown, Field Pepperwort, Cow Cress, Field Cress. Pd (DE, GA, NC, VA), Mt (GA, NC, VA, WV), Cp (DE, NC, SC, VA): disturbed areas; common, native of Europe. March-June. [= RAB, C, F, FNA, G, K, W, WV, S, Y, Z; = *Neolepia campestre* (Linnaeus) W.A. Weber]

* ***Lepidium densiflorum*** Schrader, Prairie Pepperweed, Green-flowered Peppergrass. Mt (WV), Cp (DE), Pd (DE), {NC, SC, VA}: disturbed areas; uncommon (rare in NC, SC, VA, and WV), native of w. North America. May-June. [= C, F, FNA, G, S, WV; > *L. densiflorum* var. *densiflorum* – K, Y, Z]

* ***Lepidium didymum*** Linnaeus, Wart-cress, Lesser Swine-cress. Cp (DE, GA, NC, SC, VA), Pd (DE, GA, NC, SC, VA), Mt (VA, WV): fields, roadsides, disturbed areas; common (rare in VA and WV Mountains, rare in DE), native of South America. [= FNA, X; = *Coronopus didymus* (Linnaeus) Smith – RAB, C, F, G, K, Y, Z; = *Carara didyma* (Linnaeus) Britton – S]

* ***Lepidium draba*** Linnaeus, Hoary Cress. Cp (DE, VA), Mt (WV): disturbed areas; uncommon (rare in VA), native of Eurasia. April-August. Reported for VA by Harvill et al. (1992). Al-Shehbaz (1986) discusses 2 subspecies of *L. draba* (as *Cardaria draba*). [= FNA; = *L. draba* ssp. *draba* – X; = *Cardaria draba* (Linnaeus) Desvaux – C, F, G, Z; = *Cardaria draba* ssp. *draba* – K, Y]

* ***Lepidium perfoliatum*** Linnaeus, Perfoliate Pepperwort, Clasping Pepperweed, Shieldcress. Cp (NC), Pd (GA, NC), Mt (WV), {SC, VA}: disturbed areas; rare, native of Europe. April-May. [= RAB, C, F, FNA, G, K, Y, Z]

* ***Lepidium ruderale*** Linnaeus, Narrowleaf Pepperwort, Stinking Pepperweed. Cp (DE, NC, VA), Pd (DE, VA), Mt (WV): disturbed areas; common (rare in NC, VA, and WV), native of Europe. April-June. [= RAB, C, F, FNA, G, K, S, Y, Z]

* ***Lepidium sativum*** Linnaeus, Garden Cress. Cp (DE), Pd (DE): disturbed areas; common. Reported for scattered locations in sc. and se. PA (Rhoads & Klein 1993) and VA (K based on Massey 1961). May-August. [= C, F, FNA, G, K, Z]

Lepidium virginicum Linnaeus *ssp.* ***virginicum***, Poor Man's Pepper. Cp (DE, GA, NC, SC, VA), Pd (DE, GA, NC, SC, VA), Mt (GA, NC, SC, VA, WV): disturbed areas; common. April-June (and sporadically later). *L. virginicum* var. *virginicum* is widespread in e. and c. North America; also introduced in various places elsewhere in the world. Rollins (1993) interprets *L. virginicum* as having seven additional varieties, all in western North America and Central America. For North America, FNA recognizes two subspecies, a course followed here. [= FNA; = *L. virginicum* var. *virginicum* – C, G, K, Y, Z; < *L. virginicum* – RAB, F, S, W, WV]

* ***Lepidium africanum*** (Burmann f.) A.P. de Candolle, African Pepperwort. Waif around wool-combing mills in Coastal Plain of SC; there appears to be little evidence that it is established in our area. For further information and keys, see Rollins (1993) and Al-Shehbaz (1986). [= K, Y, Z]

* ***Lepidium austrinum*** Small, Southern Pepperwort. Waif around wool-combing mills in Coastal Plain of SC; there appears to be little evidence that it is established in our primary area. March-June. Also reported from MS (Bryson 1991, FNA). For further information and keys, see Rollins (1993) and Al-Shehbaz (1986). [= FNA, K, Y, Z]

* ***Lepidium bonariense*** Linnaeus, Argentinian Pepperwort. Waif around wool-combing mills in Coastal Plain of SC; there appears to be little evidence that it is established in our area. For further information and keys, see Rollins (1993) and Al-Shehbaz (1986). [= K, Y, Z]

* *Lepidium coronopus* (Linnaeus) Al-Shehbaz. {AL, FL, TN}; disturbed areas; rare, native of Europe. [= FNA; > *Lepidium squamatum* Forsskål – X; > *Coronopus squamatus* (Forsskål) Ascherson – C, K; > *Coronopus procumbens* Gilibert – F, G; = *Carara coronopus* (Linnaeus) Medikus – S]

* *Lepidium graminifolium* Linnaeus, Grassleaf Pepperwort. Introduced, especially on ballast, south to MD, PA. April-June. [= K, Y, Z]

* ***Lepidium lasiocarpum*** Nuttall *ssp.* ***lasiocarpum***. Waif around wool-combing mills in Coastal Plain of SC; there appears to be little evidence that it is established in our area. March-June. For further information and keys, see Rollins (1993) and Al-Shehbaz (1986). [= FNA; = *L. lasiocarpum* var. *lasiocarpum* – K, Z; < *L. lasiocarpum* – Y]

* ***Lepidium oblongum*** Small. Waif around wool-combing mills in Coastal Plain of SC; there appears to be little evidence that it is established in our area. For further information and keys, see Rollins (1993) and Al-Shehbaz (1986). [= FNA, Y; > *L. oblongum* var. *oblongum* – K, Z]

* ***Lepidium schinzii*** Thellung. Waif around wool-combing mills in Coastal Plain of SC; there appears to be little evidence that it is established in our area. For further information and keys, see Rollins (1993) and Al-Shehbaz (1986). [= Y, Z]

Lobularia Desvaux 1815 (Sweet Alyssum)

A genus of 4 species, herbs, of Eurasia and Macaronesia. References: Borgen in FNA (2010); Rollins (1993)=Z; Al-Shehbaz (1987)=Y.

* ***Lobularia maritima*** (Linnaeus) Desvaux, Sweet Alyssum. Pd (VA), Cp (DE, NC, VA), Mt (WV): disturbed areas, lawns; rare, native of Europe. June-November. The NC occurrences are doubtfully established, from gardens and a "lawn." [= C, F, FNA, G, K, Y, Z]

Lunaria Linnaeus 1753 (Honesty)

A genus of 3 species, biennial herbs, of Europe. References: Al-Shehbaz in FNA (2010); Rollins (1993)=Z; Al-Shehbaz (1987)=Y. Key based on Z.

1 Upper cauline leaves coarsely and irregularly dentate, the teeth acute to obtuse, sometimes with a mucro or short linear tip < 0.5 mm long; siliques broadly rounded at both ends (when mature – young siliques may be cuneate and acute); plant annual or biennial..... ***L. annua***

1 Upper cauline leaves spinulose-dentate, the teeth acuminate and usually with a linear tip > 0.5 mm long; siliques cuneate at the base, acute at the tip; plant perennial ..... ***[L. rediviva]***

* ***Lunaria annua*** Linnaeus, Annual Honesty, Silver-dollar. Cp (DE, VA), Pd (DE, VA), Mt (NC, VA, WV) {GA}: escaped from cultivation around gardens, not usually persistent; uncommon (rare in GA, NC, VA, and WV), native of se. Europe. April-June. [= C, F, FNA, G, K, Z]

* *Lunaria rediviva* Linnaeus, Perennial Honesty. Mt (VA): cultivated ornamental, perhaps persistent around gardens; rare, native of Europe. Reported for VA by Kartesz (1999), on the basis of a specimen at VPI. April-June. [= C, F, FNA, G, K, Z]

Matthiola W.T. Aiton 1812 (Stock)

A genus of about 50 species, herbs, mainly of Eurasia and Africa. References: Al-Shehbaz in FNA (2010); Rollins (1993)=Z.

* ***Matthiola incana*** (Linnaeus) R. Brown, Stock. Cp (NC): disturbed dunes, sandy fields, vacant lots; rare, native of Europe. Reported for the Buxton area, Dare County, NC, by Burk (1961). [= FNA, K, Z]

Microthlaspi F.K. Meyer 1973 (Penny-cress)

A genus of 4 species, annual herbs, of Europe, Asia, and n. Africa. Mummenhoff & Koch (1994) and Meyer (1973, 1979) discuss the reasons for separating *Microthlaspi* from *Thlaspi*. References: Al-Shehbaz in FNA (2010); Rollins (1993)=Z; Thieret & Baird (1985)=Y; Mummenhoff & Koch (1994)=X; Al-Shehbaz (1986)=V.

* ***Microthlaspi perfoliatum*** (Linnaeus) F.K. Meyer, Perfoliate Penny-cress, Thoroughwort Penny-cress. Pd (DE, NC, VA), Mt (NC, VA, WV), Cp (VA): fields, disturbed areas; common (uncommon in WV, rare in NC, rare in DE, rare in VA Coastal Plain), native of Europe. March-April; April-May. [= FNA, K, X; = *Thlaspi perfoliatum* Linnaeus – RAB, C, F, G, V, W, WV, Y, Z]

Myagrum Linnaeus 1753

A genus of 1 species, an annual herb, native of s. Europe and sw. Asia. References: Al-Shehbaz in FNA (2010).

Myagrum perfoliatum Linnaeus. {VA}; {habitat}; rare, native of s. Europe. [= FNA]

Nasturtium R. Brown 1812 (Watercress)

A genus of 5 species, perennial herbs, of Eurasia, n. Africa, and North America. Al-Shehbaz & Price (1998) summarize the reasons for separating *Nasturtium* from *Rorippa*; Franzke et al. (1998) provide corroboration based on molecular analysis. References: Al-Shehbaz in FNA (2010); Rollins (1993)=Z; Stuckey (1972)=Y; Green (1962)=X; Al-Shehbaz & Price (1998)=V; Al-Shehbaz (1988a)=Q; Franzke et al. (1998).

1 Petioles of emergent leaves lacking auricles toward the base; seeds yellowish-brown, finely reticulate, with 400-500 polygonal depressions on each side ..... ***N. floridanum***
1 Petioles of emergent leaves auriculate toward the base; seeds reddish-brown, rather coarsely reticulate, with 25-150 (-175) polygonal depressions on each side.
  2 Mature siliques 1-1.5 mm wide, terete or subterete; seeds in 1 row in each locule of the silique; seeds with (75-) 100-150 (-175) polygonal depressions on each side ..... ***N. microphyllum***
  2 Mature siliques (1.8-) 2-3 mm wide, flattened; seeds in 2 rows in each locule of the silique; seeds with 25-50 (-60) polygonal depressions on each side ..... ***N. officinale***

Nasturtium floridanum (Al-Shehbaz & Rollins) Al-Shehbaz & R.A. Price, Florida Watercress. Cp (FL): spring runs, blackwater bottomlands; rare. March-May. Ne. FL and e. Panhandle FL south to s. FL; endemic to FL, but north to counties adjacent to se. GA. [= FNA, V; = *Rorippa floridana* Al-Shehbaz & Rollins – K, WH, Z; < *Nasturtium microphyllum* Boenninghausen ex Reichenbach – GW, misapplied; *Nasturtium stylosum* Shuttleworth ex O.E. Schulz] {synonymy incomplete}

* ***Nasturtium microphyllum*** Boenninghausen ex Reichenbach, Narrow-fruited Watercress. Mt (NC, VA): streams, springs; rare, native of Europe. See Green (1962) for additional information. [= FNA, V; = *Rorippa microphylla* (Boenninghausen ex Reichenbach) Hylander ex Löve & Löve – C, K, Q, X, Z; < *Nasturtium officinale* – RAB, G, W; = *Nasturtium officinale* R. Brown var. *microphyllum* (Boenninghausen ex Reichenbach) Thellung – F]

* ***Nasturtium officinale*** R. Brown, Watercress. Mt (GA, NC, SC, VA, WV), Pd (DE, GA, NC, SC, VA), Cp (DE, FL, GA, NC, SC, VA): streams, springs, seepages; common (uncommon in DE, FL, GA, NC, and SC), native of Eurasia. April-July. [= FNA, GW, V, WV; = *Rorippa nasturtium-aquaticum* (Linnaeus) Hayek – C, K, Q, WH, X, Z; < *Nasturtium officinale* – RAB, G, W (also see *N.*

microphyllum); > *Nasturtium officinale* var. *officinale* – F; > *Nasturtium officinale* var. *siifolium* (Reichenbach) W.D.J. Koch – F; = *Sisymbrium nasturtium-aquaticum* Linnaeus – S]

Orychophragmus Bunge 1833 (Purple-mistress)

A genus of 7 species, herbs, of s. Europe and n. Africa. References: Al-Shehbaz in FNA (2010); Rollins (1993)=Z.

* ***Orychophragmus violaceus*** (Linnaeus) O.E. Schulz, Purple-mistress. Pd (VA): disturbed areas; rare, native of Mediterranean Europe. March-May. Introduced and apparently well established in and around Richmond, VA; originally reported as *Moricandia arvensis* (Rollins 1993), a misidentification. [= FNA; >< *Moricandia arvensis* (Linnaeus) A.P. de Candolle – K, Z, misidentification]

Paysonia O'Kane & Al-Shehbaz 2002 (Bladderpod)

A genus of 8-9 species, herbs, endemic to southeastern United States. O'Kane & Al-Shehbaz (2002) clearly show that *Paysonia* is not a part of *Lesquerella*, which itself is included within *Physaria*. References: O'Kane in FNA (2010); Rollins (1993)=Z; Rollins & Shaw (1973)=Y; O'Kane & Al-Shehbaz (2002)=X; Al-Shehbaz (1987)=V. Key adapted from X and Z.

1 Cauline leaves cuneate or petiolate at the base, not auriculate; flowers yellow ..... *[see **Physaria**]*
1 Cauline leaves expanded at the base, usually auriculate; flowers yellow or white.
  2 Siliques strongly compressed parallel to the plane of the septum, orbicular; valves pubescent with a mixture of large, simple, bulbous-based trichomes and smaller branched trichomes; flowers yellow ..... ***[Paysonia lescurii]***
  2 Siliques not compressed, nearly globose, subglobose, pyriform, or slightly bilobed; valves glabrous or pubescent with only a single type of trichome; flowers white or yellow.
    3 Flowers white; siliques pyriform, depressed globose, or slightly bilobed; septum (of the silique) perforate or nearly absent.
      4 Siliques glabrous or very sparsely pubescent, subpyriform; valves (of the silique) papery, densely pubescent on the interior; styles glabrous ..... ***[Paysonia perforata]***
      4 Siliques densely pubescent, depressed globose or slightly bilobed; valves (of the silique) glabrous on the interior; styles hirsute ..... ***[Paysonia stonensis]***
    3 Flowers yellow; siliques globose to subglobose; septum (of the silique) complete.
      5 Siliques densely pubescent; styles pubescent (at least near base) ..... ***[Paysonia densipila]***
      5 Siliques glabrous; styles glabrous ..... ***[Paysonia lyrata]***

Paysonia densipila (Rollins) O'Kane & Al-Shehbaz, Duck River Bladderpod. Endemic to an area from c. TN south to n. AL. [= FNA, X; = *Lesquerella densipila* Rollins – K, V, Y, Z]

Paysonia lescurii (A. Gray) O'Kane & Al-Shehbaz, Lescur's Bladderpod. Endemic to an area from sc. KY south through c. TN to n. AL. [= FNA, X; = *Lesquerella lescurii* (A. Gray) S. Watson – K, S, V, Y, Z]

Paysonia lyrata (Rollins) O'Kane & Al-Shehbaz, Lyreleaf Bladderpod. Endemic to Colbert, Franklin, and Lawrence counties, AL. [= FNA, X; = *Lesquerella lyrata* Rollins – K, V, Y, Z]

Paysonia perforata (Rollins) O'Kane & Al-Shehbaz, Spring Creek Bladderpod. Endemic to Rutherford and Wilson counties, TN (Chester, Wofford, & Kral 1997). [= FNA, X; = *Lesquerella perforata* Rollins – K, V, Y, Z]

Paysonia stonensis (Rollins) O'Kane & Al-Shehbaz, Stones River Bladderpod. Endemic to Rutherford County, TN (Chester, Wofford, & Kral 1997). [= FNA, X; = *Lesquerella stonensis* Rollins – K, V, Y, Z]

Physaria (Nuttall ex Torrey & A. Gray) A. Gray

A genus of about 98 herbs, of temperate North America and South America (Al-Shehbaz & O'Kane 2002). The genus is most diverse in sw. North America. References: O'Kane in FNA (2010); Rollins (1993)=Z; Rollins & Shaw (1973)=Y; Al-Shehbaz & O'Kane (2002)=X; Al-Shehbaz (1987)=V. Key adapted from Rollins (1993).

1 Cauline leaves expanded at the base, usually auriculate; flowers yellow or white ..... *[see **Paysonia**]*
1 Cauline leaves cuneate or petiolate at the base, not auriculate; flowers yellow.
  2 Fruits (1-) 2-3 mm long, slightly pubescent on the exterior; petals 3.5-6.5 (-7.5) mm long, bright yellow; biennial or perennial from branched, woody caudex ..... ***[P. globosa]***
  2 Fruits 3-8 mm long, glabrous on the exterior; petals 5-11 mm long, either pale yellow or bright yellow to orange; annual, biennial, or short-lived perennial from a fine taproot.
    3 Stems to 2.5 dm long; basal leaves 1-2.4 cm long, entire or sinuate; petals pale yellow ..... ***[P. filiformis]***
    3 Stems 1-7 dm long; basal leaves 1.5-5 (-8) cm long, lyrate-pinnatifid (rarely merely dentate or entire); petals bright yellow to orange.
      4 Fruiting pedicels sigmoid, 5-15 (-25) mm long; gynophore 0.5-1 mm long ..... ***P. gordonii***
      4 Fruiting pedicels straight or slightly curved, (7-) 10-20 (-25) mm long; gynophore 1-2 mm long ..... ***[Ph gracilis** ssp. **gracilis]***

* ***Physaria gordonii*** (A. Gray) O'Kane & Al-Shehbaz, Gordon's Bladderpod. Mt (VA): shaly roadside; rare, native of further west. Rollins (1993) reports this species (identification unconfirmed) as a waif along the Blue Ridge Parkway, VA; it may not be

established. [= FNA; > *P. gordonii* ssp. *gordonii* – X; > *Lesquerella gordonii* (A. Gray) S. Watson var. *gordonii* – Z; = *Lesquerella gordonii* – K, Y]

Physaria filiformis (Rollins) O'Kane & Al-Shehbaz, Missouri Bladderpod. Reported for AL (FNA), apparently erroneously (Yatskievich, 2010, pers. comm.). [= FNA, X; = *Lesquerella filiformis* Rollins – K, V, Y, Z] {rejected; not keyed}

Physaria globosa (Desvaux) O'Kane & Al-Shehbaz. Endemic to an area from Posey County, IN and allegedly also s. OH south through c. KY to c. TN. [= X; = *Lesquerella globosa* (Desvaux) S. Watson – C, F, G, K, S, V, Y, Z]

Physaria gracilis (Hooker) S. Watson ssp. *gracilis*. TN, IL, MO, and OK south to AL, MS, LA, and TX. [= X; < *Lesquerella gracilis* – F, G; = *Lesquerella gracilis* (Hooker) S. Watson ssp. *gracilis* – K, V, Z] {not yet keyed}

Planodes E.L. Greene 1912 (Virginia-cress)

A monotypic genus, of North America and Mexico. References: Al-Shehbaz in FNA (2010); Al-Shehbaz (1988a)=Y; Rollins (1993)=Z.

Planodes virginicum (Linnaeus) E.L. Greene, Virginia-cress, Sibara. Cp (GA, NC, SC, VA), Pd (GA, NC, SC, VA), Mt (NC, WV): disturbed areas, fields, roadsides; common (uncommon in WV). February-June. VA west to IL, IA, and KS, south to FL and TX. A native weed, presumably much more common now than formerly. [= FNA; = *Sibara virginica* (Linnaeus) Rollins – RAB, C, F, G, K, W, WV, Y, Z; = *Arabis virginica* (Linnaeus) Poiret – S]

Raphanus Linnaeus 1753 (Radish)

A genus of 3 species, herbs, of the Old World. References: Warwick in FNA (2010); Rollins (1993)=Z; Al-Shehbaz (1985b)=Y; Stace (2010)=X.

1 Siliques moniliform (constricted between the seeds), the silique body about the same diameter for most of its length, longitudinally grooved; petals usually yellow, fading white (rarely purple); seeds 4-12 per silique ..... ***R. raphanistrum ssp. raphanistrum***
1 Siliques not moniliform, the silique body tapered from its widest point below the middle to the apex, smooth or slightly longitudinally grooved; petals usually purple (rarely white); seeds 1-3 (-5) per silique ..... ***R. sativus***

* ***Raphanus raphanistrum*** Linnaeus *ssp.* ***raphanistrum***, Wild Radish, Jointed Charlock, White Charlock. Cp (DE, FL, GA, NC, SC, VA), Pd (DE, GA, NC, SC, VA), Mt (GA, NC, SC, VA, WV): fields, roadsides, disturbed areas; common (uncommon in DE, rare in Mountains), native of Mediterranean Europe. March-June (and sporadically later). European authors (such as Stace 2010) recognize several infraspecific taxa in *R. raphanistrum*; North American material represents ssp. *raphanistrum*. [= *R. raphanistrum* ssp. *raphanistrum* – FNA, X; < RAB, C, F, G, K, W, WH, WV, Y, Z]

* ***Raphanus sativus*** Linnaeus, Radish, Garden Radish. Cp (DE, FL, GA, NC, SC, VA), Pd (DE, GA, NC, SC, VA), Mt (GA, NC, SC, VA, WV): persistent after cultivation or as a "throwout"; rare, native of Mediterranean Europe. April-June. Cultivated for at least 5000 years. [= RAB, C, F, FNA, G, K, S, W, WH, WV, X, Y, Z]

Rapistrum Crantz 1769 (Bastard-cabbage)

A genus of 2 species, herbs, of Europe. References: Warwick in FNA (2010); Rollins (1993)=Z; Al-Shehbaz (1985b)=Y.

* ***Rapistrum rugosum*** (Linnaeus) Allioni, Annual Bastard-cabbage. Cp (SC): waste areas around wool-combing mills; rare, native of Mediterranean Europe. Also naturalized at scattered sites in e. TN (Chester, Wofford, & Kral 1997), PA (Rhoads & Klein 1993), and elsewhere. [= C, F, FNA, Z; > *R. rugosum* var. *rugosum* – G; > *R. rugosum* ssp. *rugosum* – K, Y]

Rorippa Scopoli (Yellow Cress, Marshcress)

A genus of about 75 species, herbs, cosmopolitan. The separation of *Nasturtium* from *Rorippa* is warranted (Al-Shehbaz & Price 1998); Franzke et al. (1998) provide corroboration based on molecular analysis. The species treated here as R. aquatica has been placed in several genera in recent years. References: Al-Shehbaz in FNA (2010); Al-Shehbaz (1988a)=X; Rollins (1993)=Z; Stuckey (1972)=Y; Al-Shehbaz & Bates (1987)=V; Les, Anderson, & Cleland (1995)=U; Al-Shehbaz (1988a)=Q. Key modified from FNA.

1 Plant a submerged aquatic, rooting from lower nodes; leaves of two forms, the submerged pectinately divided, the emergent simple, sometimes lobed; fruit <2.5× as long as wide; petals white ..... ***R. aquatica***
1 Plant terrestrial or of wet places, not rooting from lower nodes; leaves of one form, pinnately lobed or simple; fruit >2.5× as long as wide; petals yellow or pale yellow (or absent).
  2 Plant a rhizomatous, colony-forming perennial; petals (2.0-) 2.8-6.0 mm long; siliques 3-15× as long as wide.

3 Stems branched at the base, decumbent to ascending; leaf sinuses not reaching the midrib, the lateral segments entire to weakly toothed; siliques 3-6× as long as wide ..... ***[R. sinuata]***
3 Stems branched in the upper portions, erect; leaf sinuses reaching the midrib, the lateral segments often sharply toothed; siliques 6-15× as long as wide ..... ***R. sylvestris***
2 Plant a taprooted annual or biennial; petals 0-3.5 mm long; siliques either 2-9 (-10)× or 15-50× as long as wide.
4 Flowers nearly sessile; petals absent; lower fruiting pedicels 0.5-1.5 mm long; siliques (3-) 5.4-8.5 (-10.2) mm long, (1.4-) 1.8-2.6 (-3.3) mm wide, mostly 3-5× as long as wide ..... ***R. sessiliflora***
4 Flowers clearly pedicellate; petals present (or absent in *R. dubia*); lower fruiting pedicels > 4 mm long; siliques 4-20 mm long, either 2-9 (-10)× or 15-50× as long as wide.
5 Siliques (7-) 10-40 mm long, 15-50× as long as wide.
6 Siliques straight, (15-) 25-40 mm long, 0.7-0.9 (-1.0) mm wide; seeds uniseriate ..... ***[R. dubia]***
6 Siliques curved, (7-) 10-24 (-30) mm long, 1-1.5 (-2) mm wide; seeds biseriate ..... ***R. indica***
5 Siliques 2.5-12.5 (-20.4) mm long, 2-9 (-10)× as long as wide.
7 Siliques (5.2-) 8.5-12.5 (-20.4) mm long, (4-) 6-9 (-10)× as long as wide; leaves deeply pinnatifid, the pinnae themselves toothed, lobed or dissected; seeds 0.4-0.5 mm long, 100-150 per silique ..... ***R. teres***
7 Siliques 2.5-9 mm long, 2-5× as long as wide; leaves serrate, lobed, or pinnately dissected, the pinnae (when present) merely toothed; seeds 0.5-0.9 mm long, 20-80 per silique.
8 Leaves hirsute on the lower surface; stems hirsute usually up to the terminal raceme ..... ***R. palustris*** *ssp.* ***hispida***
8 Leaves glabrous on the lower surface; stems glabrous or sparsely hirsute ..... ***R. palustris*** *ssp.* ***palustris***

Rorippa aquatica (Eaton) E.J. Palmer & Steyermark, Lake Cress. Cp (GA, VA): shallow water of swamps and lake margins; rare. VT west to MN, south to s. GA, FL, and e. TX, widely scattered and probably dispersed by waterfowl. See Al-Shehbaz & Bates (1987) and Les, Anderson, & Cleland (1995) for additional information on this interesting plant. Apparently most closely related to *Rorippa*, and here included there. [= FNA, = ***Neobeckia aquatica*** (Eaton) Greene – K, S, U; = *Armoracia lacustris* (A. Gray) Al-Shehbaz & V. Bates – C, Q, V, Z; = *Armoracia aquatica* (Eaton) Wiegand – F, G, GW; = *Rorippa americana* (A. Gray) Britton]

Rorippa palustris (Linnaeus) Besser *ssp.* ***hispida*** (Desvaux) Jonsell. Pd (VA): moist soils; rare. NL (Labrador) to AK, south to c. VA (Amelia County), IL, NE, NM, and n. CA. Al-Shehbaz (1988a) considers reports of this taxon in the Southeast to be misidentifications of var. *fernaldiana*. [= FNA, K; = *Rorippa palustris* (Linnaeus) Besser var. *hispida* (desvaux) Rydberg – C, Z; = *Rorippa islandica* (Oeder) Bolbás var. *hispida* (Desvaux) Butters & Abbe – F, G; = *Radicula hispida* (Desvaux) Heller – S; = *Rorippa palustris* ssp. *hispida* (Desvaux) Jonsell var. *hispida* – Y]

* ***Rorippa palustris*** (Linnaeus) Besser *ssp.* ***palustris***, Marshcress. Pd (GA, NC, SC, VA), Cp (GA, NC, SC, VA), Mt (GA, NC, SC, VA, WV): marshes, bogs, seeps; common. May-October. ME and NB west to SK, south to FL, TX, ID, and n. South America. [> *Rorippa palustris* var. *palustris* – C, Z; > *Rorippa islandica* var. *islandica* – F, G, misapplied; = *Rorippa palustris* ssp. *palustris* – K, X; = *Radicula palustris* (Linnaeus) Moench – S; = *Rorippa palustris* ssp. *palustris* var. *palustris* – Y; > *Rorippa palustris* var. *fernaldiana* (Butters & Abbe) R. Stuckey – C, Z; = *Rorippa islandica* (Oeder) Bolbás – RAB, misapplied; > *Rorippa islandica* var. *fernaldiana* Butters & Abbe – F, G, WV, misapplied; < *Rorippa palustris* – GW, W; > *Rorippa palustris* ssp. *fernaldiana* (Butters & Abbe) Jonsell – K, X; > *Rorippa palustris* ssp. *glabra* (O.E. Schulz) R. Stuckey var. *fernaldiana* (Butters & Abbe) R. Stuckey – Y]

Rorippa sessiliflora (Nuttall ex Torrey & A. Gray) A.S. Hitchcock, Stalkless Marshcress. Cp (NC, SC, VA), Pd (NC, SC, VA), Mt (WV): wet places, marshes, swamps; rare. April-July. MD, WV (Cusick 1994), OH, IN, IL, MN, and NE south to Panhandle FL, s. AL, LA, and c. TX. [= RAB, C, F, FNA, G, GW, K, W, X, Y, Z; = *Radicula sessiliflora* (Nuttall ex Torrey & A. Gray) E.L. Greene – S]

* ***Rorippa sylvestris*** (Linnaeus) Besser, Creeping Yellow Cress. Pd (DE, NC, VA), Mt (VA, WV), Cp (DE, VA): lawns, disturbed moist to wet soils; uncommon (rare in NC and TN), native of Eurasia. May-August. [= RAB, C, F, FNA, G, GW, K, W, WV, X, Y, Z; = *Radicula sylvestris* (Linnaeus) Druce – S]

Rorippa teres (Michaux) R. Stuckey. Cp (GA, NC, SC): cypress-gum ponds, marshes, swamps, ditches, disturbed wet areas; rare. March-May. Se. NC south to s. FL, west to se. OK, sw. TX, and s. and w. Mexico (Sinaloa). [= C, FNA, K; > *Rorippa teres* var. *teres* – GW, X, Y, Z; = *Rorippa walteri* – RAB; = *Radicula walteri* (Elliott) E.L. Greene – S]

* *Rorippa dubia* (Persoon) H. Hara. LA, MS. [= FNA] {add X, Y, Z to synonymy}
* ***Rorippa indica*** (Linnaeus) Hiern, Indian Yellow-cress. Pd (VA): river banks and bars; rare, native of se. Asia. Reported for VA (VBA, G. Fleming, pers. comm. 2009). [= C, Y; > *R. indica* var. *apetala* Hochreutiner – K, Z; > *R. indica* var. *indica* – K, Z] {add X to synonymy}
Rorippa sinuata (Nuttall) A.S. Hitchcock. Native, east to w. KY and TN. [= C, F, FNA, G, GW, K, X, Y, Z]

Sinapis Linnaeus 1753 (Mustard)

A genus of 7 species, herbs, of s. Europe. References: Warwick in FNA (2010); Rollins (1993)=Z; Al-Shehbaz (1985b)=Y. Key adapted from Z and C.

1 Beak of silique strongly compressed; silique densely covered with long, stiff trichomes, ca. 4 mm in diameter; pedicels slender, mostly at right angles to the rachis; seeds 4-8 per silique; [section *Sinapis*] ..... ***S. alba***
1 Beak of silique conical; silique glabrous or nearly so, ca. 2 mm in diameter; pedicels thick, erect to spreading; seeds 7-13 per silique; [section *Ceratosinapis*] ..... ***S. arvensis***

* ***Sinapis alba*** Linnaeus, White Mustard, Yellow Mustard. Mt (NC, WV), Pd (DE, NC), Cp (DE): disturbed areas; rare, native of Mediterranean Europe. April-June. The seeds of this species are one source of table mustard; other species used include *Brassica juncea* and *B. nigra*. [= C, K, S, Y, Z; *? Brassica hirta* – RAB, F, G, WV]

* ***Sinapis arvensis*** Linnaeus, Charlock, Crunchweed, Wild Mustard. Pd (DE, GA, NC, VA), Mt (NC, VA, WV), Cp (DE, GA, NC, SC): disturbed areas; uncommon (rare in DE, GA, NC, SC, and VA), native of Mediterranean Europe. April-July. [= C, K, S, Y, Z; *? Brassica kaber* (A.P. de Candolle) L.C. Wheeler – RAB, G; > *Brassica kaber* var. *pinnatifida* (Stokes) L.C. Wheeler – F, WV]

Sisymbrium Linnaeus (Jim Hill Mustard)

A genus of about 41 species, herbs, mainly northern hemisphere. References: Al-Shehbaz in FNA (2010); Rollins (1993)=Z; Al-Shehbaz (1986b, 1988)=Y.

1 Silique linear, 5-10 cm long; spreading from the rachis; pedicels 5-20 mm long; petals 6-8 mm long ..... ***S. altissimum***
1 Silique subulate, 0.8-1.5 cm long, appressed to the rachis; pedicels 1-3 mm long; petals 3-4 mm long ..... ***S. officinale***

* ***Sisymbrium altissimum*** Linnaeus, Tumble Mustard, Jim Hill Mustard. Pd (DE, GA, NC, SC, VA), Mt (NC, SC, VA, WV), Cp (NC, SC, VA): fields, disturbed areas; uncommon (rare in DE), native of Eurasia. May-June. [= RAB, C, F, FNA, G, W, WV, Y, Z; = *Norta altissima* (Linnaeus) Britton – S]
* ***Sisymbrium officinale*** (Linnaeus) Scopoli, Hedge Mustard. Mt (GA, NC, SC, VA, WV), Pd (DE, GA, NC, SC, VA), Cp (FL, NC, SC, VA): fields, pastures, barnyards, disturbed areas; common (rare in DE and FL), native of Europe. [= C, FNA, K, WH, Y, Z; > *S. officinale* var. *leiocarpum* A.P. de Candolle – RAB, F, G, W, WV; > *S. officinale* var. *officinale* – RAB, F, G, W, WV; = *Erysimum officinale* Linnaeus – S]

* ***Sisymbrium irio*** Linnaeus, London-rocket. Waif around wool-combing mills in Coastal Plain of SC; there appears to be little evidence that it is established in our area. For further information and keys, see Rollins (1993) and Al-Shehbaz (1986b). [= C, F, FNA, G, K, Y, Z]
* ***Sisymbrium loeselii*** Linnaeus. Mt (WV), Cp (SC): disturbed areas, waif around wool-combing mills; rare, native of e. Europe and w. Asia. [= C, F, FNA, G, K, Y, Z] {not yet keyed}
* ***Sisymbrium turczaninowii*** Sonderegger, Russian Rocket. Waif around wool-combing mills in Coastal Plain of SC; there appears to be little evidence that it is established in our area. For further information and keys, see Rollins (1993) and Al-Shehbaz (1986b). [= K, Y, Z] {not keyed}

Teesdalia Aiton f. 1812 (Shepherd's Cress)

A genus of 3 species, herbs, of Europe, n. Africa, and the Middle East. References: Al-Shehbaz in FNA (2010); Rollins (1993)=Z; Appel (1998); Al-Shehbaz (1986)=Y.

* ***Teesdalia nudicaulis*** (Linnaeus) Aiton f., Shepherd's Cress, Hedge Mustard, Bank Cress. Pd (NC), Cp (DE, NC) {SC, VA}: lawns, fields, roadsides, disturbed areas; common (uncommon in NC Piedmont, uncommon in SC and VA, uncommon in DE Coastal Plain), native of Europe. March-April; April-June. [= RAB, C, F, FNA, G, K, Y, Z]

Thlaspi Linnaeus 1753 (Penny-cress)

A genus of about 6 species, as much more narrowly circumscribed, annual herbs, native to Eurasia and n. Africa. Mummenhoff & Koch (1994), Meyer (1973, 1979), and Koch & Al-Shehbaz (2004) discuss the reasons for separating *Microthlaspi* from *Thlaspi*. References: Al-Shehbaz in FNA (2010); Rollins (1993)=Z; Al-Shehbaz (1986)=Y. [also see *Microthlaspi*]

1 Siliques 5-8 mm long, 2-4 mm wide; seeds brown, alveolate; lower stem with scattered long hairs; fresh plant smelling of garlic when crushed; [section *Pterotropis*] ..... ***T. alliaceum***
1 Siliques (8-) 10-17 mm long, 7-12 mm wide; seeds brown, concentrically ridged; lower stem glabrous; fresh plant not smelling of garlic when crushed; [section *Thlaspi*] ..... ***T. arvense***

* ***Thlaspi alliaceum*** Linnaeus, Garlic Penny-cress. Pd (DE, NC, VA), Mt (WV), Cp (DE): fields, disturbed areas, roadsides; uncommon (rare in NC, VA, and WV, rare in DE Coastal Plain), native of Europe. March-April; April-May. [= RAB, FNA, K, Y, Z]
* ***Thlaspi arvense*** Linnaeus, Field Penny-cress, Frenchweed. Pd (DE, GA, NC, SC, VA), Mt (GA, NC, SC, VA, WV), Cp (DE, FL, GA, NC, SC, VA): fields, disturbed areas; common (uncommon in DE, rare in FL, GA, and SC), native of Europe. March-May; April-June. [= RAB, C, F, FNA, G, K, S, W, WH, WV, Y, Z]

Turritis Linnaeus 1753 (Tower Mustard)

A genus of 2 species, annual or biennial herbs, circumboreal. References: Al-Shehbaz in FNA (2010); Rollins (1993)=Z; Al-Shehbaz (1988a)=Y; Koch, Bishop, & Mitchell-Olds (1999); Koch & Al-Shehbaz (2002).

Turritis glabra Linnaeus, Tower Mustard. Mt (NC, VA, WV), Pd (DE): open disturbed areas, forest edges; uncommon (rare in DE, NC, and VA). May-June; July-August. Circumboreal, south in North America to NC, sc. TN (Chester, Wofford, &Kral 1997), AR, KS, NM, and CA. Possibly only an introduction in our area. [= FNA; = *Arabis glabra* (Linnaeus) Bernhardi – RAB, C, F, G, W; > *A. glabra* var. *glabra* – Y, Z]

Warea Nuttall 1834 (Warea, Pineland-cress)

A genus of 4 species, annual herbs, of se. North America. The genus is endemic to se. United States, consisting of our species and two others of peninsular FL. This is the only genus of tribe *Thelypodieae* in our area. References: Al-Shehbaz in FNA (2010); Rollins (1993)=Z; Al-Shehbaz (1985a)=Y; Channell & James (1964).

Identification notes: *Warea* (Brassicaceae) and *Polanisia* (Cleomaceae) are superficially similar. The genus is quite showy and conspicuous, reminiscent of a small *Cleome* because of its white to pink, clawed petals and silique borne on a long gynophore.

1 Leaves cuneate at the base; petals white to pink.....***W. cuneifolia***
1 Leaves rounded or slightly auriculate at the base; petals deep purple.....***W. sessilifolia***

Warea cuneifolia (Muhlenberg ex Nuttall) Nuttall, Carolina Warea, Carolina Pineland-cress. Cp (FL, GA, NC, SC): xeric white sands of sandhills, primarily in Sandhill Region; rare. July-September; August-September. Sc. NC south to Panhandle FL and se. AL. [= RAB, FNA, K, S, WH, Y, Z]

Warea sessilifolia Nash, Sessile-leaf Warea, Sessile-leaf Pineland-cress. Cp (AL, FL, GA): sandhills; uncommon (rare in GA). August-September. Panhandle FL and adjacent AL (Pike County) and wc. GA (Stewart County) (Sorrie 1998b). [= FNA, K, S, WH, Y, Z]

277. OLACACEAE A.L. de Jussieu ex R. Brown in Tuckey 1818 (Olax Family) [in SANTALALES]

A family of about 14 genera and 100 species, trees, shrubs, and woody vines, pantropical in distribution. Sometimes further divided, as by Nickrent et al. (2010), in which case *Ximenia* is placed in Ximeniaceae. References: Nickrent et al. (2010).

Ximenia Linnaeus 1753 (Tallow-wood)

A genus of about 8 species, root-parasitic shrubs, tropical. *Ximenia* is placed in the segregate family Ximeniaceae by Nickrent et al. (2010).

Ximenia americana Linnaeus, Tallow-wood, Hog-plum. Cp (FL): hammocks, pine flatwoods, scrub; uncommon. Endemic to FL peninsula, north to Duval County, FL. [= K, S, WH]

279. SANTALACEAE R. Brown 1820 (Sandalwood Family) [in SANTALALES]

A family of about 41 genera and 930 species, trees, shrubs, and herbs, primarily of tropical and warm temperate regions of the Old World and New World. All members of the family are hemiparasitic, attaching to the stems or roots of other plants. Viscaceae are closely related to and should either be included in the Santalaceae (Angiosperm Phylogeny Group 2003, 2009), as done here, or the contrasting approach should be taken, involving the segregation of smaller, monophyletic families (Nickrent et al. 2010). In our area, this would mean Santalaceae s.s. (*Nestronia*), Cervantesiaceae (*Pyrularia*), Thesiaceae (*Buckleya*), Comandraceae (*Comandra*), and Viscaceae (*Phoradendron*) (Nickrent et al. 2010). References: Nickrent et al. (2010); Nickrent & Malécot (2001).

1 Leaves alternate; monoecious herb or shrub.
  2 Herb, < 2 (-3) dm tall; leaves 1-4 cm long, glabrous; inflorescence a terminal panicle of cymes; [tribe *Comandreae* or family *COMANDRACEAE]* .....***Comandra***
  2 Shrub, > 4 dm tall; leaves 5-15 cm long, pubescent; inflorescence a terminal raceme; [tribe *Pyrularieae* or family *CERVANTESIACEAE*]... .....***Pyrularia***
1 Leaves opposite; dioecious shrubs.
  3 Aerial shrubs, parasitic on treetrunks and branches; leaves coriaceous, brittle when live; [tribe *Visceae* or family *VISCACEAE*] ....***Phoradendron***
  3 Terrestrial shrubs, parasitic via root connections; leaves herbaceous, flexible when live in texture
    3 Staminate flowers in terminal umbel-like dichasia; pistillate flowers (and fruits) solitary, terminal; clumped shrub to 4 m tall; [tribe *Thesiae* or family *THESIACEAE*].....***Buckleya***
    3 Staminate flowers in axillary umbels; pistillate flowers (and fruits) solitary, axillary; rhizomatous shrub to 1 m tall; [tribe *Santaleae* or family *SANTALACEAE*].....***Nestronia***

Buckleya Torrey (Piratebush)

A genus of 5 species, shrubs, of temperate e. North America and e. Asia; the 3 species other than our own are *B. lanceolata* of Japan, and *B. henryi*, *B. graebneriana*, and *B. angulosa* of China. *Buckleya* is placed in the segregate family Thesiaceae by Nickrent et al. (2010). References: Carvell & Eshbaugh 1982=Z; Massey et al. (1983).

Buckleya distichophylla (Nuttall) Torrey, Piratebush. Mt (NC, VA): dry or rocky bluffs and slopes; rare. April-May; June-October. A Southern Appalachian endemic: sw. VA south through ne. TN to sw. NC, in the western edge of the Blue Ridge and to the west in the Ridge and Valley. It is apparently parasitic on a variety of hosts – not limited to *Tsuga*, as has sometimes been reported. The branches are often mistaken for a compound leaf. [= RAB, C, F, G, K, S, W, Z]

Comandra Nuttall (Bastard-toadflax)

A genus of 2 species (the only other species European). *Comandra* is placed in the segregate family Comandraceae by Nickrent et al. (2010).

Comandra umbellata (Linnaeus) Nuttall *var.* ***umbellata***, Eastern Bastard-toadflax. Pd (DE, GA, NC, SC, VA), Mt (GA, NC, SC, VA, WV), Cp (DE, NC, SC, VA): dry forests and woodlands, woodland borders; common (uncommon in WV). April-June; July. Var. *umbellata* ranges from ME to MI, south to n. GA and AL; other varieties are western. [= C; < *C. umbellata* – RAB, W, WV; = *C. umbellata* ssp. *umbellata* – K; *? C. umbellata* – S; > *C. umbellata* – F, G; > *C. richardsiana* – F, G]

Nestronia Rafinesque (Nestronia)

A monotypic genus, a shrub, endemic to se. United States. *Nestronia* is placed in a much more narrowly circumscribed Santalaceae by Nickrent et al. (2010). References: Libby & Bloom (1998).

Identification notes: In its clonal, usually knee-high growth, *Nestronia* has something of the aspect of an opposite-leaved lowbush blueberry.

Nestronia umbellula Rafinesque, Nestronia, Conjurer's-nut, Leechbrush. Pd (GA, NC, SC, VA), Cp (GA, NC, SC): relatively mesic sites in sandhills in the upper Coastal Plain, mesic to dry Piedmont oak forests; rare. April-May; July. Sc. VA south and west to sc. GA, se. AL, nc. AL, and sc. TN; disjunct in sc. KY. See Libby & Bloom (1998) for an interesting discussion and county distribution map. It sometimes forms colonies (presumably clones) several hectares in size. [= RAB, C, F, G, K, S, W]

Phoradendron Nuttall 1848 (Mistletoe)

A genus of about 235 species, epiphytic hemiparasites, of tropical and rarely temperate America. *Phoradendron* is placed in the segregate family Viscaceae by Nickrent et al. (2010). References: Kuijt (2003)=Y; Kuijt (1982)=Z.

Phoradendron serotinum (Rafinesque) M.C. Johnston *ssp.* ***serotinum***, American Mistletoe, Christmas Mistletoe. Cp (DE, GA, NC, SC, VA), Pd (GA, NC, SC, VA), Mt (GA, NC, SC, VA, WV): parasitic on various species of trees, especially abundant in swamp forests (perhaps because they are less frequently cut and have older, more mature hardwoods); common (uncommon in Piedmont and Mountains). October-November (-March); November-January (-May). Kuijt (2003) interprets this as a species with four subspecies; ssp. *serotinum* is the eastern component, ranging from NJ west to s. OH, s. IN, and s. MO, south to s. FL and s. TX; this interpretation is supported by genetic studies currently underway (Hawkins et al., in prep.). The other three subspecies are distributed in sw. United States and n. Mexico. The nomenclatural argument about which Rafinesquian epithet to adopt is arcane; the basionym "*leucarpum*" has nomenclatural precedence by 3 years, but the combination in *Phoradendron* can be considered a later homonym of *Phoradendron leucocarpum* Patschovsky. I here follow Kuijt (2003) in his decision to reject "*leucarpum*." *Phoradendron* is, of course, the mistletoe familiar (at least traditionally) in e. United States as a Christmas decoration. Z comments that "the superficial likeness of *Phoradendron serotinum* to the European *Viscum album* has made the transfer of the latter's folklore to North America easy;" *Viscum album* was a sacred plant of Celtic and druidical pre-Christian European societies. The white berries of *P. serotinum* are extremely poisonous. Their sticky flesh promotes the dispersal of the seeds by birds from tree to tree. [= Y; = ***Phoradendron leucarpum*** (Rafinesque) Reveal & M.C. Johnston – K; < *P. serotinum* (Rafinesque) M.C. Johnston – RAB, C, W, Z; < *P. flavescens* (Pursh) Nuttall – F, G, S, WV]

Pyrularia Michaux (Buffalo-nut)

A genus of 4 species, shrubs, of e. North America and e. Asia (the other 3 species are of e. Asia). *Pyrularia* is placed in the segregate family Cervantesiaceae by Nickrent et al. (2010).

Pyrularia pubera Michaux, Buffalo-nut, Oil-nut. Mt (GA, NC, SC, VA, WV), Pd (GA, NC, SC, VA): moist forests; common. April-May; July-October. A Southern and Central Appalachian endemic, *P. pubera* ranges from sw. PA (Rhoads & Klein 1993), e. WV, and w. VA south and west to e. KY, w. NC, e. TN, and n. and wc. GA. The oil in the fruits is very poisonous. [= RAB, C, F, G, K, S, W, WV]

284. TAMARICACEAE Link 1821 (Tamarisk Family) [in CARYOPHYLLALES]

A family of about 4 genera and 78 species, shrubs and trees, of Eurasia and Africa (especially from the Mediterranean to c. Asia). References: Crins (1989b); Gaskin in Kubitzki & Bayer (2003); Gaskin et al. (2004).

Tamarix Linnaeus 1753 (Tamarisk, Salt-cedar)

A genus of about 54 species, trees and shrubs, native of Eurasia and Africa. References: Baum (1978)=Z; Crins (1989b)=Y.

Identification notes: An important character is the staminal disk; three terms are used. In **hololophic** disks, the lobe between each stamen is obvious and separate from the stamens on either side, and each is usually 2-lobed. In **paralophic** disks, each lobe is deeply bipartite, and each half-lobe is fused to the base of the adjacent stamen, but is still somewhat distinct from it. In **synlophic** disks, the lobes are also deeply bipartite, but each half-lobe is fused confluently with the stamen base, giving the appearance that the filament has swollen base.

1 Flowers 4-merous; [section *Oligadenia*].
  2 Petals 1.5-2.5 mm long; bracts subtending the pedicels diaphanous; young growth completely glabrous; [section *Oligadenia*; series *Arbusculae*] ..... ***T. parviflora***
  2 Petals 3.5-5 mm long; bracts subtending the pedicels herbaceous; young growth (especially the bracts and the raceme axis) papillose; [section *Oligadenia*; series *Anisandrae*] ..... ***T. tetragyna***
1 Flowers 5-merous.
  3 Racemes 5-10 mm wide; [section *Oligadenia*].
    4 Bracts of the raceme linear to linear oblong, about equaling the pedicel; disk hololophic; young growth glabrous; [section *Oligadenia*; series *Laxae*] ..... ***T. chinensis***
    4 Bracts of the raceme lanceloate to ovate, exceeding the pedicel; disk synlophic, paralophic, or hololophic; young growth glabrous or papillose; [section *Oligadenia*; series *Anisandrae*].
      5 Young growth glabrous (except sometimes papillose on the raceme axis); disk synlophic; flowers with 5 antesepalous stamens and 0 antepetalous stamens ..... ***T. africana***
      5 Young growth papillose; disk hololophic to paralophic; flowers with 4-5 antesepalous stamens and 0-4 antepetalous stamens ..... ***T. tetragyna***
  3 Racemes 3-5 mm wide; [section *Tamarix*].
    6 Young growth papillose; disk synlophic; [section *Tamarix*; series *Canariensis*] ..... ***T. canariensis***
    6 Young growth glabrous; disk synlophic or hololophic; [section *Tamarix*; section *Gallicae*].
      7 Petals caducous; disk synlophic ..... ***T. gallica***
      7 Petals persistent; disk hololophic ..... ***T. ramosissima***

* ***Tamarix africana*** Poiret, African Tamarisk. Cp (SC): brackish marshes, coastal sands; rare, native of sw. Mediterranean Europe, ne. Africa, and the Canary Islands. [= K, Y; > *T. africana* var. *africana* – Z]

* *Tamarix aralensis* Bunge, Russian Tamarisk. Reported for NC (Kartesz 1999), but the specimen on which the report is based is of a plant in cultivation as an ornamental. Not keyed. [= K, Y, Z]

* ***Tamarix canariensis*** Willdenow, Canary Island Tamarisk. Cp (FL, GA, NC, SC): brackish marshes, coastal hammocks, coastal sands; uncommon, native of sw. Europe, ne. Africa, and the Canary Islands. [= K, Y, Z; < *T. gallica* Linnaeus – RAB, S; >< *T. parviflora* – WH]

* ***Tamarix chinensis*** Loureiro, Chinese Tamarisk. Cp (NC): coastal sands; rare, native of China, Korea, and Japan. [= C, K, Y, Z; = *T. pentandra* Pallas – G, an illegitimate name]

* ***Tamarix gallica*** Linnaeus, French Tamarisk. Cp (GA, NC, VA?): brackish marshes; rare, native of the w. Mediterranean region of Europe. April-July. Most reports of this taxon from the Southeast represent misidentifications or a very broad interpretation of the species. [= F, G, K, Y, Z; < *T. gallica* – RAB, S]

* ***Tamarix parviflora*** A.P. de Candolle, Small-flower Tamarisk. Cp (NC, VA): coastal sands; rare, native of ne. Europe (Italy, Greece, Cyprus, Turkey). [= C, G, K, Y, Z; < *T. gallica* Linnaeus – RAB, S]

* ***Tamarix ramosissima*** Ledebour, Salt-cedar. Cp (GA, NC, SC, VA): brackish marshes, coastal hammocks, dunes and coastal sands; common, native of w. to e. Asia. [= K, Y, Z; < *T. gallica* Linnaeus – RAB, S]

* ***Tamarix tetragyna*** C. Ehrenberg. Cp (GA): coastal sands; rare, native of the Middle East. Established on Cumberland Island, Camden County, GA (Crins 1989b). [= K, Y, Z]

285. PLUMBAGINACEAE A.L. de Jussieu 1789 (Leadwort Family) [in CARYOPHYLLALES]

A family of about 24-27 genera and 650-775 species, shrubs, vines, and herbs, of cosmopolitan distribution. Lledó et al. (1998) and other authors suggest that the portion of the Plumbaginaceae often recognized as tribe Staticeae or subfamily Staticoideae (which includes *Limonium*) would be better treated as a distinct family. References: Morin in FNA (2005); Lledó et al. (1998); Kubitzki in Kubitzki, Rohwer, & Bittrich (1993).

Limonium P. Miller 1754 (Sea-lavender)

A genus of about 350 species, dwarf shrubs, perennial, and annual herbs, of cosmopolitan distribution. References: Luteyn (1976)=Z; Smith in FNA (2005); Kubitzki in Kubitzki, Rohwer, & Bittrich (1993).

Limonium carolinianum (Walter) Britton, Carolina Sea-lavender. Cp (DE, FL, GA, NC, SC, VA): tidal marshes, especially in hypersaline flats; common. August-October. Along the coast from NL (Labrador) south to s. FL, west to TX and ne. Mexico. Various treatments recognize from 1 to 4 taxa in our area. The most recent monographer, Luteyn (1976), recognizes only a polymorphic *L. carolinianum* – a treatment followed by most flora authors since. Godfrey & Wooten (1981) follow Luteyn's treatment, but state "we are not at all confident that Luteyn's treatment is a reasonable one." [= C, FNA, GW, K, WH, Z; > *L. carolinianum* var. *carolinianum* – RAB, G; > *L. carolinianum* var. *obtusilobum* (Blake) Ahles – RAB; > *L. nashii* Small var. *nashii* – RAB, G; > *L. nashii* Small var. *angustatum* (A. Gray) Ahles – RAB; > *L. carolinianum* – F, S; > *L. nashii* Small – F, S; > *L. carolinianum* var. *angustatum* (A. Gray) Blake – G; > *L. angustatum* (A. Gray) Small – S; > *L. obtusilobum* Blake – S]

286. POLYGONACEAE A.L. de Jussieu 1789 (Smartweed Family) [in CARYOPHYLLALES]

A family of about 43-48 genera and 1100-1200 species, trees, shrubs, vines, and herbs, cosmopolitan, but especially north temperate. Recent changes in the circumscription of various genera (including *Polygonum, Persicaria, Fallopia*, etc.) have received strong support from molecular phylogenetic studies (Kim & Donoghue 2008; Lamb Frye & Kron 2003). References: Freeman & Reveal in FNA (2005); Horton (1972)=Z; Mitchell & Dean (1978)=Y; Ronse Decraene & Akeroyd (1988); Brandbyge in Kubitzki, Rohwer, & Bittrich (1993); Lamb Frye & Kron (2003); Kim & Donoghue 2008).

1 Woody vine, climbing by tendrils; [subfamily *Polygonoideae*, tribe *Coccolobeae*].
  2 Leaf base deeply cordate.....***Antigonon***
  2 Leaf base truncate to broadly cuneate .....***Brunnichia***
1 Herb (sometimes very robust and rather woody), herbaceous vine, or (*Fallopia baldschuanica*) a somewhat woody vine lacking tendrils.
  3 Stem leaves (in our species) whorled; flowers in involucrate heads; ocreae absent; stamens 9; leaves densely white-tomentose on the lower surface; [of xeric situations of shale barrens and sandhills]; [subfamily *Eriogonoideae*, tribe *Eriogoneae*] .....***Eriogonum***
  3 Stem leaves alternate; flowers in various inflorescences (not involucrate); ocreae present; stamens (3-) 5-8 (-9); leaves glabrous or variously pubescent, but not densely white-tomentose; [of various habitats, including xeric ones]; [subfamily *Polygonoideae*].
    4 Tepals 6, in 2 series of 3 each; plants with leaves basally disposed, the largest basal (these withering in some species later in the season); [tribe *Rumiceae*].
      5 Tepals (the outer series) spinose.....***Emex***
      5 Tepals foliose.
        6 Fruit 3-winged; basal leaves very large, 20-40 cm wide; inner and outer tepals similar; [plant cultivated, rarely persistent or escaped] .....***Rheum***
        6 Fruit 3-angled; basal leaves small to medium in size, 0.5-15 cm wide; inner tepals wider than the outer tepals; [plants common, mostly weedy] .....***Rumex***
    4 Tepals mostly 5 in a single whorl; plants with leaves along the stem, lacking well-developed basal leaves.
      7 Flowers in small clusters or very reduced racemes of 1-5 flowers, borne in the axils of normally sized or reduced leaves; plants erect or sprawling herbs with stems < 1 m long, from taproots; leaves jointed at base; [tribe *Polygoneae*].....***Polygonum***
      7 Flowers in diffuse axillary panicles, or in terminal or long-peduncled axillary racemes, corymbs, or heads; plants various, either erect or sprawling herbs, or erect, robust, and suffrutescent herbs, or climbing herbaceous or suffrutescent vines, or suffrutescent bushy herbs; leaves not jointed at base (except *Polygonella*).
        8 Leaves cuneate at the base, either linear, spatular, or oblanceolate, mostly < 4 cm long and < 5 mm wide; leaves jointed at the base; pedicels jointed at the base; [tribe *Polygoneae*] .....***Polygonella***
        8 Leaves cuneate, cordate, or hastate at the base, either lanceolate or ovate, mostly > 5 cm long and > 8 mm wide; leaves not jointed at the base; pedicels not jointed at the base.
          9 Inflorescence corymbiform, terminal; achenes strongly exserted at maturity; tepals almost free, horizontally spreading, white, 3-4 mm long; [erect annual, uncommonly cultivated and rarely persistent or escaped]; [tribe *Persicarieae*] .....***Fagopyrum***
          9 Inflorescence paniculate, racemiform, or headlike, terminal and axillary; achenes enclosed in the perianth at maturity; tepals fused for much of their length, ascending, pink, green, or white.
            10 Outer tepals neither keeled nor winged at maturity; inflorescence of spikelike racemes, heads, or sparse, interrupted racemes; [tribe *Persicarieae*] .....***Persicaria***
            10 Outer tepals keeled or winged at maturity; inflorescence a compound panicle of racemes; [tribe *Polygoneae*].
              11 Plants climbing or sprawling, herbaceous to somewhat woody, the stems slender; perianth usually not enlarging in fruit; stigma capitate or peltate .....***Fallopia***
              11 Plants erect, robust (1-4 m tall), woody, the stems generally over 1 cm in diameter, hollow; perianth enlarging in fruit; stigma fimbriate.....***Reynoutria***

Antigonon Endlicher 1837 (Love-chain, Coralvine, Corallita)

A genus of about 6 species, vines, of tropical America. References: Freeman in FNA (2005).

* ***Antigonon leptopus*** Hooker & Arnott, Love-chain, Queen's-jewels, Confederate-vine, Corallita. Cultivated and persisting; commonly cultivated, rarely persisting or escaping, native of tropical America. [= FNA, K, WH; = *Corculum leptopus* (Hooker & Arnott) Stuntz]

Brunnichia Banks ex Gaertner 1788 (Buckwheat-vine)

A genus of 3-4 species, vines, of. e. North America and w. Africa. References: Holmes in FNA (2005); Brandbyge in Kubitzki, Rohwer, & Bittrich (1993).

Brunnichia ovata (Walter) Shinners, Buckwheat-vine, Eardrop-vine, Ladies'-eardrops, Redvine. Floodplain forests, swamp forests. June-July; August-September. Ne. SC south to n. FL, west to e. TX, and north in the interior to w. TN, w. KY, s. IL, and se. MO. Introduced in se. VA. [= FNA, GW, K, WH; = *B. cirrhosa* Gaertner – RAB, C, F, G, S]

Emex Campderá (Emex, Devil's-thorn, Cape Spinach)

A genus of 2 species, herbs, of Mediterranean Europe and s. Africa.

* ***Emex spinosa*** (Linnaeus) Campderá. Disturbed areas; not recently collected and perhaps only a waif, native of Mediterranean Europe. [= K, S, WH]

Eriogonum Michaux 1803 (Wild-buckwheat)

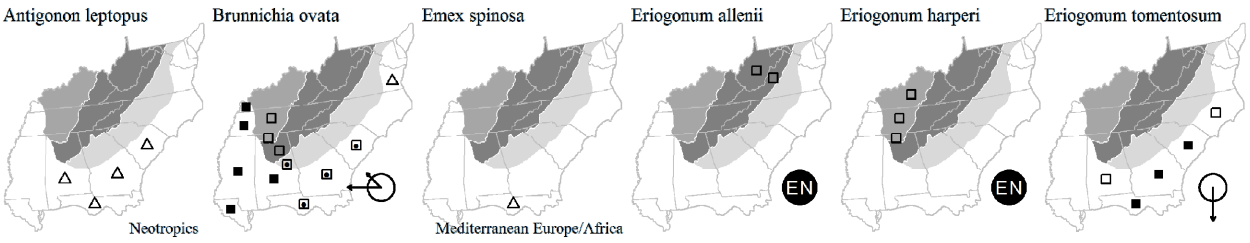
A genus of about 250 species, herbs and shrubs, of w. North America (a few in se. North America). Like *Astragalus*, it is represented in e. North America by a few species restricted to unusually dry habitats. References: Reveal in FNA (2005); Reveal (1989, 2004)=Y; Brandbyge in Kubitzki, Rohwer, & Bittrich (1993).

1 Basal leaves absent; cauline leaves alternate; [of limestone glades and barrens of KY, TN, and n. AL]; [subgenus *Eriogonum*] ..... ***[E. harperi]***
1 Basal leaves well-developed; cauline leaves whorled; [of other habitats and areas (see below)].
2 Tepals bright yellow; plants 3-5 dm tall; achenes pilose at the beak; [of shale barrens of VA and WV]; [subgenus *Oligogonum*] ...***E. allenii***
2 Tepals white to pink; plants 4-12 dm tall; achenes glabrous; [of sandhills of s. NC (at least formerly), SC, and southward]; [subgenus *Eriogonum*] .....***E. tomentosum***

Eriogonum allenii S. Watson, Shale-barren Wild-buckwheat. Open and sunny situations in shale barrens (and rarely sandstone). July-August. Endemic to shale barrens of w. VA and e. WV. [= C, FNA, K, W, Y, Z; = *E. alleni* – F, G, WV, orthographic variant]

Eriogonum harperi Goodman, Harper's Wild-buckwheat. Limestone glades and barrens. Endemic of sc. KY, nc. TN, and n. AL. [= *E. longifolium* Nuttall var. *harperi* (Goodman) Reveal – C, FNA, K, Y, Z]

Eriogonum tomentosum Michaux, Sandhill Wild-buckwheat, Southern Wild-buckwheat, Dog-tongue. Sandhills, usually in white sand, primarily in the fall-line Sandhills and on riverine dunes in the middle and upper Coastal Plain. Late July-September; September-November. S. NC (at least formerly) south to c. peninsular FL, west to s. AL. There seems no reason to doubt the label data of an 1890's Biltmore Herbarium collection from Bladen County, NC (Pittillo, Horton, & Herman 1972), as *E. tomentosum* is fairly common not far away in SC; the species has apparently not been seen in NC since. [= RAB, FNA, K, S, WH, Y, Z]



Fagopyrum P. Miller 1754 (Buckwheat)

A genus of about 8-16 species, perennial and annual herbs, of e. Asia and Africa. The latin and common name refer to the similarity of the seeds to beechnuts. References: Hinds & Freeman in FNA (2005); Brandbyge in Kubitzki, Rohwer, & Bittrich (1993).

1 Flowers white; achene smooth and shiny ..... ***F. esculentum***
1 Flowers greenish; achene rough and dull..... ***F. tataricum***

* ***Fagopyrum esculentum*** Moench, Buckwheat. Mt (GA, NC, SC, VA), Pd (DE, GA, NC, SC, VA), Cp (DE, FL, NC, SC, VA): fields, disturbed areas, railroad rights-of-way, escaped from cultivation; rare, native of Eurasia. June-November. [= RAB, C, FNA, G, K, W, WH, WV; = *F. sagittatum* Gilibert – F]

* ***Fagopyrum tataricum*** (Linnaeus) Gaertner, Tartarian Buckwheat, India-wheat. Mt (WV): disturbed areas; rare, native of Asia. [= C, F, FNA, G, K, WV]

Fallopia Adanson 1763 (Climbing Buckwheat)

A genus of about 9-10 species, woody and herbaceous vines, of temperate regions of the Northern Hemisphere. If accepted (as here) as a genus distinct from *Polygonum*, this group takes the name *Fallopia* Adanson (1763), which has priority over *Tiniaria* (1832) and *Bilderdykia* (1827). *Reynoutria* is sometimes included. References: Ronse Decraene & Akeroyd (1988)=X; Brandbyge in Kubitzki, Rohwer, & Bittrich (1993). [also see *Reynoutria*]

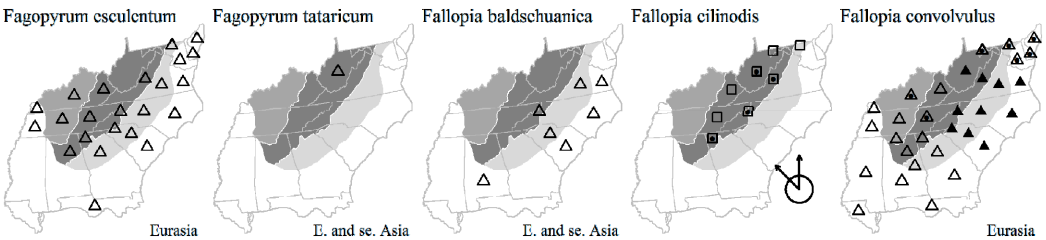
1 Plant woody; inflorescences freely branched, strongly paniculate; [sometimes cultivated, apparently naturalizing] ..... ***F. baldschuanica***
1 Plant herbaceous; inflorescences less-branched, usually a reduced panicle with only a few racemose branches; [collectively common and in various natural and disturbed habitats].
2 Ocreae reflexed bristly at the base; perianth white; achene glossy black; [of high elevation openings and woodlands]..... ***F. cilinodis***
2 Ocreae smooth; perianth greenish to yellowish; achene glossy or dull black; [mostly of lower elevations].
3 Achene dull black; outer sepals keeled, not expanding into obvious wings in fruit, the fruit therefore 3.5-4.5 mm long (measured from the pedicel joint to the tip); [weedy annual] ..... ***F. convolvulus*** *var.* ***convolvulus***
3 Achene glossy black; outer sepals expanding into obvious wings in fruit, the fruit therefore 7-15 mm long (measured from the pedicel joint to the tip); [native perennial or weedy annual].
4 Fruiting perianth wings usually truncate to attenuate-decurrent on stipelike base, flat, or (less often) undulate or crinkled, margins entire (rarely undulate-crenate) ..... ***F. dumetorum***
4 Fruiting perianth wings decurrent on stipelike base, undulate or crinkled, rarely flat, margins wavy-crenulate to incised or lacerate (rarely entire).
5 Perianth 7-10 mm long at maturity (measured from the pedicel joint to the tip); achenes 2-3.5 mm long..... ***F. cristata***
5 Perianth 10-15 mm long at maturity (measured from the pedicel joint to the tip); achenes 3.5-6 mm long..... ***F. scandens***

* ***Fallopia baldschuanica*** (Regel) Holub, Silver-lace-vine, China Fleece-vine. Disturbed areas, roadsides; rare, native of Asia. [= FNA; > *Fallopia aubertii* (Henry) Holub – X; > *Polygonum aubertii* Henry – C, F, K]

Fallopia cilinodis (Michaux) Holub, Fringed Climbing Buckwheat, Fringed Black Bindweed. Around rock outcrops, in openings, glades, and open woodlands at high elevations. June-September. NL (Newfoundland) west to SK, south to PA, w. NC, n. GA, e. TN, IN, IL, and MN. [= FNA; = *Polygonum cilinode* Michaux – RAB, C, K, W, Y, Z; > *Polygonum cilinode* var. *cilinode* – F, WV; > *Polygonum cilinode* var. *laevigatum* Fernald – F, WV; = *Bilderdykia cilinodis* (Michaux) Greene – S; = *Tiniaria cilinodis* (Michaux) Small]

* ***Fallopia convolvulus*** (Linnaeus) Á. Löve, Bindweed, Climbing Buckwheat, Black Bindweed, Nimble-will. Disturbed areas; common (uncommon in DE, rare in FL), native of Eurasia. May-September. [= FNA, X; = *Polygonum convolvulus* – RAB, GW, W, WH, WV, Y, Z; > *Polygonum convolvulus* Linnaeus var. *convolvulus* – C, F, K; > *Polygonum convolvulus* var. *subulatum* Lejeune & Courtois – K; = *Bilderdykia convolvulus* (Linnaeus) Dumortier – S; = *Tiniaria convolvulus* (Linnaeus) Webb & Moquin-Tandon]

Fallopia cristata (Engelmann & A. Gray) Holub, Crested Climbing Buckwheat. Mt (NC, SC, VA, WV), Pd (NC, SC, VA), Cp (FL, NC, SC, VA) {DE?, GA}: moist to wet open habitats; common (rare in NC). July-October. MA, NY, IN, IL, MN, south to c. peninsular FL and TX. [= *Polygonum scandens* Linnaeus var. *cristatum* (Engelmann & A. Gray) Gleason – C, GW, K, WH, Y; < *Polygonum scandens* Linnaeus var. *cristatum* (Engelmann & A. Gray) Gleason – RAB; = *Polygonum cristatum* Engelmann & A. Gray – F, WV; = *Bilderdykia cristata* (Engelmann & A. Gray) Greene – S; < *Fallopia scandens* – X; < *Polygonum scandens* – Z; ? *Tiniaria cristata* (Engelmann & A. Gray) Small; = *Fallopia cristata* (Engelmann & A. Gray) Holub]



* ***Fallopia dumetorum*** (Linnaeus) Holub. Mt (WV), Pd (DE, Cp (DE): disturbed areas, thickets; uncommon (rare in DE). Introduced at least as far south as scattered locations in c. and se. PA (Rhoads & Klein 1993), WV, KY, TN, and AL. NS and MI south to FL and TX (FNA). [= FNA; < *Polygonum scandens* Linnaeus var. *cristatum* (Engelmann & A. Gray) Gleason – RAB; = *Polygonum*

scandens Linnaeus var. *dumetorum* (Linnaeus) Gleason – C, G, K; < *Polygonum scandens* – F, W, WV; = *Bylderdykia dumetorum* (Linnaeus) Dumortier – S] {add to synonymy}

Fallopia scandens (Linnaeus) Holub, Common Climbing Buckwheat. Mt (NC, SC, VA, WV), Pd (NC, SC, VA), Cp (FL, NC, SC, VA), {DE?, GA}: moist to wet open habitats; uncommon. July-October. NS, ON and MB, south to Panhandle FL and TX. [= *Polygonum scandens* Linnaeus var. *scandens* – RAB, C, GW, K, WH, Y; < *Polygonum scandens* – F, W, WV; = *Bilderdykia scandens* (Linnaeus) Greene – S; < *Fallopia scandens* – X; < *Polygonum scandens* – Z; = *Tiniaria scandens* (Linnaeus) Small]

Persicaria P. Miller 1754 (Smartweed, Tearthumb, Jumpseed)

A genus of about 150 species, herbs, nearly cosmopolitan (primarily temperate Northern Hemisphere). References: Hinds & Freeman in FNA (2005); Park (1988)=X; Kim & Donoghue (2008); Brandbyge in Kubitzki, Rohwer, & Bittrich (1993). Key based in part on FNA.

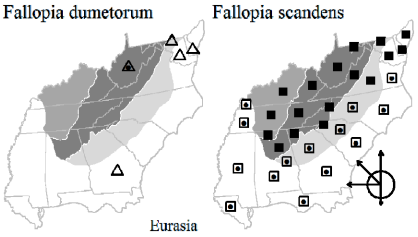
1 Stem, petioles, and lower surface of major leaf veins with abundant recurved prickles; [section *Echinocaulon*].
2 Ocreae foliaceous, green, orbicular, perfoliate; tepals becoming fleshy and blue in fruit ..... ***P. perfoliata***
2 Ocreae scarious, not as above; tepals not becoming fleshy or blue in fruit.
3 Leaf blades triangular in outline, the larger 6-11 cm wide; perianth 4-parted ..... ***P. arifolia***
3 Leaf blades lanceolate to narrowly elliptic, the larger 0.8-3 cm wide; perianth 5-parted.
4 Inflorescence branches glandular-pubescent; stamens 5, in 1 whorl; leaves sessile (rarely shortly petiolate), usually cuneate or rounded at the base (rarely slightly cordate) ..... ***P. meisneriana*** *var.* ***beyrichiana***
4 Inflorescence branches glabrous; stamens 8, an outer whorl of 5 and an inner whorl of 3; leaves petiolate, sagittate at the base ..... ***P. sagittata***
1 Stem, petioles, and lower surface of major leaf veins unarmed.
5 Styles exserted, persistent on achenes; inflorescences spikelike, interrupted; [section *Tovara*] ..... ***P. virginiana***
5 Styles included, rarely exserted, deciduous; inflorescences capitate, paniclelike, or spikelike, uninterrupted or interrupted.
6 Inflorescences capitate; [section *Cephalophilon*] ..... ***P. chinensis***
6 Inflorescences panicle-like or spikelike.
7 Inflorescence panicle-like; [section *Rubrivena*] ..... ***P. wallichii*** *var.* ***wallichii***
7 Inflorescence spike-like; [section *Persicaria*].
8 Ocreae with a green, herbaceous flange; leaves 3-17 cm wide ..... ***P. orientalis***
8 Ocreae hyaline, tan, brown, or reddish throughout; leaves < 6 (-8) cm wide.
9 Ocreae lacking cilia or with cilia 0-1 mm long.
10 Plants perennial, with rhizomes or stolons; leaves lacking a triangular reddish blotch in the middle of the upper surface.
11 Achenes biconvex; styles 2; leaf base cuneate; ocreae 12-23 mm long ..... ***P. glabra***
11 Achenes triangular in ×-section; styles 3; leaf base rounded to cordate; ocreae 6-12 mm long ..... ***P. hirsuta***
10 Plants annual, lacking rhizomes or stolons; leaves often with a triangular reddish blotch in the middle of the upper surface (except for in *P.minor*).
12 Peduncles glabrous; leaves lacking a triangular reddish blotch in the middle of the upper surface ..... ***P. minor***
12 Peduncles usually stipitate-glandular; leaves often with a triangular reddish blotch in the middle of the upper surface.
13 Outer tepals with 3 strong veins, each forked in an anchor shape; tepals 4 (-5); inflorescences usually arching-drooping ..... ***P. lapathifolia***
13 Outer tepals with inconspicuous and irregularly-forking veins; tepals 5; inflorescences erect ..... ***P. pensylvanica***
9 Ocreae with cilia 1-12 mm long.
14 Perianth with glandular punctae.
15 Achenes minutely textured, dull; axillary inflorescences sometimes included within ocreae ..... ***P. hydropiper***
15 Achenes smooth, shiny; axillary inflorescences never included within ocreae.
16 Glandular punctae not uniformly distributed on the tepals, mainly on the lower portions of the outer tepals and on the inner tepals ..... ***P. hydropiperoides***
16 Glandular punctae uniformly distributed on the tepals, not noticeably absent on the upper portion sof the outer tepals.
17 Inflorescences interrupted; ocreolae mostly not overlapping (especially the lower), the margins mostly ciliate with hairs < 2 mm long; leaves 0.6-2.4 cm wide ..... ***P. punctata***
17 Inflorescences not interrupted; ocreolae usually overlapping, the margins usually eciliate or with cilia < 1 mm long; leaves 2-4.5 cm wide ..... ***P. robustior***
14 Perianth lacking glandular punctae.
18 Plants annual, lacking rhizomes or stolons
19 Peduncles stipitate-glandular ..... ***P. careyi***
19 Peduncles not spititate-glandular.
20 Bristles of ocreae (0.5-) 1-4 (-6) mm long; leaves lacking a triangular reddish blotch in the middle of the upper surface; achenes triangular in ×-section; styles 3 ..... ***P. longiseta***
20 Bristles of ocreae 0.2-1.3 (-2) mm long; leaves often with a triangular reddish blotch in the middle of the upper surface; achenes biconvex or triangular in ×-section; styles 2-3 ..... ***P. maculosa***
18 Plants perennial, with rhizomes or stolons; leaves lacking a triangular reddish blotch in the middle of the upper surface.
21 Achenes biconvex; styles 2 ..... ***P. amphibia***
21 Achenes triangular in ×-section; styles 3.
22 Ocreae glabrous, or strigose towards the base (the hairs stiff and appressed) ..... ***P. hydropiperoides***
22 Ocreae strigose and hirsute, at least some of the hairs loosely ascending to spreading.
23 Leaf blades rounded to cordate at the base; stem internodes brownish-hirsute ..... ***P. hirsuta***
23 Leaf blades cuneate to truncate at the base; stem internodes glabrous or loosely spreading-hirsute near the nodes only ..... ***P. setacea***

Persicaria amphibia (Linnaeus) S.F. Gray, Water Smartweed. Mt (NC, SC, VA, WV), Pd (NC, SC, VA), Cp (DE), {GA}: marshes, wet disturbed areas; common (uncommon in SC, VA, and WV, rare in GA and NC). June-August. Widespread in the Northern Hemisphere, in North America from NL (Newfoundland), NU, and AK south to SC, TN, TX, and CA, and southwards into the New World tropics. [= FNA; > *Polygonum coccineum* Muhlenberg ex Willdenow – RAB, G, Z; > *Polygonum amphibium* Linnaeus var. *emersum* Michaux – C, GW, K, Y; > *Polygonum amphibium* Linnaeus – W; > *Polygonum coccineum* var. *coccineum* – F; > *Polygonum natans* (Michaux) Eaton – G; > *Persicaria muhlenbergii* (S. Watson) Small – S; > *Persicaria amphibia* (Linnaeus) S.F. Gray var. *emersa* (Michaux) Hickman; > *Persicaria amphibia* (Linnaeus) S.F. Gray var. *stipulacea* (Coleman) Hara; > *Polygonum amphibium* Linnaeus var. *stipulaceum* Coleman – C, F, K, Y]

Persicaria arifolia (Linnaeus) Haraldson, Halberd-leaf Tearthumb. Cp (DE, GA, NC, SC, VA), Pd (DE, NC, VA), Mt (VA, WV): marshes, wet thickets; common (uncommon in WV, rare in GA). July-November; August-December. NS west to MN. south to se. GA w. NC, and w. TN. [= FNA; = *Polygonum arifolium* Linnaeus – RAB, C, GW, K, W, WV, X, Y, Z; > *Polygonum arifolium* var. *arifolium* – F, G; > *Polygonum arifolium* var. *pubescens* (R. Keller) Fernald – F, G; = *Tracaulon arifolium* (Linnaeus) Rafinesque – S; = *Truellum arifolium* (Linnaeus) Soják]

Persicaria careyi (Olney) Greene. Cp (DE, FL*), Mt (WV), {VA}: moist soils, disturbed areas; rare. NB west to ON and MN, south to VA, KY, IL, seemingly widely scattered. Reported for sc. PA (Rhoads & Klein 1993), DE, NJ, and MD (Kartesz 1999). [= FNA; = *Polygonum careyi* Olney – C, F, G, K, WH] {synonymy incomplete}

* ***Persicaria chinensis*** (Linnaeus) H. Gross, Chinese Knotweed. Disturbed areas; native of Asia. Introduced in MD and NJ. [= FNA; = *Polygonum chinense* Linnaeus – K]



* ***Persicaria extremiorientalis*** (Voroschilov) Tzvelev, East Asian Smartweed. Disturbed areas; roadsides, roadsides; native of Japan, China, Korea, and Sakhalin. August-November. See Atha, Nee, & Naczi (2010) for additional information. [] {not yet keyed}

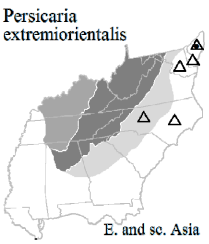
Persicaria glabra (Willdenow) M. Gómez, Dense-flower Smartweed. Cp (DE, FL, GA, NC, SC, VA): swamp forests; uncommon (rare in VA). June-October. Nearly Pantropical, in North America north to s. NJ, VA, KY, MO, and TX. [= FNA; > *Polygonum densiflorum* Meisner – RAB, C, F, G, GW, K, WH, Z; > *Persicaria portoricensis* (Bertero ex Small) Small – S; > *Persicaria densiflora* (Meisner) Moldenke]

Persicaria hirsuta (Walter) Small, Hairy Smartweed. Cp (FL, GA, NC, SC): pondcypress savannas, depression ponds in pinelands; uncommon (rare in NC). June-December. Se. NC south to c. peninsular FL, west to s. MS. [= FNA, S; = *Polygonum hirsutum* Walter – RAB, GW, K, WH, Z]

* ***Persicaria hydropiper*** (Linnaeus) Opiz, Common Smartweed, Waterpepper, Marshpepper Smartweed. Pd (DE, GA, NC, SC, VA), Cp (DE, GA, NC, VA), Mt (NC, VA, WV): wet pastures, barnyards, ditches; common, native of Europe. July-November. [= FNA, S; = *Polygonum hydropiper* Linnaeus – RAB, C, F, GW, K, W, Z; > Polygonum hydropiper var. hydropiper – WV; > Polygonum hydropiper var. projecta Stanford – WV]

Persicaria hydropiperoides (Michaux) Small, Waterpepper. Cp (DE, FL, GA, NC, SC, VA), Pd (DE, GA, NC, SC, VA), Mt (GA, VA, WV): swamp forests, streams, ditches; common (uncommon in VA and WV Mountains). May-November. NS, ON, and AK, south to FL, TX, and CA, and into the New World tropics. [= FNA; > *Polygonum hydropiperoides* var. *hydropiperoides* – RAB, C, F; > *Polygonum hydropiperoides* Michaux – GW, WH, Y; = *Polygonum hydropiperoides* – K, W, WV, Z; > *Polygonum hydropiperoides* var. *breviciliatum* Fernald – F; > *Polygonum hydropiperoides* var. *euronotorum* Fernald – F; > *Persicaria hydropiperoides* (Michaux) Small – S; > *Persicaria hydropiperoides* (Michaux) Small var. *opelousana* (Riddell ex Small) J.S. Wilson; > *Polygonum hydropiperoides* var. *opelousanum* (Riddell ex Small) Riddell ex W. Stone – RAB, C; > *Polygonum opelousanum* Riddell – GW, Y; > *Polygonum opelousanum* Riddell var. *opelousanum* – F; > *Persicaria opelousana* (Riddell ex Small) Small – S]

Persicaria lapathifolia (Linnaeus) S.F. Gray, Willow-weed, Dockleaf Smartweed, Pale Smartweed. Cp (DE, FL, GA, NC, SC, VA), Pd (DE, GA, NC, SC, VA), Mt (GA, NC, SC, VA, WV): bottomlands, bottomland fields, disturbed areas; common (uncommon in FL, GA, NC, SC, VA, and WV). July-November. [= FNA, S; = *Polygonum lapathifolium* Linnaeus – RAB, C, GW, K, W, WH, WV, Y, Z; > *Polygonum lapathifolium* var. *lapathifolium* – G; > *Polygonum lapathifolium* var. *nodosum* (Rafinesque) Weinm. – G]



* ***Persicaria longiseta*** (de Bruijn) Kitagawa, Longbristle Smartweed, Bristly Lady's-thumb. Cp (DE, FL, GA, NC, SC, VA), Pd (DE, GA, NC, SC, VA), Mt (GA, NC, SC, VA, WV): disturbed areas, ditches; common (uncommon in NC and SC

Mountains, rare in FL), native of Asia. May-October. [= FNA; = *Polygonum cespitosum* Blume var. *longisetum* (de Bruijn) A.N. Steward – RAB, C, F, G, GW, K, W, WV, Y, Z; = *Polygonum caespitosum* Blume var. *longisetum* (de Bruijn) A.N. Steward – WH; = *Polygonum longisetum* de Bruijn]

* ***Persicaria maculosa*** S.F. Gray, Lady's-thumb, Heart's-ease. Cp (DE, FL, GA, VA), Pd (DE, GA, VA), Mt (GA, VA, WV), {NC, SC}: disturbed areas; common (uncommon in DE, rare in FL), native of Eurasia. June-December. [= FNA; = *Polygonum persicaria* Linnaeus – RAB, C, G, GW, K, W, WH, WV, Y, Z; > *Polygonum persicaria* var. *persicaria* – F; > *Polygonum persicaria* var. *angustifolium* Beckh. – F; > *Polygonum persicaria* var. *ruderale* (Salisbury) Meisner – F; > *Polygonum dubium* Stein – F; = *Persicaria persicaria* (Linnaeus) Small – S]

Persicaria meisneriana (Chamisso & Schlechtendahl) M. Gómez *var.* ***beyrichiana*** (Chamisso & Schlechtendahl) C.C. Freeman, Mexican Tearthumb. Cp (FL, GA, SC): wet savannas, blackwater river floodplains, ditches; rare (GA Special Concern), sometimes considered only introduced in southeastern North America, but probably native. E. SC south to FL, west to LA; Mexico and Central America south to n. South America; Brazil; se. Africa. See Mitchell (1970) and Freeman (2004). [= FNA; = *Polygonum meisnerianum* Chamisso & Schlechtendahl var. *beyrichianum* (Chamisso & Schlechtendahl) Meisner – GW, K, WH; < *Polygonum meisnerianum* – Z; < *Truellum meisnerianum* (Chamisso & Schlectendahl) Soják]

* ***Persicaria minor*** (Hudson) Opiz, Small Water-pepper. {VA}: disturbed moist areas; rare, native of Europe. [= FNA; = *Polygonum minus* Hudson]

* ***Persicaria orientalis*** (Linnaeus) Spach, Kiss-me-over-the-garden-gate, Prince's-feather, Prince's-plume. Cp (DE, NC, SC, VA), Pd (GA, NC, VA), Mt (GA, NC, VA, WV): barnyards, disturbed areas, garden edges; rare, native of Eurasia. July-November. [= FNA, S; = *Polygonum orientale* Linnaeus – RAB, C, F, K, W, WH, WV, Y, Z]

Persicaria pensylvanica (Linnaeus) M. Gómez, Pinkweed, Common Smartweed, Pennsylvania Smartweed. Cp (DE, FL, GA, NC, SC, VA), Pd (DE, GA, NC, SC, VA), Mt (GA, NC, SC, VA, WV): disturbed areas, bottomlands; common. July-December. NL (Newfoundland), ON, MT, and CA, south to FL, TX, AZ; disjunct (perhaps only introduced (?) in AK, Ecuador, Europe. [= FNA, S; = *Polygonum pensylvanicum* Linnaeus – RAB, C, GW, K, W, WV, WH, Z; > *Polygonum pensylvanicum* var. *pensylvanicum* – F; > *Polygonum pensylvanicum* var. *durum* Stanford – F; > *Polygonum pensylvanicum* var. *laevigatum* Fernald – F; > *Polygonum pensylvanicum* var. *rosaeflorum* J.B.S. Norton – F]

* ***Persicaria perfoliata*** (Linnaeus) H. Gross, Mile-a-minute-vine, Asiatic Tearthumb, Devil's-tail Tearthumb. Pd (DE, VA), Cp (DE), Mt (NC. WV): roadsides, banks, powerline rights-of-way; common, native of e. Asia. Introduced and spreading rapidly in n. VA, MD, PA, DC, and WV. Adler (1999) reports it as occurring in PA, MD, VA, WV, DE, OH, NJ, and DC. Poindexter (2010a) reports its discovery at 3 separate locations in Alleghany County, NC. [= FNA; = *Polygonum perfoliatum* Linnaeus – C, F, K, X; = *Ampelygonum perfoliatum* (Linnaeus) Roberty & Vautier]

Persicaria punctata (Elliott) Small, Dotted Smartweed. Cp (DE, FL, GA, NC, SC, VA), Pd (DE, GA, NC, SC, VA), Mt (GA, NC, SC, VA, WV): swamp forests, bottomlands, marshes; common. July-November. NS, ON, and BC south to FL, TX, and CA, south into the New World tropics. [= FNA; > *Persicaria punctata* (Elliott) Small var. *punctata* – S; = *Polygonum punctatum* – RAB, GW, W, WH, WV; > *Polygonum punctatum* Elliott var. *punctatum* – C, F, G, K, Y; > *Persicaria punctata* (Elliott) Small var. *leptostachya* (Meisner) Small – S; > *Polygonum punctatum* Elliott var. *leptostachyum* (Meisner) Small – F; > *Polygonum punctatum* var. *parvum* Marie-Victorin & Rousseau – F; > *Polygonum punctatum* Elliott var. *confertiflorum* (Meisner) Fassett – C, G, K, Y; < *Polygonum punctatum* – Z (also see *Persicaria robustior*)]

Persicaria robustior (Small) E.P. Bicknell, Water Smartweed. {VA}: peaty shores or semi-aquatic in water; rare? NS, QC, MI, MO, south irregularly to FL s. and TX, and south into tropical America. Probably under-represented as to states of occurrence because of frequent synonymization. [= FNA; = *Polygonum robustius* (Small) Fernald – C, F, G, K, Y; < *Polygonum punctatum* – Z]

Persicaria sagittata (Linnaeus) Gross ex Nakai, Arrowleaf Tearthumb, Arrowvine, Scratch-grass. Cp (DE, FL, GA, NC, SC, VA), Pd (DE, GA, NC, SC, VA), Mt (GA, NC, SC, VA, WV): marshes, bogs, beaver impondments, wet thickets; common (rare in FL). May-December. NL (Newfoundland) west to MB, south to Panhandle FL and e. TX; China, Manchuria, India, Siberia, Korea, and Japan. [= FNA; = *Polygonum sagittatum* Linnaeus – RAB, C, G, GW, K, W, WH, WV, Y, Z; > *Polygonum sagittatum* var. *gracilentum* Fernald – F; > *Polygonum sagittatum* var. *sagittatum* – F; = *Tracaulon sagittatum* (Linnaeus) Small – S; = *Truellum sagittatum* (Linnaeus) Soják]

Persicaria setacea (Baldwin) Small, Swamp Smartweed. Cp (FL, GA, NC, SC, VA), Pd (GA, NC, SC, VA), Mt (GA, NC, SC, VA, WV): swamp forests, bottomland forests; common (rare in Piedmont, rare in WV). July-November. MA, MI, MO, and OK south to s. FL and TX. [= FNA, S; = *Polygonum setaceum* Baldwin – RAB, GW, W, WH, Y, Z; > *Polygonum setaceum* var. *interjectum* Fernald – F, K; > *Polygonum setaceum* var. *tonsum* Fernald – F, K; > *Polygonum setaceum* var. *setaceum* – F, K; = *Polygonum hydropiperoides* Michaux var. *setaceum* (Baldwin) Gleason – C, G]

Persicaria virginiana (Linnaeus) Gaertner, Jumpseed. Mt (GA, NC, SC, VA, WV), Pd (DE, GA, NC, SC, VA), Cp (DE, FL, GA, NC, SC, VA): floodplains, moist forests; common (uncommon in DE Coastal Plain). NH, QC, MN, and NE, south to FL and TX; disjunct in c. Mexico. Section *Tovara* consists of 3-5 species of e. North America and e. Asia (Mun & Park 1995); if the section is recognized as a genus (as it often has been), the correct name for this species is *Antenoron virginianum*. Variation in North America, previously sometimes recognized as varieties, as by F and G, is under study by M. Pyne. [= FNA; = *Tovara virginiana* (Linnaeus) Rafinesque – RAB, S, WV; > *Tovara virginiana* var. *glaberrima* Fernald – F; > *Tovara virginiana* var. *virginiana* – F; = *Polygonum virginianum* Linnaeus – C, GW, K, W, Y; > *Polygonum virginianum* var. *virginianum* – G; > *Polygonum virginianum* var. *glaberrimum* (Fernald) Steyermark – G; = *Antenoron virginianum* (Linnaeus) Roberty & Vautier – Z]

* ***Persicaria wallichii*** Greuter & Burdet *var.* ***wallichii***, Himalayan Knotweed, Kashmir Plume. Mt (NC): persistent and spreading from plantings; rare, native of Himalayan Asia. [= FNA; < *Polygonum polystachyum* Wallich ex Meisner – C, F, G (a later homonym); < ***Aconogonon polystachyum*** (Wallich ex Meisner) M. Král; < *Rubrivena polystachya* (Wallich ex Meisner) M.Král; < *Reynoutria polystachya* (Wallich ex Meisner) Moldenke]

Polygonella Michaux 1803 (Jointweed)

A genus of about 9 species, annual, perennial, and suffruticose herbs, of warm temperate e. North America. Ronse De Craene, Hong, & Smets (2004) suggest that *Polygonella* should be merged into *Polygonum*, as section *Duravia*, subsection *Polygonella*. References: Freeman in FNA (2005); Nesom & Bates (1984)=Q; Wunderlin (1981)=V; Horton (1961)=X; Ronse De Craene, Hong, & Smets (2004); Brandbyge in Kubitzki, Rohwer, & Bittrich (1993).

1 Ocreae ciliate; inner perianth segments fimbriate; [subgenus *Thysanella*].
2 Leaves not hyaline-bordered; stem (below the inflorescence) minutely but densely scabrous; [of e. GA south to Panhandle FL] ..... ***P. fimbriata***
2 Leaves hyaline-bordered; stem (below the inflorescence) glabrous or slightly scabrous on the angles; [of e. FL Panhandle south into peninsular FL] ..... ***P. robusta***
1 Ocreae not ciliate; inner perianth segments not fimbriate; [subgenus *Polygonella*].
3 Leaves (3-) 9-30 mm wide; [of sand pine scrub and coastal dunes in Panhandle FL and s. AL] ..... ***P. macrophylla***
3 Leaves 0.3-6 mm wide; [collectively more widespread].
4 Style and stigma (0.4-) 0.5-0.8 (-1.0) mm long at anthesis; inner sepals (1.7-) 1.9-2.5 (-2.9) mm long in flower, (3.1-) 3.3-4.7 (-6.0) mm long in fruit; perennial; leaves very numerous, (4.0-) 5.2-12.0 (-19.0) mm long, 0.5-0.9 (-1.2) mm wide, nearly as thick as wide..... ***P. americana***
4 Style and stigma 0-0.1 (-0.2) mm long at anthesis; inner sepals (0.6-) 0.7-1.8 (-2.3) mm long at anthesis, (1.6-) 1.7-2.8 (-3.6) mm in fruit; annual or perennial; leaves (2.5-) 4.4-39.0 (-65.0) mm long, (0.3-) 0.6-5.0 (-8.0) mm wide, wider than thick.
5 Annual, simple to much-branched from above the base; leaves lacking hyaline margins, mostly deciduous before fruiting (or even flowering); ocreae obtuse; achenes 1.0-1.4 mm wide.
6 Leaves (0.4-) 0.6-1.0 (-1.2) mm wide; flowers exserted from the ocreolae on pedicels (0.9-) 1.3-1.7 (-2.1) mm long at anthesis; [of the outer Coastal Plain of ne. NC and e.VA northward] ..... ***P. articulata***
6 Leaves (0.8-) 1.0-5.0 (-8.0) mm wide; flowers barely exserted from the ocreolae on pedicels ca. 0.1 mm long at anthesis; [of the outer Coastal Plain of se. SC southward]..... ***P. gracilis***
5 Perennial, much-branched from near the distinctly woody base; leaves with hyaline margins toward the tip, persistent through fruiting; ocreae obtuse, acute, acuminate, or aristate; achenes (0.7-) 0.8-1.0 (-1.2) mm wide.
7 Vernal leaves (larger leaves towards the base of the plant) 4-13 mm long, 0.5-1.2 (-2.1) mm wide, linear to linear-spatulate; leaf ocreae tips 1-1-5 mm long, acuminate to attenuate; floral ocreolae orange-reddish to orange-brownish throughout or pale distally, the pale portion no more than 1/5 the length of the ocreolae; longitudinal grooves evident in ocreolae ..... ***P. polygama*** *var.* ***croomii***
7 Vernal leaves 7-30 mm long, 1.0-6 mm wide (leaves remaining at flowering often only 1-2 mm wide), spatulate to linear-spatulate; leaf ocreae tips 0.3-0.7 mm long, acute to long-acute; floral ocreolae olivaceous proximally, pale orange to beige distally, the pale portion 1/3-1/2 the lenth of the ocreolae; longitudinal grooves absent or faint in ocreolae..... ***P. polygama*** *var.* ***polygama***

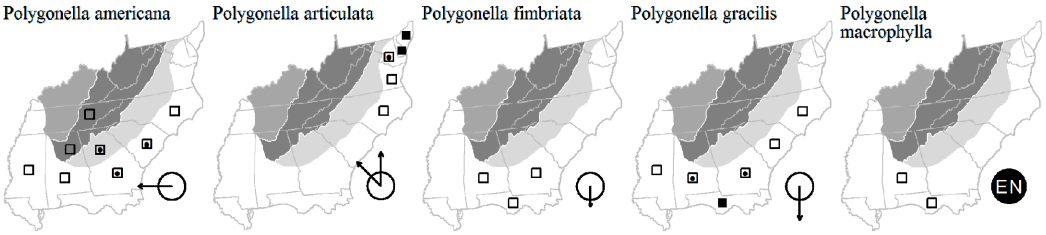
Polygonella americana (Fischer & Meyer) Small, Southern Jointweed. Sandhills, other dry habitats. June-September; August-November. Sc. NC south to s. GA west to TX and NM, north in the interior to ec. TN (Chester, Wofford, & Kral 1997), se. MO, and AR, perhaps adventive toward the northern part of the range. [= RAB, F, FNA, G, K, S, X; ***Polygonum***]

Polygonella articulata (Linnaeus) Meisner, Northern Wireweed. Sandhills, dunes, and other dry, sandy habitats. September-October; October-November. ME and s. QC west to MN, south on the Coastal Plain to VA and ne. NC, otherwise south to se. PA, NY, s. ON, MI, n. IN, n. IL, and e. IA. *P. articulata* is the only northern member of an otherwise southern and predominantly Coastal Plain genus. The record cited for GA in Jones & Coile (1988) is a mis-identification. [= RAB, C, F, FNA, G, K, X; = *Delopyrum articulatum* (Linnaeus) Small – S; **= *Polygonum articulatum*** Linnaeus]

Polygonella fimbriata (Elliott) Horton, Sandhill Jointweed. Sandhills. E. GA (not far from SC) and se. AL south to Panhandle FL. It differs from all our other species in having the inner sepals fimbriate. [= FNA, K, Q, WH; = *Thysanella fimbriata* (Elliott) A. Gray – S; = *Polygonella fimbriata* var. *fimbriata* – X; **= *Polygonum fimbriatum*** Elliott]

Polygonella gracilis Meisner, Wireweed. Sandhills. Late August-October; October-November. Sc. NC south to s. FL, west to s. MS, perhaps adventive toward the northern part of the range. [= RAB, FNA, K, WH, X; = *Delopyrum gracile* (Meisner) Small – S; **= *Polygonum gracile*** Nuttall]

Polygonella macrophylla Small, Largeleaf Wireweed. Sand pine scrub, coastal dunes. S. AL and Panhandle FL. [= FNA, K, S, WH, X; ***Polygonum***]

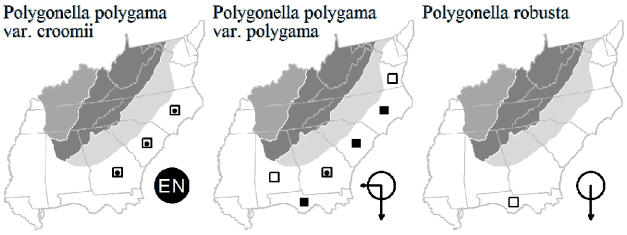


Polygonella polygama (Ventenat) Engelmann & A. Gray *var.* ***croomii*** (Chapman) Fernald, Carolina October-flower. Sandhills, primarily in the fall-line Sandhills and middle Coastal Plain. August-October; October-November. Var. *croomii* ranges from se. and sc. NC south to SC and GA. Var. *croomii* occurs mainly in the fall-line Sandhills, scattered as well in the middle Coastal Plain (Robeson and Bladen counties, NC, Dillon, Darlington, and Lee counties, SC) and rarely the outer Coastal Plain (New Hanover County, NC). In addition to our 2 varieties, var. *brachystachya* (Meisner) Wunderlin is endemic to c. and s.

peninsular FL; it resembles var. *croomii* in its narrow leaves, but has the ocrea and ocreola tips short and acute (more like var. *polygama*). I agree with Nesom & Bates (1984) that "intermediates occur ... that will have to be arbitrarily identified, but without recognition of the varieties an interesting pattern of variation is obscured." It may well prove that the taxa are valid biological species, and that confusion is only caused by herbarium identifications. [= FNA, Q, V; < *P. polygama* – RAB, K, X; = ***Polygonella croomii*** Chapman – S; ***Polygonum***]

Polygonella polygama (Ventenat) Engelmann & A. Gray *var.* ***polygama***, Common October-flower. Sandhills, primarily in the outer Coastal Plain north of SC. August-October; October-November. Var. *polygama* ranges from se. VA south to s. FL, west to se. TX (perhaps absent in GA). In our area, var. *polygama* occurs in the outer Coastal Plain of VA and NC, extending into the middle Coastal Plain and fall-line Sandhills in SC (Richland, Lexington, and Aiken counties, SC). [= FNA, Q, V, WH; < *P. polygama* – RAB, C, F, G, K, X; = ***Polygonella polygama*** – S; **=** ***Polygonum polygamum*** Ventenat]

Polygonella robusta (Small) Nesom & Bates. Sandhills, scrub. E. FL Panhandle south to c. peninsular FL. [= K, Q, WH; = *Polygonella fimbriata* (Elliott) Horton var. *robusta* (Small) Horton – X; = *Thysanella robusta* Small – S; ***Polygonum***]



Polygonum Linnaeus 1753 (Knotweed)

A genus of about 20 species, herbs, of temperate regions of the Northern Hemisphere. References: Costea, Tardif, & Hinds in FNA (2005); Brandbyge in Kubitzki, Rohwer, & Bittrich (1993); Costea & Tardif (2003a)=X. [also see *Fallopia, Persicaria, Reynoutria*] Key adapted from FNA and other sources.

1 Stems with 4 obscure ribs, or lacking apparent ribs; leaf venation parallel, with inconspicuous secondary veins; anthers pink-purple; [section *Duravia*].
  2 Pedicels deflexed; leaves not plicate, revolute at the margin; [reported for VA] ..... ***[P. douglasii]***
  2 Pedicels erect-ascending; leaves plicate with one fold on either side of the midrib, planar at the margin; [widespread in our area] .... ***P. tenue***
1 Stems with 8-16 distinct ribs; leaf venation pinnate, the secondary veins apparent; anthers whitish yellow; [section *Polygonum*].
  3 Perianth bottle-shaped, constricted above the achene.
    4 Fruiting perianth divided about ⅓ of its length; stem leaves (1-) avg. 1.6 (-3)× as long as branch leaves ..... ***[P. achoreum]***
    4 Fruiting perianth divided about ¾ of its length; stem leaves (1.5-) avg. 2.5 (-4)× as long as branch leaves ..... ***P. erectum***
  3 Perianth more open, not constricted above the achene.
    5 Inflorescences spikelike, the cymules borne in the axils of bracts shorter than the cymules ..... ***P. argyrocoleon***
    5 Inflorescences axillary, the cymules borne in the axils of leaves longer than the cymules (though often shorter than primary leaves of the stem).
      6 Ocreae pruinose; mature tepals notably white or pink, loosely spreading; achenes smooth, glossy; [of maritime situations] ..... ***P. glaucum***
      6 Ocreae not pruinose; mature tepals yellow-green, white, pink, or reddish, appressed to the achene; achenes **either** smooth and glossy **or** textured and dull; [mainly of inland and disturbed situations]; [*P. aviculare* complex].
        7 Outer 3 tepals cucullate, in fruiting condition distinctly surpassing the inner 2 sepals and concealing them.
          8 Plants prostrate; leaves 2.5-5.6 (-10)× as long as wide ..... ***P. buxiforme***
          8 Plants ascending to erect; leaves 4-12× as long as wide.
            9 Plants bluish green when fresh, turning dark brown to black when dried; leaves rounded or obtuse at the apex; pedicels 1-2 mm long; stem leaves 1-2.5 (-3.5)× as long as the branch leaves ..... ***P. prolificum***
            9 Plants yellowish green when fresh, not darkening when dried; leaves acute to acuminate at the apex; pedicels 2.5-6 mm long; stem leaves 2.1-3.5 (-4.2)× as long as the branch leaves ..... ***P. ramosissimum***
        7 Outer 3 tepals flat, equaling or shorter than the inner 2 sepals.
          10 Perianth tubes 40-57% of the perianth length.
            11 Tepals green, margins pink or red (rarely white), with branched veins; plants prostrate to ascending, with 3-15 stems; leaf blades 2.8-5.7 (-6.5)× as long as wide ..... ***P. aviculare*** *ssp.* ***depressum***
            11 Tepals green or reddish brown, margins white, with unbranched veins; plants usually ascending, with 1-7 stems; leaf blades (3.40) 4.2-9.2× as long as wide ..... ***P. aviculare*** *ssp.* ***neglectum***
          8 Perianth tubes 15-40% of the perianth length.
            12 Leaf blades2-4.5× as long as wide; perianth (2.3-) 2.8-4.7 (-5) mm long; achenes (of the early season) (2.1-) 2.7-3.7 mm long ..... ***P. aviculare*** *ssp.* ***aviculare***
            12 Leaf blades (3.4-) 4.2-9.2× as long as wide; perianth 1.9-3.4 mm long; achenes (of the early season) 1.2-1.8 mm long ..... ***P. aviculare*** *ssp.* ***neglectum***

* ***Polygonum argyrocoleon*** Steudel ex Kunze. Cp (NC): disturbed areas; rare, native of western North America. May-August? Reported for NC by Burk (1961). [= RAB, K, WH, Z]

* ***Polygonum aviculare*** Linnaeus *ssp.* ***aviculare***, Knotweed. Mt (NC, SC, VA, WV), Pd (NC, SC, VA), Cp (NC, SC, VA), {FL?, GA}: disturbed areas; common. March-November. [= FNA, X; = *P. aviculare* – RAB, C, K, S, W, Y; > *Polygonum aviculare* var. *aviculare* – F, WV; > *P. aviculare* var. *vegetum* Ledebour – F, WV; > *P. monspeliense* Persoon; < *P. aviculare* – G, Z, in the broad sense]

* ***Polygonum aviculare*** Linnaeus *ssp.* ***depressum*** (Meisner) Arcangeli, Dooryard Knotweed. Mt (WV), {DE, FL?, GA, NC, SC, VA}. [= FNA, X; = *Polygonum arenastrum* Boreau – C, K; < *P. aviculare* – G]

* ***Polygonum aviculare*** Linnaeus *ssp.* ***neglectum*** (Besser) Arcangeli, Needle-leaf Knotweed. Cp (VA): fields, disturbed areas; rare, introduced. Also documented from scattered locations in s. PA (Rhoads & Klein 1993); DE, NJ, and MD (Kartesz 1999); and WV (as *P. aviculare* ssp. *rurivagum*) (Costea & Tardif 2003). [= FNA; ? *P. bellardii* Allioni – K; < *Polygonum aviculare* var. *aviculare* – F; < *P. aviculare* – G; *Polygonum aviculare* Linnaeus var. *rurivagum* (Jord. ex Boreau) Berher; *Polygonum aviculare* Linnaeus var. *angustissimum* Meisner]

Polygonum buxiforme Small, Small's Knotweed. Mt (WV), {NC, SC, VA}: disturbed areas, marsh edges; rare in WV {uncommon?}. NL (Newfoundland), NL (Labrador), NU, and NT, south to SC, Al, MS, LA, TX, and CA. [= C, K, S, Y; = *Polygonum aviculare* Linnaeus ssp. *buxiforme* (Small) Costea & Tardif – FNA, X; =? *P. aviculare* Linnaeus var. *littorale* (Link) Mertens – F; < *P. aviculare* – G; *P. littorale* Link]

Polygonum erectum Linnaeus, Erect Knotweed. Mt (NC, SC, VA, WV), Pd (DE, NC, SC, VA), Cp (VA), {GA}: disturbed areas, open places; common (rare in GA, NC, SC, and VA). June-October; July-October. ME, ON, and AB south to GA, LA, and NM. [= RAB, C, F, FNA, K, S, W, WV, Y, Z]

Polygonum glaucum Nuttall, Seabeach Knotweed. Cp (DE, FL, GA, NC, SC, VA): ocean beaches, sound-side sandy shores, dune bases; rare. May-October; June-November. CT south to ne. FL, along the coast. [= RAB, C, F, FNA, K, S, WH, Y, Z]

Polygonum prolificum (Small) B.L. Robinson, Longfruit Knotweed, Bushy Knotweed, Prolific Knotweed. Cp (NC?, VA), Mt (WV): brackish marshes, disturbed areas; rare (VA Watch List). PE, QC, MB, and BC, south to GA, LA, TX. Also reported for NC (Kartesz 1999). [= C, G; = *Polygonum ramosissimum* Michaux var. *prolificum* Small – K, Y; = *P. prolificum* (Small) B.L. Robinson – C, G; > *P. prolificum* – F; > *P. exsertum* Small – F; < *P. ramosissimum* – Z; = *P. ramosissimum* ssp. *prolificum* (Small) Costea & Tardif – FNA, X]

Polygonum ramosissimum Michaux. {GA, NC, SC, VA}: disturbed areas; brackish marshes and shores; {uncommon?}. NS west to NU and BC, south to GA, LA, TX, CA. Reported for SC (Kartesz 1999); {investigate distribution} [= C, F, G; = *Polygonum ramosissimum* Michaux var. *ramosissimum* – K, Y; = *P. ramosissimum* Michaux ssp. *ramosissimum* – FNA, X; = *P. ramosissimum* – C, F, G] {synonymy incomplete}

Polygonum tenue Michaux, Glade Knotweed, Slender Knotweed. Pd (DE, GA, NC, SC, VA), Mt (GA, NC, VA, WV), Cp (DE, VA): glades, barrens, and thin, rocky soils, over various rock types (including granite, diabase, amphibolite, greenstone, metagabbro, and shale); uncommon (rare in DE and NC). July-September; August-October. ME, ON, MN, SD, WY, south to GA, AL, MS, LA, TX. [= RAB, C, FNA, S, W, WV, Y, Z; > *Polygonum tenue* var. *protrusum* Fernald – F, K; > *Polygonum tenue* var. *tenue* – F, K]

Polygonum achoreum Blake. Mt (WV): disturbed areas; rare. NS and NT south to CT, WV, MO, KS, CO, UT, NV, OR. [= C, F, FNA, G, K]

* ***Polygonum douglasii*** Greene. Mt (WV), {VA}: {habitat not known}; rare, native of western North America. Reported for VA in FNA. [= C, F, FNA; ? *P. douglasii* ssp. *douglasii* – K]

Reynoutria Houttuyn 1777

A genus of about 15 species, perennial herbs, of temperate e. Asia. Ronse Decraene & Akeroyd (1988) and most other recent workers in Polygonaceae treat this group as *Fallopia* section *Reynoutria* (Houttuyn) Ronse Decraene. This treatment may prove to be better than the recognition of *Reynoutria* as a genus; either course is compatible with molecular phylogenetic analyses completed to date (Lamb Frye & Kron 2003). References: Freeman & Hinds in FNA (2005); Ronse Decraene & Akeroyd (1988)=X; Brandbyge in Kubitzki, Rohwer, & Bittrich (1993); Zika & Jacobson (2003). Key based on Zika & Jacobson (2003).

1 Veins of leaf underside with multicellular hairs (as seen at 20× magnification); mid-stem leaves with deeply cordate bases; inflorescence much shorter than the subtending mid-branch leaf..... ***R. sachalinensis***
1 Veins of leaf underside with simple hairs, or merely minutely bumpy-scabrous; mid-stem leaves with truncate to slightly cordate or very broadly V-shaped bases; inflorescence shorter or longer than the subtending mid-stem leaf.
  2 Veins of leaf underside with scattered simple, stout-based hairs; mid-branch leaf bases usually slightly cordate; well-developed stem leaves usually > 20 cm long..... ***R.* ×*bohemica***
  2 Veins of leaf underside minutely scabrous with scattered bumps; mid-branch leaves truncate (to very broadly V-shaped); well-developed stem leaves <18 cm long..... ***R. japonica***

* ***Reynoutria* ×*bohemica*** J. Chrtek & A. Chrtková [***Reynoutria japonica* × *sachalinensis***], Bohemian Knotweed, Hybrid Japanese Knotweed. Mt (NC), Pd (VA): disturbed areas, sandbars; rare, native of e. Asia. [= *Polygonum* ×*bohemica* (J. Chrtek & A. Chrtková) P.F. Zika & A.L. Jacobson – Z; **= *Fallopia* ×*bohemica*** (J. Chrtek & A. Chrtková) J.P. Bailey – FNA]

* ***Reynoutria japonica*** Houttuyn, Japanese Knotweed, Japanese Bamboo, Japanese Buckwheat. Mt (GA, NC, SC, VA, WV), Pd (DE, GA, NC, SC, VA), Cp (DE, NC, SC, VA); roadsides, disturbed areas, river banks and sandbars, often forming dense thickets; common (uncommon in GA, NC, SC, and VA), native of e. Asia. May-September; August-October. [= *Polygonum cuspidatum* Siebold & Zuccarini – RAB, C, F, K, W, WV, Y, Z; **= *Fallopia japonica*** (Houttuyn) Ronse Decraene *var.* ***japonica*** – FNA; = *Pleuropterus zuccarinii* Small – S; = *Fallopia japonica* (Houttuyn) Ronse Decraene – X]

* ***Reynoutria sachalinensis*** (F. Schmidt ex Maximowicz) Nakai, Giant Knotweed, Sachaline. Pd (DE, VA), Cp (VA), Mt (NC, WV): disturbed areas, roadsides; rare, native of e. Asia. July-August; August-October. [= *Polygonum sachalinense* F. Schmidt ex Maximowicz – RAB, C, F, K, W, WV, Y, Z; **= *Fallopia sachalinensis*** (F. Schmidt ex Maximowicz) Ronse Decraene – FNA, X]

Rheum Linnaeus 1753 (Rhubarb)

A genus of about 30-60 species, perennial herbs, of temperate and subtropical Asia and Europe. References: Freeman in FNA (2005); Brandbyge in Kubitzki, Rohwer, & Bittrich (1993).

* ***Rheum rhabarbarum*** Linnaeus, Rhubarb, Pie-plant. Mt (NC, VA, WV): uncommonly cultivated (primarily in gardens in the cooler portions of our area), rarely persistent or escaped; rare, native of Europe (though originally native of Asia). July-September. [= K; = *R. rhabarbicum* – C, misspelled; = *R. rhaponticum* – G, misapplied]

Rumex Linnaeus 1753 (Dock)

A genus of about 200 species, perennial and annual herbs (and a few shrubs), of cosmopolitan distribution. References: Mosyakin in FNA (2005); Brandbyge in Kubitzki, Rohwer, & Bittrich (1993). Key based on FNA and other sources.

1 Leaf blades hastate or sagittate on at least well-developed leaves; plants dioecious (rarely polygamo-monoecious), the flowers mostly unisexual; fresh foliage pleasantly acid to taste.
  2 Inner tepals (at fruiting) about as wide as the achene, with a minute or absent free wing; pedicel jointed just below the tepals; [subgenus *Acetosella*]..... ***R. acetosella***
  2 Inner tepals (at fruiting) enlarged, longer and wider than the achene; pedicel jointed near its middle or base, well below the tepals; [subgenus *Acetosa*].
    3 Leaves sagittate, the lobes pointing downwards towards the petiole[subgenus *Acetosa*; section *Acetosa*] ..... ***[R. acetosa]***
    3 Leaves hastate, the lobes spreading, pointing out away from the leaf; [subgenus *Acetosa*; section *Americanae*]..... ***R. hastatulus***
1 Leaf blades not hastate or sagittate; plants synoecious (rarely with some dioecious or polygamo-monoecious individuals), the flowers normally bisexual (someimes bisexual and unisexual flowers in the same inflorescence); fresh foliage "green" or bitter to taste; [subgenus *Rumex*].
  4 Leaves primarily cauline; inner tepal margins entire; [subgenus *Rumex*; section *Axillares*].
    5 Pedicels 2.5-5× as long as the inner tepals; pedicel joint below the midpoint of the pedicel.
      6 Leaf blades ca. 2× as long as wide; lateral veins of leaves forming angle of ca. 80° to midvein ..... ***R. fascicularis***
      6 Leaf blades 3-7 (-10)× as long as wide; lateral veins of leaves forming angle of 40-60° to midvein.
        7 Leaf blades 3-5 (-6)× as long as wide; coriaceous and usually somewhat fleshy; inflorescences dense (interrupted only at base); pedicels 2.5-3× as long as the inner tepals; inner tepals as wide as or wider than long ..... ***R. floridanus***
        7 Leaf blades 5-7 (-10)× as long as wide; thin; inflorescences interrupted in at least the lower half; pedicels 3-5× as long as the inner tepals; inner tepals longer than wide (rarely as long as wide)..... ***R. verticillatus***
    5 Pedicels usually < 2.5× as long as the inner tepals; pedicel joint **either** the midpoint of the pedicel, **or** below it.
      8 Leaf blades widest towards the apex; leaf apex rounded or obtuse ..... ***R. cuneifolius***
      8 Leaf blades widest at the middle or towards the base; leaf apex acute (rarely nearly obtuse).
        9 Leaf blades widest towards the base; inner sepals 4.5-6 mm long, 3-4.5 (-6) mm wide ..... ***R. altissimus***
        9 Leaf blades widest near the middle; inner sepals (2-) 2.5-4.5 (-5) mm long, (2-) 2.5-4 (-4.5) mm wide.
          10 Inflorescence lax, distinctly interrupted; leaf blades thick and coriaceous, deep green, with veins prominent on the lower surface; leaf apex nearly obtuse; inner sepals 3.5-4.5 (-5) mm long, 3-4 (-4.5) mm wide..... ***R. chrysocarpus***
          10 Inflorescence dense, interrupted only towards its base; leaf blades light or yellowish green, the veins on the lower surface not noticeably prominent; leaf apex acute; inner sepals (2-) 2.5-3.5 (-3.8) mm long, (2-) 2.5-3 (-3.5) mm wide..... ***R. triangulivalvis***
  4 Leaves basally disposed, the largest and best developed in a basal rosette (these sometimes withering at maturity, especially in annual species); inner tepal margins entire or variously dentate; [subgenus *Rumex*; section *Rumex*].
    11 Inner tepal margins entire, indistinctly erose, or (rarely) minutely denticulate (the teeth then < 0.2 mm long).
      12 Inner tepals ca. 2× as long as wide, margins entire, largest tubercle almost as wide as the inner tepal.
        13 Tubercles 3, equal or nearly so in size; inflorescence leafy through at least 2/3 of its length; pedicels 1.4 (-5) mm long..... ***R. conglomeratus***
        13 Tubercles 1 (or if 3, then one much larger than the other 2); inflorescence leafy only in basal 1/3 or less of its length; pedicels (2-) 4-6 (-8) mm long ..... ***[R. sanguineus]***
      12 Inner tepals ca. 1-1.5× as long as wide, margins entire or denticulate, largest tubercle much narrower than the inner tepal.
        14 Tubercles 3, equal or nearly so in size; leaf blade >8× as long as wide, 20-55 (-70) cm long, 2-7 cm wide..... ***[R. brittanica]***
        14 Tubercles 1 or 2-3 (if 2-3, then one much larger than the other 1-2); leaf blade <6× as long as wide, 15-45 (-50) cm long, **either** 2-6 cm **or** 10-15 cm wide.
          15 Leaf blade 15-30 (-35) cm long, 2-6 cm wide, the margins strongly undulate; inner tepals 3.5-6 mm long; tubercles normally 3 (rarely 1-2) ..... ***R. crispus*** *ssp.* ***crispus***
          15 Leaf blade 30-45 (-50) cm long, 10-15 cm wide; the margins plane or weakly undulate; inner tepals (5-) 5.5-8 (-10) mm long; tubercles normally 1 (rarely 2-3) ..... ***R. patientia***
    11 Inner tepal margins prominently dentate, at least some of the teeth > 0.3 mm long.
      16 Inner tepals (not including the teeth) orbiculate-ovate to deltate, as wide as long..... ***R. stenophyllus***
      16 Inner tepals (not including the teeth) ovate-triangular or triangular, evidently longer than wide.
        17 Inner tepals with 3-5 strongly hooked teeth on each side..... ***R. brownii***
        17 Inner tepals with straight teeth.

18 Leaf blade > 4× as long as wide; inner tepals (not including the teeth) ca. 2× as long as wide.....***R. fueginus***
18 Leaf blade 2-3× as long as wide; inner tepals (not including the teeth ca. 1.5× as long as wide (sometimes to 2× as long as wide in *R. obtusifolius*).
19 Plants perennial; base of leaf blade usually distinctly cordate.
20 Stems 6-12 (-15) dm tall; leaf blades 20-40 cm long; inflorescence branches normally ascending, making an angle of 30-45° with inflorescence axis; tubercles of the inner sepals smooth .....***R. obtusifolius***
20 Stems 2-6 (-7) dm tall; leaf blades 4-10 (-15) cm long; inflorescence branches spreading, making an angle of 60-90° with inflorescence axis; tubercles of the inner sepals usually verrucose.....***R. pulcher***
19 Plants annual or biennial; base of leaf blade cuneate (rarely rounded).
21 Inner tepals 4-5 (-5.5) mm long; tubercles of the inner sepals verrucose.....***R. obovatus***
21 Inner tepals 3-4 mm long; tubercles of the inner sepals smooth or minutely punctate .....***R. paraguayensis***

* ***Rumex acetosella*** Linnaeus, Red Dock, Sheep Sorrel, Sourgrass. Mt (GA, NC, SC, VA, WV), Pd (DE, GA, NC, SC, VA), Cp (DE, FL, GA, NC, SC, VA). pastures, fields, raodsides, rock outcrops, grassy balds, gardens; common (rare in FL), native of Eurasia. March-June (sometimes later); May-July (sometimes later). Variation in *R. acetosella* has been studied in considerable detail in Eurasia, and a number of infrataxa named; the application of these to North American material is unclear at this time. *R. acetosella* ssp. *pyrenaicus* (Pourret ex Lapeyrouse) Akeroyd, a hexaploid subspecies from western Europe, is apparently the predominant naturalized subspecies in North America. See Mosyakin in FNA (2005) and the references cited therein for further information. [= RAB, C, FNA, G, GW, K, W, WV; > *R. acetosella* var. *acetosella* – F; > *R. acetosella* var. *pyrenaeus* (Pouret) Timbal-Lagrave – F; = *Acetosella acetosella* (Linnaeus) Small – S; > *Acetosella vulgaris* (Koch) Fourreau ssp. *pyrenaica* (Pourret ex Lapeyrouse) Á. Löve]

Rumex altissimus A. Wood, Pale Dock, Tall Dock, Peachleaf Dock. Mt (GA, NC, SC, VA, WV), Pd (DE, GA, NC, SC, VA), Cp (NC, VA): roadsides, disturbed areas; uncommon (rare in DE). March-June (sometimes later); May-July (sometimes later). ME and MN south to FL, TX, AZ, and n. Mexico. [= RAB, C, F, FNA, G, GW, K, S, W, WV]

* ***Rumex brownii*** Campderá, Brown's Dock. Cp (SC), Pd (NC): disturbed areas, floodplains, wool-combing waif; rare, native of Australia. [= FNA; = *R. brownei* – K, orthographic variant]

Rumex chrysocarpus Moris, Amamastla Dock. Cp (FL*, LA): swamps, disturbed wet areas; rare. Se. LA west to TX and Tamaulipas. [= FNA, WH]

* ***Rumex conglomeratus*** Murray, Clustered Green Dock. Cp (GA, NC, SC, VA), Pd (GA, NC, SC, VA), Mt (GA, VA, WV): disturbed areas, bottomland forests, pastures; common (uncommon in Piedmont and Mountains, rare in WV). May-June; May-July. [= RAB, C, F, FNA, G, GW, K, S, WV]

* ***Rumex crispus*** Linnaeus *ssp.* ***crispus***, Curly Dock. Mt (GA, NC, SC, VA, WV), Pd (DE, GA, NC, SC, VA), Cp (DE, FL, GA, NC, SC, VA): disturbed areas, pastures, fields; common (uncommon in FL). March-May; May-July. [= FNA, K; < *R. crispus* – RAB, C, F, G, GW, S, W, WV]

* ***Rumex cuneifolius*** Campderá. Cp (FL): disturbed areas; rare, not recently collected and perhaps only a waif, native of South America. A rare introduction from South America in AL, FL. [= FNA, S; ? *R. frutescens* Thouars – K, misapplied]

Rumex fascicularis Small. Cp (FL, NC?): swamps and marshes; rare (if present). Peninsular FL, and perhaps north to se. NC. [= FNA, S; < *R. verticillatus* Linnaeus – F, G, WH; = *R. verticillatus* ssp. *fascicularis* (Small) Á. Löve]

Rumex floridanus Meisner, Florida Dock. Cp (FL, GA, NC, SC): swamps and marshes; uncommon. NJ south to FL, west to LA. Reported for Orangeburg County, SC (S.W. Leonard, pers. comm.). [= FNA, G, S; < *R. verticillatus* – RAB, C, F, GW, WH; = *R. verticillatus* Linnaus ssp. *floridanus* (Meisner) Á. Löve; > *R. chrysocarpus* Moris – GW, K, misapplied]

*? ***Rumex fueginus*** Philippi, American Golden Dock. Mt* (WV*), Cp? (NC?), {MD, DE}: saline marshes, disturbed areas inland. [= FNA; < *R. maritimus* Linnaeus – G, K; = *R. maritimus* var. *fueginus* (Philippi) Dusen – F; < *R. maritimus* var. *persicarioides* (Linnaeus) R.S. Mitchell – C; < *R. persicarioides* Linnaeus – S, WV; = *R. persicarioides* var. *fueginus* (Philippi) A. Haines]

Rumex hastatulus Baldwin, Wild Dock, Heartwing Dock. Cp (FL, GA, NC, SC, VA), Pd (GA, NC, SC, VA), Mt (GA, SC): fields (especially sandy fields in the Coastal Plain), roadsides, disturbed areas; common (rare in VA). March-May; April-June. NY, IN, IL, MO, and KS, south to c. peninsular FL, TX, and NM. [= RAB, C, F, FNA, G, GW, K, S, W; = *Acetosa hastatula* (Baldwin) Á. Löve]

* ***Rumex obovatus*** Danser, Tropical Dock. Cp (FL, LA): maritime shores, riverbanks, pond margins; rare, native of South America. [= FNA, K]

* ***Rumex obtusifolius*** Linnaeus, Bitter Dock. Mt (GA, NC, SC, VA, WV), Pd (DE, GA, NC, SC, VA), Cp (DE, FL, NC, SC, VA): pastures, barnyards, disturbed areas; common (rare in FL), native of Europe. May-June; June-August. [= RAB, C, F, FNA, G, GW, K, S, W, WV]

* ***Rumex paraguayensis*** D. Parodi, Paraguayan Dock. Cp (FL, LA): moist maritime shores; rare, native of South America. See Brown & Marcus (1998). [= FNA, GW, K]

* ***Rumex patientia*** Linnaeus, Patience Dock, Monk's-rhubarb. Mt (NC, WV), Pd (DE, NC), Cp (VA): disturbed areas; rare, native of Mediterranean Europe. April-May; May-June. [= RAB, C, F, FNA, G, K]

* ***Rumex pulcher*** Linnaeus, Fiddle Dock. Cp (DE, FL, GA, NC, SC, VA), Pd (DE, GA, NC, SC, VA), Mt (SC, VA, WV*): disturbed areas, bottomland fields, bottomland forests; common (uncommon in GA, NC, SC, and VA, rare in Mountains, rare in FL), native of Eurasia. May-June; June-July. [= RAB, C, F, FNA, G, GW, K, S, W]

* ***Rumex stenophyllus*** Ledebour, Narrowleaf Dock. Cp (SC), native of Eurasia. [= FNA, K]

Rumex triangulivalvis (Danser) Rechinger f. Mt (WV), Pd (DE): disturbed areas; rare. Throughout North America, south to WV, DE, PA, KY. [= FNA; < *Rumex salicifolius* Weinmann var. *mexicanus* (Meisner) C.L. Hitchcock – K; = *R. salicifolius* var. *triangulivalvis* (Danser) C.L. Hitchcock – C; < *R. mexicanus* Meisner – F, G]

Rumex verticillatus Linnaeus, Swamp Dock. Cp (DE, FL, GA, NC, SC, VA), Pd (NC, VA), Mt (VA, WV*): tidal freshwater marshes and swamps, inland sometimes adventive in disturbed areas; common (rare in Piedmont and Mountains). April-May (sometimes later); May-July (sometimes later). QC, ON, MN, and SD, south to s. FL and TX. [= FNA, S; < *R. verticillatus* – RAB, C, F, G, GW, K, W, WH]

* *Rumex acetosa* Linnaeus, Green Sorrel. Introduced and naturalized as a weed at least far south as se. PA (Rhoads & Klein 1993). [= C, F, FNA, G; = *R. acetosa* ssp. *acetosa* – K; = *Acetosa pratensis* Miller]

Rumex brittanica Linnaeus, Great Water Dock. Native species south to PA, NJ, KY (FNA). The specimen reported for VA as *R. orbiculatus* Gray (*R. britannica* of FNA) in Castanea 42:261 (1977) has subsequently been annotated to *R. obtusifolius*. No valid collections of *R. britannica* are known for VA. [= FNA; > *R. orbiculatus* A. Gray – C, F, G, W; > *R. orbiculatus* var. *orbiculatus* – K]

* *Rumex sanguineus* Linnaeus, Bloody Dock, Red-veined Dock. Introduced at least as far south as se. PA (Rhoads & Klein 1993), MD, NJ, and AL (Kartesz 1999), perhaps only as a waif. Reported for AL, MS, LA, and VA by Small (1933). [= C, FNA, G, K, S]

287. DROSERACEAE Salisbury 1808 (Sundew Family) [in CARYOPHYLLALES]

A family of 3 genera (*Drosera, Dionaea, Aldrovanda*) and about 100 species, nearly cosmopolitan. References: Schnell (2002b); Kubitzki in Kubitzki & Bayer (2003). [including *DIONAEACEAE*]

1 Leaves catching insects via "snap-trap" leaves, with stiff marginal hairs; stamens 10-20; inflorescence cymose; [endemic to the Coastal Plain of se. NC and ne. SC] ..... ***Dionaea***
1 Leaves catching insects via "flypaper" leaves, with gland-tipped hairs; stamens 5; inflorescence racemose; [collectively widespread in our area] ..... ***Drosera***

Dionaea Ellis 1768 (Venus Flytrap, Meadow Clam)

This monotypic genus is endemic to the Coastal Plain of NC and SC; it has been introduced in various places, including Panhandle FL, Yancey County in the mountains of NC, and s. NJ, where it persists and spreads to varying degrees (Evert 1957). References: Roberts & Oosting (1958); Wood (1960); Schnell (2002b)=Z.

Dionaea muscipula Ellis, Venus Flytrap, Meadow Clam, Tippitiwitchet. Cp (FL*, NC, SC): wet savannas, sandhill seepages; rare. The shiny black seeds are exposed at the maturity and dehiscence of the capsule. Perhaps the most remarkable species in our flora, *Dionaea* has become increasingly rare and now receives some protection as a NC Special Concern species and a Convention on International Trade in Endangered Species "Appendix 2" species. Although collection and trade as a novelty item have contributed to the decline of *Dionaea*, its more fundamental problem is that faced by the great majority of Coastal Plain species in our area – destruction of habitat and fire suppression. In the fall-line Sandhills, *Dionaea* is now restricted to a very few sites on Fort Bragg; in the central Coastal Plain, it is also nearly extirpated. Substantial populations remain only in the Outer Coastal Plain, primarily in Brunswick, Pender, and Onslow counties. Ellis's Latin phrase describing the plant to Linnaeus (quoted in Croom 1837) is worth repeating for its succinctness: "Miraculum naturae! – folia biloba, radicalia, ciliata, sensibilia, conduplicanda, insecta incarcerantia." The colonial governor of North Carolina, Arthur Dobbs, wrote in 1759, "we have a kind of Catch Fly Sensitive which closes upon anything that touches it." Gibson (1991) shows that trap size and prey size are correlated; trap leaves of *Dionaea* primarily capture insects about 5 mm smaller than the length of the trap. Deliberately introduced and at least somewhat naturalized at other places in the Coastal Plain, notably Apalachicola National Forest, FL. [= RAB, GW, K, S, WH, Z]

Drosera Linnaeus 1753 (Sundew)

A genus of about 100 species, herbs, nearly cosmopolitan. References: Wood (1960)=Z; Shinners (1962)=Y; Wynne (1944)=X; Schnell (2002b)=Q; Schnell (1976, 1995).

1 Leaves filiform, the expanded leaf bases forming a corm-like base.
  2 Petals 7-10 (12) mm long; leaves 8-25 (-30) cm long, < 1 mm wide; glandular hairs on the leaves red to purple, drying dark brown; scape 6-26 cm long ..... ***D. filiformis***
  2 Petals 12-17 (-20) mm long; leaves 30-50 cm long, > 1 mm wide; glandular hairs on the leaves pale green, drying pale greenish brown; scape 25-60 cm long ..... ***D. tracyi***
1 Leaves spatulate or suborbicular, the leaf bases not expanded.
  3 Inflorescence stipitate-glandular; basal rosettes 0.8-3.5 cm in diameter; stipules absent or obsolete (consisting of a few hair-like segments); seeds black, crateriform..... ***D. brevifolia***
  3 Inflorescence glabrous; basal rosettes (2-) 3-12 cm in diameter; stipules present, fimbriate; seeds light brown and longitudinally striate, or reddish brown to black and densely papillose, or brown and coarsely corrugated into 14-16 longitudinal ridges.
    4 Leaf blades wider than long, suborbicular or reniform; seeds about 6× as long as wide; [primarily of the Mountains, rarely disjunct eastward]..... ***D. rotundifolia*** *var.* ***rotundifolia***
    4 Leaf blades about as wide as long, spatulate to obovate; seeds 1-2× as long as broad; [primarily of the Coastal Plain, rarely disjunct westward].

5 Petioles with few to many long trichomes; petals pink (sometimes fading to white); plants scapose; inflorescence straight at base; seeds coarsely corrugated into 14-16 longitudinal ridges ..... ***D. capillaris***
5 Petioles glabrous; petals white; plants usually with a leafy stem 1-10 cm long; inflorescence arching at base; seeds reddish brown to black and densely papillose ..... ***D. intermedia***

Drosera brevifolia Pursh, Dwarf Sundew. Cp (FL, GA, NC, SC, VA), Pd (GA, NC), Mt (GA, SC): pine savannas, other wet sandy sites, rarely in seepage over rock outcrops; common (rare in lower Piedmont only and Mountains, rare in VA). April-May. The species ranges from se. VA south to s. FL and west to AR, OK, and TX; disjunct in sc. TN. *D. leucantha* may be the correct name for this taxon; see Shinners (1962) and Wood (1966) for a contentious discussion of nomenclatural issues. [= C, F, GW, G, K, Q, S, WH, X, Z; = *D. leucantha* Shinners – RAB, Y]

Drosera capillaris Poiret, Pink Sundew. Cp (DE, FL, GA, NC, SC, VA), Pd (NC, SC, VA): pine savannas, other wet sandy or peaty sites; common (rare in Piedmont, rare in DE and VA). May-August. Se. VA south to s. FL and west to TX, rarely inland, as in TN; also extending into tropical America, in the West Indies, Mexico, and n. South America. [= RAB, C, F, G, GW, K, Q, S, W, WH, X, Y, Z]

Drosera filiformis Rafinesque, Threadleaf Sundew. Cp (DE, FL, NC): margins of natural pools in pinelands, especially clay-based Carolina bays; rare. June; August. E. MA south to se. NC; disjunct in the FL Panhandle (Bay and Washington counties) and in sw. NS (Sorrie 1998a). Sorrie (1998a) has clarified the taxonomy and phytogeography of *D. filiformis* and *D. tracyi*. See comments about *D. tracyi* below. Reported as adventive in a single county in WV (Harmon, Ford-Werntz, & Grafton 2006). [= GW, K, WH, Y; < *D. filiformis* – RAB, C, G (also see *D. tracyi*); = *D. filiformis* var. *filiformis* – F, Q, X, Z; < *D. tracyi* Macfarlane in L.H. Bailey – S (also see *D. filiformis*)]

Drosera intermedia Hayne, Water Sundew, Spoonleaf Sundew. Cp (DE, FL, GA, NC, SC, VA), Pd (NC, SC): savannas, ditches, pocosins, margins of pools or streams, often in standing water; common (rare in Piedmont, rare in VA). July-September. *D. intermedia* is circumboreal, in North America ranging from NL (Newfoundland) and MN south to c. peninsular FL and TX, and into tropical America. Reported as adventive in a single county in WV (Harmon, Ford-Werntz, & Grafton 2006). [= RAB, C, F, G, GW, K, S, Q, W, WH, X, Y, Z]

Drosera rotundifolia Linnaeus *var.* ***rotundifolia***, Roundleaf Sundew. Mt (GA, NC, SC, VA, WV), Cp (DE, NC, VA), Pd (DE, VA): mountain bogs and fens, seepages slopes, vertical seepages on rock (in the mountains) or clay (as along the Little River in the Sandhills of NC); uncommon (rare in DE and GA). A circumboreal species ranging south in North America to SC, ne. GA, e. and nc. TN, IL, and CA. Var. *comosa* Fernald is restricted to e. Canada, New England, and n. NY. [= F, K; < *D. rotundifolia* – RAB, C, G, GW, S, Q, W, WV, X, Y, Z]

Drosera tracyi MacFarlane in L.H. Bailey, Tracy's Sundew. Cp (FL, GA): savannas; common (rare in GA). Sc. GA and Panhandle FL, west to e. LA; it has been reported for SC by various authors, including Wynne (1944), but the basis for these reports is unknown. The notion that this species is not distinguishable from *D. filiformis* (or is only varietally distinct) is erroneous (Sorrie 1998a); see Schnell (1995) for a contrary view. [= GW, K, WH, Y; = *D. filiformis* Rafinesque var. *tracyi* (MacFarlane in L.H. Bailey) Diels – Q]

296. CARYOPHYLLACEAE A.L. de Jussieu 1789 (Pink Family) [in CARYOPHYLLALES]

A family of about 86 genera and 2200-3000 species, herbs, shrubs, and trees, nearly cosmopolitan, but mostly Northern Hemisphere. References: Rabeler & Hartman in FNA (2005); Bittrich in Kubitzki, Rohwer, & Bittrich (1993).

1 Stipules present and readily apparent, scarious or hyaline.
2 Fruit a utricle; seed 1 per fruit; petals absent; [subfamily *Paronychioideae*] ..... **Key A**
2 Fruit a capsule; seeds 3-many per fruit; petals present; [subfamily *Polycarpoideae*] ..... **Key B**
1 Stipules absent.
3 Sepals fused into a toothed or lobed tube; [subfamily *Caryophylloideae*] ..... **Key C**
3 Sepals distinct, or slightly fused at their bases; [subfamily *Alsinoideae*] ..... **Key D**

Key A – *Paronychioideae*

1 Leaves alternate; staminodes petaloid, ovate to oblong ..... ***[Corrigiola]***
1 Leaves opposite (or the uppermost alternate in *Herniaria*); staminodes not petaloid, subulate.
2 Stipules inconspicuous; sepals green-margined, obtuse, lacking awns ..... ***[Herniaria]***
2 Stipules usually conspicuous; sepals white-scarious-margined, hooded or awned ..... ***Paronychia***

Key B – *Polycarpoideae*

1 Stem leaves subulate, 1-2 mm long, pectinate-fringed at the base; basal rosette leaves spatulate (usually withering quickly after overwintering; stems wiry, stiff, subdichotomously branched; [of xeric sands on the Coastal Plain from se. VA southward] ..... ***Stipulicida***
1 Stem leaves larger, mostly both longer and broader, not pectinate-fringed at the base; basal rosette present or absent; stems either thicker, more flexuous, or not subdichotomously branched; [collectively more widespread].
2 Leaves appearing verticillate, 10-16 per node, filiform to linear ..... ***Spergula***
2 Leaves opposite or in whorls of 4, linear to ovate or spatulate.

3 Leaves mostly in whorls of 4, obovate-spatulate, 2-8 mm long ..... ***Polycarpon***
3 Leaves opposite, linear or orbicular, 5-40 mm long.
4 Leaves orbicular-ovate; styles partly united ..... ***Drymaria***
4 Leaves linear; styles separate ..... ***Spergularia***

Key C – *Caryophylloideae*

1 Calyx immediately subtended by 1-3 pairs of bracts.
2 Calyx 20-40-nerved ..... ***Dianthus***
2 Calyx 15-nerved ..... ***Petrorhagia***
1 Calyx lacking subtending bracts.
3 Sepals 25-62 mm long; calyx lobes longer than the calyx tube, the lobes as long as or longer than the corolla lobes ..... ***Agrostemma***
3 Sepals (1-) 10-28 (-40) mm long; calyx lobes shorter than the calyx tube, the lobes much shorter than the corolla lobes (except *Gypsophila*).
4 Styles 3-5 (or 0 in staminate plants); fruit valves 3, 4, 5, 6, 8, or 10; petals generally appendaged ..... ***Silene***
4 Styles 2; fruit valves 4; petals appendaged or not.
5 Sepals 1-5 mm long, the commissures between the sepals scarious ..... ***Gypsophila***
5 Sepals 7-25 mm long, lacking commissures.
6 Calyx tubular, 20-nerved; petals appendaged; perennial ..... ***Saponaria***
6 Calyx ovoid, 5-nerved; petals not appendaged; annual ..... ***Vaccaria***

Key D – *Alsinoideae*

1 Petals absent; fruit a 1-seeded, indehiscent utricle; styles 2 ..... ***Scleranthus***
1 Petals present (rarely obsolete or essentially absent); fruit a few-many seeded capsule; styles 3-5.
2 Leaves fleshy; seeds > 3 mm long; [of seabeaches and dunes] ..... ***Honckenya***
2 Leaves membranaceous or stiff; seeds < 2 mm long; [of various habitats].
3 Styles 4-5.
4 Leaves linear-subulate, < 2 mm wide; styles 4-5.
5 Valves or teeth of the capsule twice as many as the styles ..... ***Moenchia***
5 Valves or teeth of the capsule as many as the styles ..... ***Sagina***
4 Leaves ovate, obovate, > 4 mm wide; styles 5.
6 Capsule cylindric, dehiscent by 10 apical teeth ..... ***Cerastium***
6 Capsule ovoid, dehiscent by 5 valves, each apically 2-cleft ..... ***Myosoton***
3 Styles 3.
7 Inflorescence umbelliform; petals irregularly denticulate at apex ..... ***Holosteum***
7 Inflorescence cymose or racemiform; petals entire, notched, or deeply cleft.
8 Petals shallowly to deeply 2-cleft, notched at least 1/4 of the length, often divided nearly to the base and then appearing almost as 10 petals.
9 Capsule cylindric, twice as long as the sepals; petals 2-cleft 1/5 - 1/2 length; styles (3-) 5 (-6), 0.5-2 mm long ..... ***Cerastium***
9 Capsule spherical or ellipsoid, as long as or slightly longer than the sepals; petals 2-cleft 2/3-3/4 length (1/2 length to laciniate in *S. holostea*); styles (2-) 3 (-5), 0.2-7 mm long ..... ***Stellaria***
8 Petals entire, or emarginate.
10 Valves or teeth of the capsule as many as the styles ..... ***Minuartia***
10 Valves or teeth of the capsule twice as many as the styles.
11 Seeds with an aril ..... ***Moehringia***
11 Seeds lacking an aril.
12 Capsule straight; petals entire or barely emarginated ..... ***Arenaria***
12 Capsule cylindrical, and often somewhat curved; petals emarginate to bifid ..... ***Cerastium***

Agrostemma Linnaeus 1753 (Corncockle)

A genus of 2 species, herbs, of temperate Eurasia. References: Bittrich in Kubitzki, Rohwer, & Bittrich (1993).

* ***Agrostemma githago*** Linnaeus *var.* ***githago***, Corncockle, Purple Cockle, Corn-campion. Cp (DE, FL, GA, NC, SC, VA), Pd (DE, GA, NC, SC, VA), Mt (GA, NC, SC, VA, WV): fields, disturbed areas; common (rare in DE and FL), native of Europe. May-July. [= FNA; < *A. githago* – RAB, C, F, G, K, S, W, WH]

Arenaria Linnaeus 1753 (Sandwort)

A genus of about 150-210 species, herbs, of temperate and subarctic regions of the Northern Hemisphere, extending southward to the montane tropics of South America and Africa. References: Hartman, Rabeler, & Utech in FNA (2005); Bittrich in Kubitzki, Rohwer, & Bittrich (1993). [also see *Minuartia*]

1 Leaves lanceolate to oblanceolate, (7-) 15-32 mm long, 2-8 (-14) mm wide; perennial, stems to 8 dm long .....***A. lanuginosa*** *var.* ***lanuginosa***
1 Leaves ovate, 3-8 mm long, 1-4 mm wide; annual, stems to 3 dm long.
2 Seeds 0.4-0.5 mm long; fruiting calyx 2-3 mm long.....***A. leptoclados***
2 Seeds ca. 0.6 mm long; fruiting calyx 3-4 mm long .....***A. serpyllifolia***

Arenaria lanuginosa (Michaux) Rohrbach *var.* ***lanuginosa***, Spreading Sandwort. Cp (FL, GA, NC, SC, VA): dunes, maritime forests, coquina limestone outcrops; common (uncommon in GA and SC, rare in NC and VA). May-July. Se. VA south to c. peninsular FL, west to TX, AR, and Mexico, and north in the interior to sc. TN (Chester, Wofford, & Kral 1997). [= C, FNA; < *A. lanuginosa* – RAB, F, S, WH; = *A. lanuginosa* ssp. *lanuginosa* – G; > *A. lanuginosa* ssp. *lanuginosa* var. *lanuginosa* – K; > *A. lanuginosa* ssp. *lanuginosa* var. *longepedunculata* Duncan – K; *Spergulastrum lanuginosum* Michaux ssp. *lanuginosum*]

* ***Arenaria leptoclados*** (Reichenbach) Gussone, Small Thyme-leaved Sandwort, Slender Sandwort. Cp (FL), {GA, NC, SC, VA, WV}; rare in FL, native of Eurasia. The relative ranges, habitats, and abundance of the *A. leptoclados* and *A. serpyllifolia* are poorly known {additional herbarium work}. March-June. [= S; < *A. serpyllifolia* – RAB, K, W; = *A. serpyllifolia* Linnaeus var. *tenuior* Mertens & W.D. J. Koch – C, F, FNA, G; = *A. serpyllifolia* Linnaeus ssp. *leptoclados* (Reichenbach) Nyman – WH]

* ***Arenaria serpyllifolia*** Linnaeus, Large Thyme-leaved Sandwort. Cp (DE, FL), Pd (DE), {GA, NC, SC, VA, WV}; uncommon in DE and FL. The relative ranges, habitats, and abundance of this and *A. leptoclados* are poorly known. March-June. [= S; < *A. serpyllifolia* – RAB, K, W; = *A. serpyllifolia* var. *serpyllifolia* – C, F, FNA, G; = *A. serpyllifolia* ssp. *serpyllifolia* – WH]

Cerastium Linnaeus 1753 (Mouse-ear Chickweed, Mouse-ear)

A genus of about 100 species, herbs, especially north temperate but nearly cosmopolitan. References: Morton in FNA (2005); Bittrich in Kubitzki, Rohwer, & Bittrich (1993); Rabeler & Thieret (1988); Scheen et al. (2004). Key based in part on FNA.

1 Petals 10-18 mm long, 2-3× as long as the sepals; leaves 2-7 cm long; plants perennial, typically with some shoots not flowering.
2 Leaf blades narrowly to broadly linear, acute or short-acuminate at tip, tapered to base; stems erect nearly whole length
3 Plants strongly rhizomatous with long-creeping shoots, lacking taproot; flowering stems usually 25-30 cm long; stem pubescence eglandular (glandular hairs present in the inflorescence only); sepals 5-7 mm long; anthers 1.0-1.1 mm long; petals often turning brown when dry; [alien] .....***[C. arvense*** *ssp.* ***arvense]***
3 Plants clumped, with taproots or shortly rhizomatous; flowering stems usually 5-20 cm long; stem pubescence glandular; sepals 3.5-6 (-7) mm long; anthers 0.8-0.9 mm long; petals usually remaining white when dried; [native] .....***C. arvense*** *ssp.* ***strictum***
2 Leaf blades narrowly lanceolate to narrowly ovate, obtuse to acute at tip, more-or-less rounded at base; stems spreading or decumbent basally, ascending-erect distally.
4 Leaf blades narrowly lanceolate, obtuse to acute, well-spaced on stem, moderately to densely pubescent with dull hairs but may be glabrate in age; plants forming small clumps ..... ***C. velutinum*** *var.* ***velutinum***
4 Leaf blades narrowly ovate, obtuse and blunt at tip, tightly spaced on stem, very densely pubescent with silvery or translucent-white permanent hairs; plants form clumps to several dm wide; [endemic to serpentine in PA and MD] .....***[C. velutinum*** *var.* ***villosissimum]***
1 Petals 3-8 mm long, shorter than, equaling, or up to 1.5× as long as the sepals; leaves 0.5-3.0 cm long (to 8 cm long in *C. nutans* and *C. brachypodum*); plants annual, with all shoots producing flowers (except *C. fontanum* ssp. *vulgare*).
5 Perennial, matted at the base and rooting at the nodes..... ***C. fontanum*** *ssp.* ***vulgare***
5 Annual, taprooted.
6 Sepals with long, appressed, eglandular hairs extending beyond the tip of the sepal.
7 Inflorescence an open cyme, most of the pedicels longer than the sepals.....***C. brachypetalum***
7 Inflorescence a compact, cymose cluster, most of the pedicels shorter than the sepals..... ***C. glomeratum***
6 Sepals lacking long, appressed, eglandular hairs.
8 Styles, sepals, and petals 3-4 (-5); capsule teeth 6-8 (-10).
9 Styles, sepals, and petals 4 (-5); capsule teeth 8 (-10); capsules ca. 1.5 × as long as the sepals; cauline leaves 2-3 × as long as wide .....***[C. diffusum]***
9 Styles, sepals, and petals 3 (-4); capsule teeth 6 (-8); capsules ca. 2 × as long as the sepals; cauline leaves 8-10 × as long as wide... .....***C. dubium***
8 Styles, sepals, and petals 5; capsule teeth 10.
10 Bracts of the inflorescence with distinctly scarious margins; leaves mostly 0.5-1.0- (-1.5) cm long.
11 Petals equaling or surpassing the sepals; cleft in petal apex 1.0-1.5 mm deep ..... ***C. pumilum***
11 Petals shorter than the sepals; cleft in petal apex 0.2-0.5 (-0.9) mm deep .....***C. semidecandrum***
10 Bracts of the inflorescence with green margins; leaves mostly (1.0-) 1.5-8 cm long.
12 Pedicels 3-10 (-15) mm long; leaves to 3.5 cm long.....***C. brachypodum***
12 Pedicels (10-) 15-40 (-55) mm long; leaves to 8 cm long .....***C. nutans***

Cerastium arvense Linnaeus *ssp.* ***strictum*** (Linnaeus) Ugborogho. Mt (WV): sandy and gravelly areas; rare. {overall distribution}. Reported for GA, TN, KY, WV, MD, DE, and NJ, among other states (Kartesz 1999), the GA record not validated in FNA. [= FNA, K; < *C. arvense* – C, G; < *C. arvense* var. *arvense* – F]

* ***Cerastium brachypetalum*** Desportes, Gray Mouse-ear. Mt (NC, SC, WV), Pd (NC, SC, VA), Cp (NC, VA): roadsides, disturbed areas; common (rare in SC and WV), native of Europe. April-June. The reports of *C. tetrandrum* for e. VA in F and G are actually this species. [= RAB, C, F, FNA, G, W; > *C. brachypetalum* ssp. *brachypetalum* – K; >< *C. tetrandrum* W. Curtis – F, G, misidentified]

Cerastium brachypodum (Engelmann ex A. Gray) B.L. Robinson. Mt (NC, VA), Pd (SC, VA), Cp (VA): disturbed areas, roadsides; rare. April-May. IL west to AB and OR, south to NC, nc. GA (Jones & Coile 1988), and AZ. This taxon is perhaps

only introduced in our area from further west. [= F, FNA, K, S; = *C. nutans* Rafinesque var. *brachypodum* Engelmann ex A. Gray – RAB, G, W; < *C. nutans* – C]

* ***Cerastium dubium*** (Bastard) Guépin. Cp (VA): disturbed areas; rare, native of s. Europe and Asia. Introduced in scattered states in the United States, including VA, KY, TN, MS (FNA). First reported for VA by Belden et al. (2004). [= C, FNA, K]

* ***Cerastium fontanum*** Baumgartner *ssp.* ***vulgare*** (Hartman) Greuter & Burdet, Common Mouse-ear. Mt (NC, SC, VA, WV), Pd (DE, NC, SC, VA), Cp (FL, NC, SC, VA): fields, disturbed areas; common (uncommon in DE, rare in FL), native of Europe. March-June. [= FNA, K, WH; = *C. holosteoides* Fries var. *vulgare* (Hartman) Hylander – RAB; = *C. vulgatum* Linnaeus – C, S; > *C. vulgatum* var. *vulgatum* – F, G; > *C. vulgatum* var. *holosteoides* (Fries) Wahlenberg – F, G; > *C. vulgatum* var. *hirsutum* Fries – G; *? C. fontanum* ssp. *triviale* (Link) Jalas – W]

* ***Cerastium glomeratum*** Thuillier, Sticky Mouse-ear. Cp (DE, FL, NC, SC, VA), Pd (DE, NC, SC, VA), Mt (NC, SC, VA, WV): fields, disturbed areas; common (uncommon in DE), native of Europe. March-May. [= RAB, FNA, K, W, WH; = *C. viscosum* Linnaeus – C, F, G, S, an ambiguous name, of uncertain application]

Cerastium nutans Rafinesque. Mt (NC, SC, VA, WV), Pd (DE, NC, SC, VA), Cp (DE, VA): alluvial forests, bottomlands, moist forests; common (uncommon in NC, rare in DE). April-May. NS west to NT, south to SC, GA, AZ, Mexico, and OR. [= F; = *C. nutans* var. *nutans* – RAB, G, K, W; < *C. nutans* – C; > *C. nutans* var. *nutans* – FNA; > *C. longepedunculatum* Willdenow ex Britton – S]

* ***Cerastium pumilum*** W. Curtis, Dwarf Mouse-ear. Cp (NC, VA), Pd (NC, SC, VA), Mt (NC, WV): disturbed areas; rare, native of Europe. April-May. See Rabeler & Thieret (1988) for discussions and reports. [= C, F, FNA, G, K; > *C. glutinosum* Fries]

* ***Cerastium semidecandrum*** Linnaeus, Little Mouse-ear. Cp (DE, FL, NC, SC, VA), Mt (NC, VA, WV), Pd (NC, VA): disturbed areas; uncommon (rare in DE, FL, NC, and WV), native of Europe. April-June. Reported for SC by Nelson & Kelly (1997). [= RAB, C, F, FNA, G, K, S, W, WH]

* ***Cerastium tomentosum*** Linnaeus, Snow-in-summer. Mt (NC, VA, WV): disturbed areas; rare, native of Eurasia. This species is "cultivated and sometimes escaped" in scattered locations in PA (Rhoads & Klein 1993). First reported for NC by Pittillo & Brown (1988). [= C, F, FNA, G, K]

Cerastium velutinum Rafinesque *var.* ***velutinum***, Field Mouse-ear, Starry Grasswort. Pd (DE, VA), Mt (VA): rocky river-scour areas, other open situations; rare. April-August. [= FNA; < *C. arvense* – C, G, S, W; < *C. arvense* Linnaeus var. *villosum* (Muhlenberg ex Darlington) Hollick & Britton – F; = *C. arvense* Linnaeus ssp. *velutinum* (Rafinesque) Ugborogho var. *velutinum* (Rafinesque) Britton – K; = *Cerastium arvense* Linnaeus var. *velutinum* (Rafinesque) Britton]

* *Cerastium arvense* Linnaeus ssp. *arvense*. Introduced at scattered locations in ne. North America, including MD and NJ (FNA). [= FNA, K; < *C. arvense* – C, G; < *C. arvense* var. *arvense* – F]

Cerastium diffusum Persoon, Sea Mouse-ear. East to KY and TN (K), though not shown for those states in FNA. March-April. [= FNA, K; *? C. diffusum* var. *diffusum* – C]

Cerastium velutinum Rafinesque var. *villosissimum* (Pennell) J.K. Morton. This taxon is highly restricted, found only at a few stations in the serpentine barrens of Chester County, PA, and Cecil County, MD (Gustafson et al. 2003). [= FNA; = *C. arvense* var. *villosissimum* Pennell – F; < *C. arvense* – C, G; < *C. arvense* Linnaeus ssp. *velutinum* (Rafinesque) Ugborogho var. *villosum* (Muhlenberg ex Darlington) Hollick & Britton – K]

Corrigiola Linnaeus (Strapwort)

A genus of ca. 10 species, of Eurasia, Africa, and South aqmerica. References: Thieret & Rabeler in FNA (2005).

* *Corrigiola litoralis* Linnaeus ssp. *litoralis*, Strapwort. Introduced south to MD and PA. [= FNA; < *C. littoralis* – C, F, G, orthographic variant; < *C. litoralis* – K]

Dianthus Linnaeus 1753 (Pink, Carnation)

A genus of about 300-320 species, herbs, of Eurasia and Africa. Species other than those treated here are grown in gardens and may escape or persist. References: Rabeler & Hartman in FNA (2005); Bittrich in Kubitzki, Rohwer, & Bittrich (1993).

1 Flowers clustered in crowded cymes, short-pedicelled; [subgenus *Carthusianastrum*].
  2 Leaves 2-5 (-8) mm wide; annual or biennial; inflorescence pubescent ..... ***D. armeria***
  2 Leaves mostly (8-) 10-20 mm wide; perennial; inflorescence glabrous ..... ***D. barbatus***
1 Flowers solitary, or few, long-pedicelled; [subgenus *Dianthus*].
  3 Petal blade 5-9 (-10) mm long, toothed ..... ***D. deltoides***
  3 Petal blade (8-) 12-18 mm long, fringed ..... ***D. plumarius***

* ***Dianthus armeria*** Linnaeus *ssp.* ***armeria***, Deptford Pink. Mt (GA, NC, SC, VA, WV), Pd (DE, GA, NC, SC, VA), Cp (DE, FL, NC, SC, VA): fields, roadsides, pastures; common (rare in FL), native of Europe. May-September. [= FNA; < *D. armeria* – RAB, C, F, G, K, S, W, WH, WV]

* ***Dianthus barbatus*** Linnaeus *ssp.* ***barbatus***, Sweet William. Pd (DE, NC, SC), Mt (VA, WV), Cp (DE), {GA}: cultivated as an ornamental, rarely escaped to disturbed areas; rare, native of Europe. June-August. [= FNA; < *D. barbatus* – RAB, C, F, G, K, WV]

* ***Dianthus deltoides*** Linnaeus *ssp.* ***deltoides***, Maiden Pink, Meadow Pink. Pd (NC, VA), Mt (NC, WV): cultivated as an ornamental, rarely escaped to adjacent areas; rare, native of Europe. May. See Rabeler & Thieret (1988) for additional information. [= FNA; < *D. deltoides* – C, F, G, K]

* ***Dianthus plumarius*** Linnaeus *ssp.* ***plumarius***, Garden Pink, Grass Pink. Cp (NC), Pd (NC, SC), Mt (VA): cultivated as an ornamental, rarely escaped to disturbed areas; rare, native of e. Europe. June-August. [= FNA; < *D. plumarius* – RAB, C, F, G, K]

Drymaria Willdenow ex J.A. Schultes 1819 (Drymary)

A genus of about 48 species, herbs, mostly New World (tropical to temperate), but 1 species pantropical. References: Duke (1961)=Z; Hartman in FNA (2005); Bittrich in Kubitzki, Rohwer, & Bittrich (1993).

Drymaria cordata (Linnaeus) Willdenow ex Schultes *var.* ***cordata***, Drymary, West Indian Chickweed. Cp (FL, GA): moist hammocks, moist disturbed areas; uncommon (rare in GA). Sc. GA south to s. FL south into the New World tropics; also old World tropics. Var. *diandra* Blume is restricted to the Old World. [= FNA; = *D. cordata* ssp. *cordata* – K, Z; < *D. cordata* – S, WH]

Gypsophila Linnaeus 1754 (Baby's-breath)

A genus of about 150 species, annual and perennial herbs, of temperate Eurasia, Africa, and Australia. References: Pringle in FNA (2005).

1 Leaves 0.2-2 (-3) mm wide; stems diffusely and repeatedly branched near the base and upward ..... ***G. muralis***
1 Leaves (1-) 3-16 mm wide; stems simple, few-branched toward the top, **or** much-branched
  2 Annual; plants strict or few branched upwards; petals 6-15 mm long ..... ***G. elegans***
  2 Perennial; plants much-branched 1-4 (-8) mm long ..... ***G. paniculata***

* ***Gypsophila elegans*** Bieberstein, Annual Baby's-breath. Cp (NC), Pd (NC), Mt (WV): disturbed areas, persistent from cultivation, doubtfully established; rare, native of Eurasia. See Rabeler & Thieret (1988) for additional information. [= C, FNA, K]

* ***Gypsophila muralis*** Linnaeus, Cushion Baby's-breath. Pd (NC): disturbed areas, roadsides, yards, cemeteries; rare, native of Europe. Found in Alamance County, NC (McCormick, pers. comm., 2009). Reported for various eastern states, including KY, TN, PA, NJ (FNA). [= C, FNA, K]

* ***Gypsophila paniculata*** Linnaeus, Tall Baby's-breath. Cp (FL): disturbed areas; rare, native of Eurasia. [= FNA, K, WH] {add to synonymy}

Herniaria Linnaeus (Rupture-wort)

A genus of about 45 species, herbs, of Eurasia, Africa, and South America. References: Thieret, Hartman, & Rabeler in FNA (2005).

* *Herniaria glabra* Linnaeus, Smooth Rupture-wort, introduced south to MD, NJ, and PA (Kartesz 1999). [= FNA, C, F, G, K]

Holosteum Linnaeus 1753 (Jagged Chickweed)

A genus of 3-4 species, herbs, of temperate Eurasia. References: Rabeler & Hartman in FNA (2005); Bittrich in Kubitzki, Rohwer, & Bittrich (1993).

* ***Holosteum umbellatum*** Linnaeus *ssp.* ***umbellatum***, Jagged Chickweed. Mt (GA, NC, SC, VA, WV), Pd (DE, GA, NC, SC, VA), Cp (DE, VA): fields, roadsides, lawns, disturbed shale barrens, other disturbed areas; common (uncommon in DE), native of Europe. March-May. Four additional subspecies are not known to be present in North America. [= FNA; < *H. umbellatum* – RAB, C, F, G, K, S, W, WV]

Honckenya Ehrhart 1788 (Seabeach-chickweed, Sea-sandwort)

A monotypic genus, an herb, with circumboreal distribution. References: Wagner in FNA (2005); Bittrich in Kubitzki, Rohwer, & Bittrich (1993).

Honckenya peploides (Linnaeus) Ehrhart *ssp.* ***robusta*** (Fernald) Hultén, Southern Seabeach-chickweed, Southern Sea-sandwort. Cp (DE, VA): seabeaches and dunes; rare. June-July. The species is circumboreal, in North America ranging south to e. VA. Ssp. *robusta* ranges from NL (Newfoundland) south to e. VA; 3 other subspecies do not occur south of NL

(Newfoundland). [= FNA, K; = *Honckenya peploides* var. *robusta* (Fernald) House – C; = *Arenaria peploides* Linnaeus var. *robusta* Fernald – F; = *Honkenya peploides* ssp. *robusta* – G (apparently misspelled)]

Minuartia Linnaeus 1753 (Sandwort)

A genus of about 120-175 species, herbs, of the northern hemisphere (and rarely South America). References: Rabeler, Hartman, & Utech in FNA (2005); Bittrich in Kubitzki, Rohwer, & Bittrich (1993).

1 Sepals acute, with prominent nerves; [of calcareous or mafic barrens of VA, and westward or northward].
  2 Primary leaves with axillary fascicles of secondary leaves ..... ***M. michauxii** var. **michauxii***
  2 Primary leaves lacking axillary fascicles of secondary leaves.
    3 Sepals 3-nerved; seeds 0.7-0.9 mm long ..... ***[M. muscorum]***
    3 Sepals 5-nerved; seeds 0.5-0.7 mm long ..... ***M. patula***
1 Sepals obtuse (rarely sub-acute), nerveless or with very obscure nerves; [of various habitats].
  4 Lower stem leaves closely imbricated; [of xeric sands of the Coastal Plain of NC and SC] ..... ***M. caroliniana***
  4 Lower stem leaves not imbricate; [**either** of rock outcrops of the Piedmont and Mountains **or** of moist habitats of the Coastal Plain].
    5 Stems prostrate or decumbent, leafy throughout; pedicels and sepals stipitate-glandular; [of moist habitats of the Coastal Plain] ..... ***M. godfreyi***
    5 Stems erect, leafy mostly near the base, the stem leaves few in number and reduced in size upward; pedicels and sepals glabrous; [of rock outcrops of the Piedmont and Mountains].
      6 Larger stem leaves 2-5 (-7) mm long; petals 1-7 mm long ..... ***M. uniflora***
      6 Larger stem leaves (7-) 10-30 mm long; petals 4-10 mm long.
        7 Leaves distinctly oblanceolate, very thin in texture, prominently veined; flowers 1-3 per stem ..... ***M. cumberlandensis***
        7 Leaves linear-lanceolate, herbaceous bu not notably thin, not prominently veined; flowers 3-many per stem.
          8 Plants 10-20 cm tall, annual, not mat-forming; cymes 9-15-flowered; sepals 3-4 mm long; petals 4-6 (-8) mm long; [of Piedmont and low mountain granitic flatrocks and other outcrops] ..... ***M. glabra***
          8 Plants 5-10 (-15) cm tall, perennial, mat-forming; cymes 3-7-flowered; sepals 3.5-5.5 mm long; petals 6-10 mm long; [of mountain peaks and Piedmont monadnocks] ..... ***M. groenlandica***

Minuartia caroliniana (Walter) Mattfeld, Carolina Sandwort, Longroot. Cp (DE, FL, GA, NC, SC, VA): deep white sands of barren sandhills; uncommon (rare in DE and VA). April-June. NY (and formerly RI) to Panhandle FL, on the Coastal Plain. [= FNA, K, WH; = *Arenaria caroliniana* Walter – RAB, C, F, G; = *Sabulina caroliniana* (Walter) Small – S; = *Alsinopsis caroliniana* (Walter) Small; = *Minuopsis caroliniana* (Walter) W.A. Weber]

Minuartia cumberlandensis (B.E. Wofford & Kral) McNeill, Cumberland Sandwort. Vertical sandstone outcrops in the Cumberland Plateau of ne. TN; it might be expected in extreme sw. VA. [= FNA, K; = *Arenaria cumberlandensis* B.E. Wofford & Kral – C]

Minuartia glabra (Michaux) Mattfeld, Appalachian Sandwort. Pd (GA, NC, SC, VA), Mt (GA, NC, SC, VA): granitic flatrocks, other outcrops of granite, granitic gneiss, or other felsic gneisses and schists, in the mountains restricted to low or medium elevations; uncommon. April-May. ME and NH south to w. GA (Jones & Coile 1988) and AL, primarily on the Piedmont and also in the Cumberlands (Chester, Wofford, & Kral 1997). [= FNA, K; = *Arenaria groenlandica* (Retzius) Sprengel var. *glabra* (Michaux) Fernald – RAB, C, F, G; = *A. glabra* Michaux – GW, W; = *Sabulina glabra* (Michaux) Small – S; = *Porsildia groenlandica* (Retzius) Á. Löve & D. Löve ssp. *glabra* (Michaux) Á. Löve & D. Löve]

Minuartia godfreyi (Shinners) McNeill, Godfrey's Sandwort. Cp (FL, NC, SC), {GA}: tidal freshwater marshes, other wetlands; rare. April-June. Peculiarly and irregularly distributed, with isolated and scattered locations in the Coastal Plain and Mountains: wc. VA, ne. TN, e. NC, ne. SC, e. Panhandle FL, n. peninsular FL, wc. AL, and se. AR. [= FNA, K, WH; = *Arenaria godfreyi* Shinners – RAB, GW, W; = *Sabulina uniflora* – S, misapplied; = *Stellaria paludicola* Fernald & Schubert]

Minuartia groenlandica (Retzius) Ostenfeld, Mountain Sandwort, Greenland Sandwort. Mt (NC, VA, WV), Pd (NC): low elevation rock outcrops (such as sandstone pavements in the VA Ridge and Valley) to high elevation rock outcrops in the Mountains (ascending to nearly 2000m on Roan Mountain), also disjunct on the summits of quartzite monadnocks in the upper Piedmont (such as Pilot Mountain, Surry County, NC and Hanging Rock, Stokes County, NC); rare. May-October. Greenland, NS, and QC south to the higher mountains of New England and NY; disjunct in the Southern Appalachians of VA, w. NC, and e. TN. [= FNA, K; = *Arenaria groenlandica* (Retzius) Sprengel var. *groenlandica* – RAB, C, F, G; = *Sabulina groenlandica* (Retzius) Small – S; = *A. groenlandica* (Retzius) Sprengel – W; = *Porsildia groenlandica* (Retzius) Á. Löve & D. Löve ssp. *groenlandica*]

Minuartia michauxii (Fenzl) Farwell *var.* ***michauxii***, Rock Sandwort. Mt (VA, WV), Pd (DE): limestone, dolostone, calcareous sandstone, and calcareous shale outcrops and barrens; uncommon (rare in DE and WV). June-July. Var. *michauxii* ranges from NY west to MN, south to sw. VA and AR. Var. *texana* (B.L. Robinson) Mattfeld occurs from MO and NE south to TX. [= K; = *Arenaria stricta* Michaux var. *stricta* – C, F; < *M. michauxii* – FNA; = *A. stricta* Michaux ssp. *stricta* – G; < *Sabulina stricta* (Michaux) Small – S; < *A. stricta* Michaux – W, WV]

Minuartia patula (Michaux) Mattfeld, Lime-barren Sandwort. Mt (GA, VA), Pd (VA), Cp (GA): rocky barrens of calcareous or mafic rocks, locally common in Lee County, VA; rare (VA Watch List). April-June. Ec. PA and w. VA west to IN and MN, south to AL and TX. [= FNA, K; = *Arenaria patula* Michaux var. *patula* – C, G; < *A. patula* Michaux – F; < *Sabulina patula* (Michaux) Small – S]

Minuartia uniflora (Walter) Mattfeld. Pd (GA, NC, SC), Cp (GA): granitic flatrocks, outcrops of Altamaha grit; uncommon (rare in NC and SC). April-May. S. NC south to c. GA, west to ec. AL, on the Piedmont and extending into the Coastal Plain of Georgia on Altamaha grit. *M. alabamensis*, named on the basis of its tiny flowers, has been shown to be a self-

pollinating form of *M. uniflora* which has arisen repeatedly and independently at various sites in the range of *M. uniflora*. [= FNA, K; = *Arenaria uniflora* (Walter) Muhlenberg – RAB; > *A. uniflora* (Walter) Muhlenberg – GW, W; > *A. alabamensis* McCormick, Bozeman, & Spongberg – GW, W; = *Sabulina brevifolia* (Nuttall ex Torrey & A. Gray) Small – S; > *M. alabamensis* (McCormick, Bozeman, & Spongberg) Wyatt]

Minuartia muscorum (Fassett) Rabeler. KY and TN west to MO. [= FNA, K; = *Arenaria patula* Michaux var. *robusta* (Steyermark) Maguire – C, G; < *A. patula* – F; < *Sabulina patula* (Michaux) Small – S; = *M. patula* (Michaux) Mattfeld var. *robusta* (Steyermark) McNeill]

Moehringia Linnaeus 1753 (Grove-sandwort)

A genus of about 25 species, of temperate regions of the Northern Hemisphere. References: Rabeler & Hartman in FNA (2005); Bittrich in Kubitzki, Rohwer, & Bittrich (1993).

Moehringia lateriflora (Linnaeus) Fenzl, Grove-sandwort, Blunt-leaved Sandwort. Pd (VA), Mt (WV): rocky, disturbed areas (powerline) over mafic rocks (diabase); rare. May-July. Circumboreal, ranging south in North America to n. VA (Fairfax County), n. WV (Morton et al. 2004), MO, and CA. [= FNA, K; = *Arenaria lateriflora* Linnaeus – C, F, G]

Moenchia Ehrhart 1788

A genus of 3 species, herbs, native of Europe. References: Rabeler & Hartman in FNA (2005); Bittrich in Kubitzki, Rohwer, & Bittrich (1993).

* ***Moenchia erecta*** (Linnaeus) P.G. Gaertner, B. Meyer, & Scherbius *ssp.* ***erecta***, Upright Chickweed. Cp (SC): disturbed areas; rare, introduced. This species was collected as a "wool alien" in Berkeley County, SC in 1958 (Rabeler 1991). [= FNA; < *M. erecta* – K; = *Sagina erecta* Linnaeus]

Myosoton Moench 1794 (Water-chickweed)

A monotypic genus, an herb, of temperate Eurasia. References: Rabeler in FNA (2005); Bittrich in Kubitzki, Rohwer, & Bittrich (1993).

* ***Myosoton aquaticum*** (Linnaeus) Moench, Water-chickweed, Giant Chickweed, Water Mouse-ear. Mt (NC, VA, WV), Pd (DE, VA), Cp (DE, VA): marshes, streambeds, wet meadows; uncommon (rare in DE and NC), native of Europe. June-October. [= F, FNA, K, WV; = *Stellaria aquatica* (Linnaeus) Scopoli – RAB, C, G, GW, W; = *Alsine aquatica* (Linnaeus) Britton – S]

Paronychia P. Miller 1754 (Whitlow-wort, Nailwort)

A genus of about 110 species, herbs and shrubs, nearly cosmopolitan in distribution. This genus consists mostly of plants of dry rocky or sandy habitats. References: Hartman, Thieret, & Rabeler in FNA (2005); Chaudhri (1968)=Z, Ward (1977a, 1977b)=Y; Shinners (1962h)=X; Bittrich in Kubitzki, Rohwer, & Bittrich (1993). Key adapted from Y and Z.

Identification notes: Magnification of at least 10× is necessary for the identification of many of the taxa.

1 Leaf surfaces with silky, appressed pubescence (usually densely so, but sometimes sparse), giving the plant a silvery appearance; flowers 3.5-6 mm long, largely concealed by scarious bracts; [subgenus *Paronychia*].....***P. argyrocoma***
1 Leaf surfaces glabrous or with very short pubescence (neither appressed nor silky), the plant green; flowers 1-4 mm long, not concealed by scarious bracts.
  2 Sepals petaloid, the tip, margins, or entire sepal whitish; perigynous zone very well developed (mostly equaling or somewhat longer than the sepals); [of the Coastal Plain, from SC southward and westward]; [subgenus *Siphonychia*].
    3 Sepals glabrous to the base; plant a cespitose perennial with ascending annual stems.
      4 Stems minutely gray-puberulent.....***P. erecta*** *var.* ***corymbosa***
      4 Stems glabrous and often also glaucous.....***P. erecta*** *var.* ***erecta***
    3 Sepals densely pubescent on the basal portion (glabrous above); plant a sprawling, ascending or erect annual.
      5 Pubescent portion of the sepal nearly ½ its length; sepals broadly rounded and hooded; stem glabrous or one side with curly hairs.....***P. americana***
      5 Pubescent portion of the sepal <1/3 its length; sepals narrowed toward the apex, with a short tooth or awn; stem uniformly pubescent with retrorse hairs.
        6 Stem spreading or ascending, the branching unevenly dichotomously, the flowers therefore in diffuse cymes; glabrous portion of the sepal 0.8 mm long.....***P. patula***
        6 Stem erect, the branching symmetrical and dichotomous, the flowers therefore in weirdly geometric, tight square cymes; glabrous portion of the sepal > 1.1 mm long.....***P. rugelii***

2 Sepals not petaloid, green, sometimes scarious-margined; perigynous zone somewhat shorter than the sepals; [of various provinces, collectively widespread in our area]; [subgenus *Paronychia*].
7 Sepals tipped with a distinct awn, 0.35-0.75 mm long; flowers 2-4 mm long.
8 Suffrutescent perennial, at least the flowering stems ascending or erect; leaves linear-subulate, 15-25 (-30) mm long, 0.5-1 mm wide, acute; [of Mountain and Piedmont rocky areas] ..... ***P. virginica*** *var.* ***virginica***
8 Prostrate annual; leaves oblong-elliptic or spatulate, 3-12 (-16) mm long, 1.5-3.5 (-5) mm wide, obtuse; [of Coastal Plain sands from sc. NC southward]..... ***P. herniarioides***
7 Sepals tipped with a short cusp or mucro; flowers 1-1.6 mm long.
9 Leaves with a distinctly ciliate margin; plants prostrate, the branching below the inflorescence not pseudo-dichotomous.
10 Plant an annual (-biennial); stems 1-4 dm long, uniformly and minutely recurved-puberulent; flowers 1.25-1.4 mm long, shortly ciliate to nearly glabrous; sepals ca. 1 mm long, oval-oblong, the margin ciliolate; style 0.4-0.5 mm long, bifid; fruit rounded at the top ..... ***P. baldwinii*** *ssp.* ***baldwinii***
10 Plant a perennial; stems 2-12 dm long, glabrous or minutely puberulent in longitudinal bands; flowers 1.45-1.55 mm long, more or less glabrous; sepals 1-1.2 mm long, oblong, with a brownish margin; style 0.35-0.4 mm long, the 2 lobes divergent-recurved at maturity; fruit narrowed to the top ..... ***P. baldwinii*** *ssp.* ***riparia***
9 Leaves entirely glabrous or with a slightly ciliate-serrulate margin; plants erect, suberect, or somewhat prostrate, pseudo-dichotomously branched.
11 Style elongate, 0.6-0.75 mm long; anthers 0.25-0.3 mm in diameter; stipular bracts subtending the flowers narrowly lanceolate, ca. 0.5× as long as the flowers ..... ***P. montana***
11 Style short, 0.3-0.35 mm long; anthers ca. 0.15 mm in diameter; stipular bracts subtending the flowers lanceolate, from much shorter than to exceeding the flowers.
12 Stems glabrous; leaves oval-elliptic, 5-25 mm long, 2-8 (-10) mm wide, obtuse (rarely sub-obtuse or acute), very thin in texture, deep-green; calyx 0.9-1.3 mm long; sepals 0.5-1 mm long, herbaceous ..... ***P. canadensis***
12 Stems retrorsely puberulent (sometimes sparsely so); leaves oblanceolate, 5-15 mm long, 2-5 mm wide, acute (rarely sub-obtuse to obtuse), firm in texture, dull brownish-green; calyx 1.1-1.6 mm long; sepals 1-1.2 mm long, leathery.
13 Stipular bracts subtending the flowers exceeding the flowers (calyx) ..... ***P. fastigiata*** *var.* ***paleacea***
13 Stipular bracts subtending the flowers somewhat shorter than the flowers (calyx).
14 Sepals with a minute cusp or mucro ..... ***P. fastigiata*** *var.* ***fastigiata***
14 Sepals with a distinct white awn to 0.2 mm long ..... ***P. fastigiata*** *var.* ***nuttallii***

Paronychia americana (Nuttall) Fenzl ex Walpers, American Whitlow-wort. Cp (FL, GA, SC): sandhills; rare. June-September. S. SC south to GA and s. FL. Two taxa have been questionably distinguished. Ssp. *americana*, with the cymes many-flowered and forming spheroidal glomerules, has the range of the species; ssp. *pauciflora* (Small) Chaudhri, differing in its laxer, more open cymes, is restricted to s. GA and n. FL. [= FNA, WH, X, Y; > *Paronychia americana* (Nuttall) Fenzl ex Walpers ssp. *americana* – K, Z; > *Paronychia americana* (Nuttall) Fenzl ex Walpers ssp. *pauciflora* (Small) Chaudhri – K, Z; > *P. americana* – RAB; > *Siphonychia americana* (Nuttall) Torrey & Gray – S; > *Siphonychia pauciflora* Small – S]

Paronychia argyrocoma (Michaux) Nuttall, Silverling, Silver Whitlow-wort. Mt (GA, NC, VA, WV), Pd (NC, VA): thin soils of rock outcrops, especially on mountain summits at medium to high elevations, disjunct to a few Piedmont monadnocks; uncommon (rare in GA and WV). July-September. A characteristic component of the summit flora of Southern Appalachian peaks, *P. argyrocoma* occurs in the mountains of New England (ME, NH, VT, and MA), and in the Southern Appalachians of WV, VA, NC, TN, and n. GA (Jones & Coile 1988). [= RAB, C, FNA, K, S, W, WV; > *P. argyrocoma* var. *argyrocoma* – F, G; > *P. argyrocoma* var. *albimontana* Fernald – F, G, Z]

Paronychia baldwinii (Torrey & A. Gray) Fenzl ex Walpers *ssp.* ***baldwinii***, Annual Dune Whitlow-wort. Cp (FL, GA, NC, SC): dry sandy sites, woodlands or dunes; uncommon. June-October. E. NC south to c. peninsular FL and west to AL (and LA?), on the Coastal Plain. [= K, Y, Z; < *P. baldwinii* – FNA, WH; < *P. riparia* – RAB; = *Anychiastrum baldwinii* (Torrey & Gray) Small – S]

Paronychia baldwinii (Torrey & A. Gray) Fenzl ex Walpers *ssp.* ***riparia*** (Chapman) Chaudhri, Perennial Dune Whitlow-wort. Cp (FL, GA, NC, SC, VA): dry sandy sites, woodlands or dunes; uncommon (VA Watch List). June-October. Se. VA south to n. FL (and AL?), on the Coastal Plain. Though Chaudhri (1968) and Ward (1977a and 1977b) independently reached the conclusion to reduce *P. riparia* to a subspecies of *P. baldwinii*, neither stated any reasons for their choice of subspecific status. I here follow the independent conclusions of Chaudhri and Ward, but the appropriate taxonomic rank remains unclear. [= K, Y; < *P. riparia* – RAB, F; < *P. baldwinii* – FNA, WH; = *P. riparia* Chapman – C, F; = *Anychiastrum riparium* (Chapman) Small – S; > *P. baldwinii* ssp. *riparia* var. *riparia* – Z; > *P. baldwinii* ssp. *riparia* var. *ciliata* Chaudhri – Z]

Paronychia canadensis (Linnaeus) Wood, Canada Whitlow-wort, Forked Chickweed. Mt (GA, NC, SC, VA, WV), Pd (DE, NC, SC, VA), Cp (DE, NC, SC, VA): dry rocky woods, shale barrens; uncommon (common in WV, rare in the NC, SC, and VA Coastal Plain). June-October. NH and s. ON west to MN, south to n. GA (Jones & Coile 1988), AL, MO, and KS. This species is somewhat taller on average than *P. fastigiata* or *P. montana*. [= RAB, C, F, FNA, G, K, W, WV, Z; = *Anychia canadensis* (Linnaeus) Britton, Sterns, & Poggenburg – S]

Paronychia erecta (Chapman) Shinners *var.* ***corymbosa*** (Small) Chaudhri, Hairy Squareflower. Cp (FL): coastal dunes; uncommon. Panhandle FL west to se. LA. March-November. [= K, Y, Z; = *Odontonychia corymbosa* Small – S; < *Paronychia erecta* – FNA, WH, X]

Paronychia erecta (Chapman) Shinners *var.* ***erecta***, Smooth Squareflower. Cp (FL): coastal dunes; uncommon. Panhandle FL west to s. MS. March-November. [= K, Y, Z; = *Odontonychia erecta* (Chapman) Small – S; < *Paronychia erecta* – FNA, WH, X]

Paronychia fastigiata (Rafinesque) Fernald *var.* ***fastigiata***, Common Forked Whitlow-wort. Mt (NC, SC, VA, WV), Pd (DE, NC, VA), Cp (DE, NC, SC, VA): dry, usually rocky, woodlands, often on thin soil around outcrop edges; uncommon (rare in DE). June-October. MA west to MN south to FL and TX. The three varieties of *P. fastigiata* (though accepted by Chaudhri

and many recent floras) need additional investigation to confirm their taxonomic status, habitats, and geographic ranges. [= C, F, G, K, WV, Z; < *P. fastigiata* – RAB, W; < *P. fastigiata* var. *fastigiata* – FNA; < *Anychia polygonoides* Rafinesque – S]

Paronychia fastigiata (Rafinesque) Fernald *var.* ***nuttallii*** (Small) Fernald, Pennsylvania Forked Whitlow-wort. Mt (NC, VA, WV): dry woods; rare. June-October. NY, sc. PA, n. VA, WV, e. TN, and w. NC. [= C, F, FNA, G, K, WV, Z; < *P. fastigiata* – RAB, W; < *Anychia polygonoides* Rafinesque – S]

Paronychia fastigiata (Rafinesque) Fernald *var.* ***paleacea*** Fernald, Green Forked Whitlow-wort. Mt (NC, VA, WV), Pd (DE, NC, VA), Cp (NC, VA): dry, mostly rocky woodlands; uncommon (rare in WV). June-October. NJ, DE, and PA west to IL, south to VA, NC, KY, TN, MO, and TX. [= C, F, G, K, WV, Z; < *P. fastigiata* – RAB, W; < *P. fastigiata* var. *fastigiata* – FNA; < *Anychia polygonoides* Rafinesque – S]

Paronychia herniarioides (Michaux) Nuttall, Michaux's Whitlow-wort. Cp (FL, GA, NC, SC): sandhills; rare. April-July. Sc. NC south to c. peninsular FL and e. Panhandle FL. The NC distribution ascribed by Small, Chaudhri, and FNA is based on the type specimen of André Michaux ("in arenosis aridis Carolinae septentrionalis"); the species has been relocated in NC (Scotland County) by Harry E. LeGrand, Jr, over two centuries later. [= RAB, FNA, K, WH, Y, Z; = *Gastronychia herniarioides* (Michaux) Small – S]

Paronychia montana (Small) Pax & K. Hoffmann, Shale-barren Whitlow-wort. Mt (NC, VA): dry rock outcrops and talus barrens, especially on shale barrens; uncommon. June-October. C. PA (and OH?) south through w. VA and e. WV to a few localities in NC, TN, GA, and AL. [= K, Z; < *P. fastigiata* – RAB, W; = *P. fastigiata* var. *pumila* (A. Wood) Fernald – C, F, FNA, G; = *Anychiastrum montanum* Small – S]

Paronychia patula Shinners, Pineland Nailwort. Cp (FL, GA): sandhills; uncommon (rare in GA). July-September. Sw. GA west to s. AL, south to c. peninsular FL. [= FNA, K, WH, X, Y, Z; = *Siphonychia diffusa* Chapman – S]

Paronychia rugelii (Chapman) Shuttleworth ex Chapman, Sand-squares, Rugel's Nailwort. Cp (FL, GA): sandhills; uncommon (rare in GA). July-October. S. GA south to c. peninsular FL. [= FNA, WH, X, Y; > *Paronychia rugelii* (Chapman) Shuttleworth ex Chapman var. *interior* (Small) Chaudhri – K, Z; > *Paronychia rugelii* (Chapman) Shuttleworth ex Chapman var. *rugelii* – K, Z; > *Odontonychia interior* Small – S; > *Gibbesia rugelii* (Chapman) Small – S]

Paronychia virginica Sprengel *var.* ***virginica***, Virginia Whitlow-wort. Mt (VA, WV), Pd (GA, VA): shale barrens, rocky riversides, calcareous rock outcrops and talus, serpentine outcrops; rare. June-August. The ranges of the two varieties are variously stated; the distinguishing characteristics and distributions are not clear. Var. *virginica* occurs in w. MD, w. VA, WV, GA, and AL (or allegedly also in NC, AR, OK, and TX). Var. *parksii* (Cory) Chaudhri occurs in TX (or also in OK). [= C, Z; < *P. virginica* – F, FNA, K, W, WV; = *P. virginica* ssp. *virginica* – G; = *P. dichotoma* (Linnaeus) Nuttall – S]

Paronychia chartacea Fernald *var.* ***minima*** (L.C. Anderson) R.L. Hartman, Paper Nailwort. Cp (FL): scrub; rare. (May-) July-October. Endemic to Panhandle FL. [= FNA; < *P. chartacea* – WH; < *Nyachia pulvinata* Small; = *P. chartacea* Fernald ssp. *minima* L.C. Anderson – K] {add to synonymy; add to key}

Petrorhagia (Seringe) Link 1831 (Pink)

A genus of about 28-33 species, herbs, of Eurasia. References: Rabeler & Hartman in FNA (2005); Rabeler (1985)=Z; Bittrich in Kubitzki, Rohwer, & Bittrich (1993). Key based on Z.

1 Flowers in capitate inflorescences (solitary in impoverished or very young plants); bracts subtending the calyx broad and long, usually completely enclosing the calyx; [section *Kohlrauschia*] ..... ***P. prolifera***
1 Flowers solitary (or in fascicles of 2-3); bracts subtending the calyx narrow and short, enclosing about ½ of the calyx; [section *Petrorhagia*] .. .. ***[P. saxifraga]***

* ***Petrorhagia prolifera*** (Linnaeus) P.W. Ball & Heywood, Childing Pink, Proliferous Pink. Cp (DE, SC, VA), Mt (NC, VA, WV), Pd (GA, NC, VA): roadsides, disturbed areas; uncommon (rare in WV), native of Europe. May-September. Reported for GA by Duncan (1985). [= C, FNA, K, Z; = *Dianthus prolifer* Linnaeus – F, WV; = *Tunica prolifera* (Linnaeus) Scopoli – G; = *P. prolifer* – W, orthographic variant]

* *Petrorhagia saxifraga* (Linnaeus) Link var. *saxifraga*, Saxifrage Pink, is "cultivated and occasionally escaped" south to se. PA (Rhoads & Klein 1993), s. NJ, and MD (Rabeler (1985). Rabeler (1985) reports a location from Page Co. VA, but it appears that this is persistent from cultivation. [= FNA; < *P. saxifraga* – C, K, Z; < *Tunica saxifraga* (Linnaeus) Scopoli]

Polycarpon Linnaeus 1759 (Allseed)

A genus of about 18 species, herbs, primarily of Europe, with several species in South America, and 1 cosmopolitan. References: Thieret & Rabeler in FNA (2005); Bittrich in Kubitzki, Rohwer, & Bittrich (1993).

* ***Polycarpon tetraphyllum*** (Linnaeus) Linnaeus *ssp.* ***tetraphyllum***, Four-leaved Allseed. Cp (AL, FL, GA, SC, VA): disturbed areas, lawns, parking lots, ballast; rare, native of Europe. April-October. Reported for AL (Diamond & Woods 2009). Reported for VA (Wright, pers. comm. 2010). [= FNA, K; < *Polycarpon tetraphyllum* – RAB, S, WH]

Sagina Linnaeus 1753 (Pearlwort)

A genus of about 25 species, herbs, mainly north temperate. References: Crow in FNA (2005); Crow (1978)=Z; Bittrich in Kubitzki, Rohwer, & Bittrich (1993). [also see *Moenchia*]

1 Leaf blades fleshy; seeds reniform or nearly spherical, lacking a groove on one side; flowers 5-merous.....***S. japonica***
1 Leaf blades thin; seeds obliquely triangular, with a groove on one side; flowers 4-merous or 5-merous.
2 Annual, usually without a persistent rosette of leaves; flowers (4-) 5-merous; seeds 0.3-1.4 mm long; sepals erect-appressed in fruit.....***S. decumbens***
2 Perennial, usually with a persistent rosette; flowers 4 (-5)-merous; seeds (0.3-) 0.4 (0.5) mm long; sepals spreading in fruit.....***S. procumbens***

Sagina decumbens (Elliott) Torrey & A. Gray, Eastern Pearlwort. Cp (DE, FL, GA, NC, SC, VA), Pd (GA, NC, SC, VA), Mt (GA, NC, SC, VA, WV): disturbed ground, fields, cracks in pavement or sidewalks; common (uncommon in Mountains of GA, NC, SC, and VA, rare in Mountains of WV). March-June. NB west to IL and MO, south to c. peninsular FL and TX, with adventive occurrences further west. Crow (1978) and Crow in FNA (2005) treat *S. decumbens* and *S. occidentalis* S. Watson of the Pacific Coast of North America as subspecies. They differ primarily in seed architecture. Though clearly closely related, they seem equally well (and more simply) regarded as sibling species. A report of *S. subulata* (Swartz) K. Presl for Bedford County, VA, is apparently actually *S. decumbens*. [= RAB, C, F, G, S, W, WH; = *S. decumbens* ssp. *decumbens* – FNA, K, Z]

* ***Sagina japonica*** (Swartz) Ohwi, Japanese Pearlwort. Cp (DE): disturbed areas; rare, native of e. Asia. Also naturalized in se. PA (Rhoads & Klein (1993). [= FNA, K]

* ***Sagina procumbens*** Linnaeus, Northern Pearlwort, Bird's-eye. Cp (DE), Pd (DE), Mt (NC, WV): disturbed soils; uncommon (rare in NC), native of Eurasia (or, at least, ne. North America). May-September. Crow (1978) questions whether *S. procumbens* is native at all in the Western Hemisphere. In North America, it is concentrated in 2 main regions, from NS and QC south to MD, and from sw. BC south to c. CA, with scattered occurrences elsewhere, such as around the Great Lakes, CO, AR, s. OH, and w. NC. Whether or not the species is native in the New World, the occurrence in NC (in a gravel parking lot on top of Roan Mountain) is almost certainly adventive. [= C, FNA, G, K, WV, Z; > *S. procumbens* var. *procumbens* – F; > *S. procumbens* var. *compacta* Lange – F]

Saponaria Linnaeus 1753 (Soapwort)

A genus of about 40 species, herbs, of temperate regions of Eurasia. References: Thieret & Rabeler in FNA (2005); Bittrich in Kubitzki, Rohwer, & Bittrich (1993). [also see *Vaccaria*]

* ***Saponaria officinalis*** Linnaeus, Soapwort, Bouncing Bet. Mt (GA, NC, SC, VA, WV), Pd (DE, GA, NC, SC, VA), Cp (DE, GA, NC, SC, VA): disturbed areas, fields, roadsides; common (rare in DE Coastal Plain), native of Europe. May-October. [= RAB, C, F, FNA, G, K, S, W, WV]

Scleranthus Linnaeus 1753 (Knawel)

A genus of 10 species, herbs, mainly of temperate regions of the Northern Hemisphere. References: Bittrich in Kubitzki, Rohwer, & Bittrich (1993).

* ***Scleranthus annuus*** Linnaeus, Knawel, Annual Knawel. Cp (DE, GA, NC, SC, VA), Pd (GA, NC, SC, VA), Mt (GA, NC, SC, VA, WV): fields, ditches, roadsides, other disturbed areas; common (uncommon in Mountains), native of Europe. March-October. [= RAB, C, F, G, K, W, WV]

Silene Linnaeus 1753 (Catchfly, Campion, Fire-pink, Wild-pink)

A genus of about 700 species, of Eurasia and North America. References: Morton in FNA (2005); Clausen (1939)=Z; Wilbur (1970b)=Y; Bittrich in Kubitzki, Rohwer, & Bittrich (1993). [including *Lychnis*]

1 Styles mostly 5; capsule with 5 or 10 teeth; calyx tubular at anthesis, becoming strongly inflated later in *S. dioica* and *S. latifolia*.
2 Petal limbs deeply divided into 4 linear segments .....***S. flos-cuculi***
2 Petal limbs unlobed, emarginate, or shallowly 2-lobed.
3 Leaf blades with dense silky white hairiness; flowers bisexual .....***S. coronaria***
3 Leaf blades variously pubescent, but not with silky-appressed pubescence.
4 Petals pink; capsule teeth revolute .....***[S. dioica]***
4 Petals white; capsule teeth spreading to slightly reflexed.....***S. latifolia***
1 Styles mostly 3; capsule with 3 or 6 teeth; calyx tubular or campanulate at anthesis, not greatly inflated (except in *S. vulgaris*).
5 Middle cauline leaves in whorls of 4; petals fimbriate .....***S. stellata***
5 Middle cauline leaves opposite; petals entire, bilobed, 2-cleft, or 8-cleft.

6 Flowers bright red.
7 Petals entire or slightly erose at the tip; cauline leaves 10-20 pairs ..... ***S. regia***
7 Petals deeply notched at the tip; cauline leaves 2-8 pairs.
8 Cauline leaves 2.0-7.0 cm wide, elliptic, obovate, or orbicular, usually 1-2× as long as wide; entire plant sticky glandular-pubescent; [of sandstone cliffs and crevices, in our area only in sw. VA] ..... ***S. rotundifolia***
8 Cauline leaves 0.8-2.0 cm wide, mostly oblanceolate, usually at least 3× as long as wide; plant not covered with sticky glandular hairs; [of various, mostly rocky, habitats, widespread in our area] ..... ***S. virginica***
6 Flowers white or pink.
9 Petals 8-cleft or more divided; plants perennial; [native].
10 Plants 2-6 dm tall; petals pink, the >8 ultimate segments of each dichotomously forked at nearly right angles; calyx ca. 2.5 cm long; stem with long, villous pubescence ..... ***S. catesbaei***
10 Plants (5-) 7-15 dm tall; petals white, the 8 segments of each essentially parallel to one another; calyx ca. 1 cm long; stem with short rigid pubescence ..... ***S. ovata***
9 Petals entire, bilobed, or 2-cleft; plants 0.5-8 dm tall, perennial or annual; [**either** alien weeds occurring mostly in disturbed sites, **or** native in forests, woodlands, or rock outcrops].
11 Plant < 2.5 dm tall; plant perennial, with a stout, carrot-like taproot; [native, of woodlands, rock outcrops, barrens, glades, and dry roadbanks].
12 Calyx pubescence of long, straight, nonglandular hairs; [of OH, WV, ?VA, and MO south to AL] ... ***S. caroliniana*** *var.* ***wherryi***
12 Calyx pubescence of glandular hairs; [of NC and ne. TN northward in and east of the Appalachians].
13 Leaves pubescent over the surface with appressed, white hairs, also ciliate on the margin; basal leaves mostly obtuse to rounded at the apex, to 12 cm long and 3 cm wide; [of NC south, mostly in sandy, acidic soils of the Coastal Plain and associated with granite in the lower Piedmont] ..... ***S. caroliniana*** *var.* ***caroliniana***
13 Leaves glabrous on the surface, ciliate on the margin; basal leaves mostly acute to obtuse at the apex, to 15 cm long and 2 cm wide; [of NC north, often associated with calcareous or mafic rocks in the Piedmont and Mountains] ..... ***S. caroliniana*** *var.* ***pensylvanica***
11 Plant usually 2-8 dm tall (depauperate individuals rarely smaller); plant annual or biennial (perennial from a creeping rhizome in *S. nivea* and *S. vulgaris*), lacking a carrot-like taproot; [alien, mostly of disturbed habitats (except *S. nivea* and *S. antirrhina*).
14 Calyx with 20-30 parallel veins.
15 Calyx glabrous ..... ***C. csereii***
15 Calyx pubescent and usually glandular.
16 Mature calyx 8-15 mm long; seeds 0.6-0.9 mm broad ..... ***C. conica***
16 Mature calyx 20-30 mm long; seeds 1.3-1.8 mm broad ..... ***C. conoidea***
14 Calyx with 10 or fewer veins (or the venation obscure).
17 Plants rhizomatous perennials (biennial in *S. csereii*); petals white.
18 Fruiting calyx ovoid, contracted at the mouth to ca. ½ the diameter of the calyx at its widest point; stamens ca. 2× as long as the calyx; filaments purple ..... ***S. csereii***
18 Fruiting calyx clavate or campanulate, not contracted at the mouth; stamens 1.0-1.5× as long as the calyx; filaments usually white.
19 Petal appendages 1.0-1.6 mm long; inflorescences leafy; [native] ..... ***S. nivea***
19 Petal appendages absent or to 0.2 mm long; inflorescences with reduced leaves resembling bracts; [alien, mostly of disturbed habitats] ..... ***S. vulgaris***
17 Plants annuals; petals white, pink, or lavender.
20 Stems glabrous or sparsely pubescent (if pubescent, puberulent).
21 Calyx 4-10 mm long; carpophore ca. 1 mm long ..... ***S. antirrhina***
21 Calyx 13-17 mm long; carpophore 7-8 mm long ..... ***S. armeria***
20 Stems densely pubescent (hirsute or glandular-hirsute).
22 Petals entire or emarginate; fruiting calyx 6-10 mm long ..... ***S. gallica***
22 Petals deeply 2-lobed; calyx; fruiting calyx 10-30 mm long.
23 Fruiting calyx 10-15 mm long; petal appendages ca. 0.2 mm long ..... ***S. dichotoma***
23 Fruiting calyx (15-) 25-30 mm long; petal appendages 0.5-1.5 mm long ..... ***S. noctiflora***

Silene antirrhina Linnaeus, Sleepy Catchfly, Garter-pink. Mt (GA, NC, SC, VA, WV), Pd (DE, GA, NC, SC, VA), Cp (DE, FL, GA, NC, SC, VA): fields, disturbed areas; common. April-July. Nearly throughout North America, south to c. peninsular FL, and in Mexico and South America; introduced in Europe. [= RAB, C, F, FNA, G, K, S, W, WH, WV]

* ***Silene armeria*** Linnaeus, Sweet William Catchfly, None-so-pretty, Garden Catchfly. Mt (NC, VA, WV), Pd (DE, NC, VA), Cp (DE, FL, NC, SC, VA): disturbed areas; uncommon (rare in FL, NC, SC, VA, and WV), native of Europe. June-October. [= RAB, C, F, FNA, G, K, W, WH, WV]

Silene caroliniana Walter *var.* ***caroliniana***, South Carolina Wild-pink, Rock Catchfly. Pd (FL, GA, NC, SC), Cp (GA, NC, SC): in acidic, sandy, open woodlands, especially woodlands around granitic flatrocks and sandy Coastal Plain woodlands; uncommon (rare in GA and NC). April-July. Sc. NC south through the e. three-quarters of SC just into e. GA; disjunct in Panhandle FL. See Wilbur (1970b) and Clausen (1939) for additional discussion of these infraspecific taxa in *S. caroliniana*. [= C, F; < *S. caroliniana* – RAB, S, WH; = *S. caroliniana* ssp. *caroliniana* – FNA, G, K, Z; = *S. caroliniana* ssp. *caroliniana* var. *caroliniana* – Y]

Silene caroliniana Walter *var.* ***pensylvanica*** (Michaux) Fernald, Northern Wild-pink, Sticky Catchfly. Mt (NC, VA, WV), Pd (NC, VA), Cp (DE, NC, SC, VA): open woodlands, especially calcareous; common (rare in DE and NC). April-July. NH west to e. OH, south to VA, e., nc., and w. NC, and ne. TN (Chester, Wofford, & Kral 1997). [= F, W; < *S. caroliniana* – RAB, S; > *S. caroliniana* var. *pensylvanica* – C; = *S. caroliniana* ssp. *pensylvanica* (Michaux) Clausen – FNA, G, K, Z; = *S. pensylvanica* Michaux – WV; = *S. caroliniana* ssp. *caroliniana* var. *pensylvanica* – Y]

Silene caroliniana Walter *var.* ***wherryi*** (Small) Fernald. Mt (VA?, WV): dry, rocky places; rare. April-July. OH and WV (and VA according to FNA) south and west to AL, KY, MO, and KS. [= F; > *S. caroliniana* var. *pensylvanica* – C; = *S. caroliniana* ssp. *wherryi* (Small) Clausen – FNA, G, K, Y, Z; = *S. wherryi* Small]

Silene catesbaei Walter, Eastern Fringed Catchfly, Fringed Campion. Cp (FL, GA): mesic deciduous forests along streams or on lower- to mid-slopes; rare. Mid-March-early May. C. GA south to Panhandle FL, and possibly in AL based on a C.T. Mohr specimen (see FNA). Ward (2006) discusses the nomenclatural change. [= *Silene polypetala* (Walter) Fernald & Schubert – FNA, K, WH; = *S. baldwinii* Nuttall – S]

* ***Silene coronaria*** (Linnaeus) Clairville, Mullein-pink, Rose Campion. Mt (GA, NC, SC, VA, WV), Pd (DE, NC, SC, VA), Cp (VA): disturbed areas; uncommon (rare in GA, NC, SC, and WV), native of Europe. May-July. [= FNA; = *Lychnis coronaria* (Linnaeus) Desrousseaux – RAB, C, F, G, K, WV]

* ***Silene csereii*** Baumgarten, Balkan Bladder-campion. Mt (NC, WV): habitat not known; rare, native of Europe. Documented for w. NC (J.K. Morton, pers.comm.). Also reported in se. PA (Rhoads & Klein 1993) and e. WV. [= FNA, K; = *S. cserei* – C, F, G, orthographic variant]

* ***Silene dichotoma*** Ehrhart *ssp.* ***dichotoma***, Forked Catchfly. Mt (NC, VA, WV), Pd (VA), {GA}: fields, disturbed areas; common (uncommon in WV), native of Europe. May-August. [= FNA; < *S. dichotoma* – RAB, C, F, G, K, S, W, WV]

* ***Silene flos-cuculi*** (Linnaeus) Clairville *ssp.* ***flos-cuculi***, Ragged Robin. Mt (NC): rare; native of Europe. Introduced and established in Alleghany County, NC (Poindexter 2008) and elsewhere in ne. North America, as in MD and PA. [= FNA; < *Lychnis flos-cuculi* Linnaeus – C, F, G, K]

* ***Silene gallica*** Linnaeus, Small-flowered Catchfly. Cp (FL, NC, SC, VA): sandy disturbed areas; rare, native of Europe. May-July. [= RAB, C, F, FNA, G, K, WH; > *S. anglica* Linnaeus – S, misapplied]

* ***Silene latifolia*** Poiret, White Campion, White Cockle, Evening Lychnis. Mt (NC, SC, VA, WV), Pd (DE, NC, SC, VA), Cp (NC, SC, VA): fields, roadsides, disturbed areas; common (uncommon in DE, rare in SC), native of Europe. May-July. [= C, FNA; > *S. latifolia* Poiret ssp. *alba* (P. Miller) Greuter & Burdet – K; = *Lychnis alba* P. Miller – RAB, F, G, S, W, WV; *? S. pratensis* (Rafinesque) Grenier & Godron; *? Melandrium dioicum* (Linnaeus) Cosson & Germain]

Silene nivea (Nuttall) Muhlenberg ex Otth, Snowy Campion. Mt (GA, VA, WV), Pd (VA): rocky or sandy flood-scoured riversides or creeksides; rare (VA Rare). June-July. NJ west to ND, south to n. VA, w. VA, WV, nw. GA (Jones & Coile 1988), TN, and MO. [= C, F, FNA, G, K, W, WV; = *Silene alba* Muhlenberg – S, misapplied]

* ***Silene noctiflora*** Linnaeus, Sticky Cockle, Night-flowering Catchfly, Sticky Campion. Mt (NC, VA, WV), Pd (DE, NC, VA), Cp (DE, NC, VA): fields, disturbed areas; uncommon (rare in NC and VA), native of Europe. June-August. [= RAB, C, F, FNA, G, K, S, W, WH, WV; = *Melandrium noctiflorum* (Linnaeus) Fries]

Silene ovata Pursh, Mountain Catchfly. Mt (GA, NC, SC, VA), Cp (GA): circumneutral soils of woodlands and forests, especially over mafic or calcareous rocks, mostly at medium elevations in the mountains; rare. August-September. Sw. VA and KY west to AR, south to nw. GA, n. AL, and AR; disjunct in sc. and sw. GA. [= RAB, C, F, FNA, G, K, S, W]

Silene regia Sims, Royal Catchfly. Cp (FL, GA): prairies and calcareous woodlands and forests; rare (GA Rare). OH and e. MO south to e. TN (Chester, Wofford, & Kral 1997), nw. and sw. GA (Jones & Coile 1988), FL Panhandle (Jackson County), and AL. [= C, F, FNA, G, K, S, WH]

Silene rotundifolia Nuttall, Roundleaf Fire-pink, Sandstone Fire-pink. Mt (GA, VA, WV): sandstones cliffs, ledges, and talus, and at bases of sandstone cliffs; rare. S. OH and WV south to nw. GA (Jones & Coile 1988) and n. AL, nearly restricted to the Cumberland Plateau. [= C, F, FNA, G, K, S, WV]

Silene stellata (Linnaeus) Aiton f., Starry Campion, Widow's-frill. Mt (GA, NC, SC, VA, WV), Pd (DE, GA, NC, SC, VA), Cp (DE, NC, SC, VA): dry to mesic forests, rock outcrops; common (rare in NC, SC, and VA Coastal Plain). July-September. CT west to SD, south to c. GA and TX. [= RAB, F, FNA, K, S, W, WV; > *S. stellata* var. *stellata* – C, G; > *S. stellata* var. *scabrella* Palmer & Steyermark – C, G]

Silene virginica Linnaeus, Fire-pink. Mt (GA, NC, SC, VA, WV), Pd (DE, GA, NC, SC, VA), Cp (DE, FL, GA, NC, SC, VA): woodlands, rock outcrops, crevices in cliffs, roadbanks; common (rare in Coastal Plain, rare in DE Piedmont). April-July. NJ and NY west to s. ON and se. MI, south to Panhandle FL (Bay County), GA and OK. Var. *robusta* Strausbaugh & Core, named from locations in e. WV, extends as well to se. KY and e. TN. It differs in its greater size and numerous pairs of cauline leaves, the leaves larger (7-15 cm long, 2-4 cm wide, vs. 7.5-10 cm long, 0.5-2 cm wide) and smaller calyx (1.5-2 cm long, vs. ca. 2.2 cm long) (Strausbaugh & Core 1952, 1978); additional study is needed. [= RAB, C, F, FNA, G, S, W, WH; > *S. virginica* var. *virginica* – K, WV; > *S. virginica* var. *robusta* Strausbaugh & Core – K, WV]

* ***Silene vulgaris*** (Moench) Garcke, Bladder Campion, Maiden's-tears. Mt (NC, VA, WV), Pd (DE, GA, NC, VA), Cp (NC, SC, VA): disturbed areas; common (uncommon in GA, NC, SC, and WV, rare in DE, rare in VA Coastal Plain), native of Europe. May-August. [= C, FNA, K; = *S. cucubalus* Wibel – RAB, G, W, WV; > *S. cucubalus* var. *cucubalus* – F; > *S. cucubalus* var. *latifolia* (Reichenbach) G. Beck – F; > *S. latifolia* (P. Miller) Britten & Rendle - S]

* ***Silene conica*** Linnaeus *ssp.* ***conica***, Sand Catchfly. Cp (DE): disturbed areas; rare, native of Eurasia. May-July. [= FNA; < *S. conica* – C, F]

Silene conoidea Linnaeus, Large Sand Catchfly. Pd (DE): disturbed areas; uncommon, native of Eurasia. [= C, FNA]

* ***Silene dioica*** (Linnaeus) Clairville, Red Campion, Red Catchfly. Cp (DE): disturbed areas; rare, native of Europe. Introduced south at least to scattered locations in s. PA (Rhoads & Klein 1993). Reported rather vaguely for VA (Maguire 1950) as "south to Virginia;" no additional documentation is known to me. [= C, F, FNA, K; = *Lychnis dioica* Linnaeus]

Spergula Linnaeus 1753 (Spurrey)

A genus of 6 species, herbs, of temperate Eurasia and n. Patagonia. References: Hartman & Rabeler in FNA (2005); Bittrich in Kubitzki, Rohwer, & Bittrich (1993).

1 Wing of the seed narrower than the body of the fruit; leaf blades terete or nearly so, 1.5-3 (-5) cm long..... ***Sp. arvensis***
1 Wing of the seed as wide as or wider than the body of the seed; leaf blades usually flat, 0.3-1.5 (-2.0) cm long.
2 Seed wings light brown or darker, 0.2-0.3 mm wide; stamens usually 10 ..... ***[Sp. morisonii]***
2 Seed wings white to tan, 0.4-0.6 mm wide; stamens usually 5..... ***Sp. pentandra***

* ***Spergula arvensis*** Linnaeus, Corn Spurrey. Cp (DE, FL, GA, NC, SC, VA), Pd (DE, NC, SC, VA), Mt (VA, WV): fields, roadsides, disturbed areas; uncommon (rare in FL and WV), native of Europe. April-June. Two varieties are sometimes recognized; var. *arvensis*, with seeds ornamented with white, clavate papillae, the plants sparsely glandular, and var. *sativa*, with seeds reticulate and lacking papillae, the plants sparsely to densely glandular. Additional information is needed on the distinctiveness, range in our area, etc. of the two putative varieties. [= RAB, C, FNA, K, S, WH, WV; > *S. arvensis* Linnaeus var. *arvensis* – F, G; > *S. arvensis* Linnaeus var. *sativa* (Boenninghausen) Mertens & W.D.J. Koch – F, G]
* ***Spergula pentandra*** Linnaeus, Wingstem Spurrey. Cp (NC, VA): sandy fields; rare, native of Europe. April-June. [= RAB, C, F, FNA, G, K]

* *Spergula morisonii* Boreau, Morison's Spurrey. Fallow fields, disturbed areas. Native of Europe, known from MD (Prince Georges County) (Steury 2004a), MA, and NJ (FNA). [= C, FNA]

Spergularia (Persoon) J. & K. Presl 1819 (Sand-spurrey)

A genus of about 25 species, herbs, cosmopolitan. The genus is perhaps not distinct from *Spergula*. References: Hartman & Rabeler in FNA (2005); Bittrich in Kubitzki, Rohwer, & Bittrich (1993).

1 Stamens 6-10; seeds **either** 0.4-0.6 **or** 0.8-1.1 mm long; axillary leaf clusters of 2-4 leaves (or sometimes absent in *Sp. media*).
2 Seeds 0.8-1.1 mm long, smooth, without scupturing except for wings; leaf blades fleshy..... ***[Sp. media*** *var.* ***media]***
2 Seeds 0.4-0.6 mm long, sculptured with wavy lines, not winged but with peglike papillae; leaf blades scarcely fleshy ..... ***Sp. rubra***
1 Stamens 1-5; seeds 0.5-0.7 (-0.8) mm long; axillary leaf clusters usually absent.
3 Seeds shiny and silvery; stipules wider than long; styles 0.3-0.4 mm long..... ***Sp. echinosperma***
3 Seeds dull, not silvery; stipules longer than wide; styles 0.4-0.7 mm long..... ***Sp. salina***

* ***Spergularia echinosperma*** Čelakovský. Cp (GA): disturbed soils; rare, native of Europe. Naturalized in GA and AL (FNA). [= FNA, K]
* ***Spergularia rubra*** (Linnaeus) J.& K. Presl, Purple Sand-spurrey, Roadside Sand-spurrey. Pd (VA), Cp (DE): disturbed areas; uncommon (rare in VA), native of Eurasia. May-September. [= C, F, FNA, G, K; = *Tissa rubra* (Linnaeus) Britton – S]
Spergularia salina J. & K. Presl, Saltmarsh Sand-spurrey. Cp (DE, FL, GA, NC, SC, VA): brackish and salt marsh flats; uncommon. June-October. Widespread on coasts of North America (from QC south to c. peninsular FL, from BC south to Baja California), inland along salted highways, in South America, and Eurasia. Considered by some (C, G) to be introduced only in North America, by others native (F, FNA, S). [= FNA, K; = *S. marina* (Linnaeus) Grisebach – RAB, C, F, G, GW, WH, misapplied; = *Tissa marina* (Linnaeus) Britton – S, misapplied]

* ***Spergularia media*** (Linnaeus) K. Presl *var.* ***media***. Mt (WV): disturbed areas; rare, native of {}. Known from salted highways in NY, OH, MI, and IL and salt or brackish marsh habitats in coastal NY. [= FNA; < *S. media* – C, F, G; ? *Spergularia maritima* (Linnaeus) Chiovenda – K] {synonymy incomplete}

Stellaria Linnaeus 1753 (Chickweed, Stitchwort, Starwort)

A genus of about 120-200 species, cosmopolitan (centered in Asia). References: Morton in FNA (2005); Bittrich in Kubitzki, Rohwer, & Bittrich (1993).

1 Leaves narrow, usually linear, lanceolate, oblanceolate, or narrowly elliptic, the blade 3-10× as long as wide, 0.8-10 mm wide; stems prominently 4-angled.
2 Sepals 2.0-3.5 mm long; petals 0-3.0 mm long, shorter than the sepals or absent; seeds 0.3-0.9 mm long.
3 Inflorescence a leafy terminal cyme of (1-) 5-50 flowers; seeds 0.7-0.9 mm long, smooth or slightly rugose ..... ***S. borealis*** *var.* ***borealis***
3 Inflorescences axillary, soliray or in small cymes of 2-5 flowers; seeds 0.3-0.8 mm long, distinctly papillose.
4 Flowers in axillary inflorescences of 1-5 flowers; sepals 5; petals 5; seeds 0.3-0.4 mm long, with small, rounded tubercles; [widespread]..... ***S. alsine***
4 Flowers solitary in leaf axils; sepals 4 (-5); petals absent; seeds 0.6-0.8 mm long, with stalked, knoblike tubercles; [of c. KY and TN] ..... ***[S. fontinalis]***
2 Sepals 3.5-9 mm long; petals 3.5-13 mm long, equaling or longer than the sepals; seeds 0.7-2.5 mm long.
5 Seeds 2-2.5 mm long; bracts of the inflorescence herbaceous; petals notched < halfway to the base ..... ***S. holostea***
5 Seeds 0.7-1.2 mm long; bracts of the inflorescence scarious; petals notched > halfway to the base.
6 Sepals 4.5-5.5 mm long, strongly 3-nerved; seeds 0.8-1.2 mm long, coarsely tuberculate; inflorescence diffuse, many-flowered..... ..... ***S. graminea***

6 Sepals 3.5-4.5 mm long, weakly 3-nerved; seeds 0.7-1.0 mm long, obscurely sculptured and appearing almost smooth; inflorescence more compact, fewer-flowered.....***S. longifolia***

1 Leaves broad, usually ovate, obovate, or broadly elliptic, the blade 1-2.5× (or to 4×) as long as wide, 4-30 mm wide (if > 2.5× as long as wide, then definitely > 10 mm wide); stems terete or 4-angled.

7 Leaves long-petiolate, the petiole about as long as the blade, the blades cordate to truncate at the base; sepals 2.5-3.5 mm long, obtuse to broadly acute; seeds 0.6-0.8 mm long; stem glabrous or glandular-puberulent (the pubescence not in lines).....***S. prostrata***

7 Leaves sessile, short-petiolate, to long-petiolate (if long petiolate, the blades cuneate), the blades rounded to cuneate at the base; sepals 3.5-11 mm long, broadly acute to acuminate; seeds 0.4-2.0 mm long; stem puberulent to short-pilose (the pubescence in vertical lines or not).

8 Leaves (1.0-) 2.5-10 cm long (with strong dimorphism between sterile and fertile shoots, the leaves of sterile shoots much larger); seeds 1.7-2 mm long; sepals 4-11 mm long; stem pubescence in vertical lines or uniformly distributed; perennial, the stems strong and ascending to erect; [native].

9 Sepals 7-11 (-12) mm long, acuminate, ciliate, but more-or-less glabrous on the back; [of the mountains].....***S. corei***

9 Sepals 3.5-7 mm long, acute, ciliate and more-or-less pubescent on the back; [widespread in our area].....***S. pubera***

8 Leaves 0.5-4.0 cm long; seeds 0.6-1.7 mm long; sepals 3.0-6.5 mm long; stem pubescence always in vertical lines; annual, the stems weak and in part prostrate, the tips or vigorous growth ascending; [alien].

10 Sepals 5.0-6.5 mm long; stamens 8-10; seeds 1.1-1.7 mm long.....***S. neglecta***

10 Sepals 3.0-5.2 (-6.0) mm long; stamens 1-5 (-8); seeds 0.4-1.3 mm long.

11 Stamens 3-5 (-8); sepals 4.5-5.2 (-6.0) mm long; seeds 0.9-1.4 mm long; petals usually present.....***S. media***

11 Stamens 0-3 (-5); sepals 3.0-4.0 mm long; seeds 0.4-0.9 mm long; petals usually absent.....***S. pallida***

Stellaria alsine Grimm, Bog Stitchwort, Longstalk Starwort, Bog Chickweed. Mt (NC, WV), Pd (DE, GA): seepages; rare. April-May. Circumboreal, in North America ranging south to DE, MD, w. NC, GA, FL, and LA (Rabeler & Thieret 1988). Possibly only introduced in parts at least of our area. [= RAB, C, F, FNA, G, K, W; *? Stellaria uliginosa* Murray]

Stellaria borealis Bigelow *var.* ***borealis***, Northern Stitchwort. Mt (WV): cold swamps; rare. May-September. Greenland and NL (Labrador) west to AK, south to MD, n. WV (Canaan Valley, Tucker Co.), sc. PA, MI, WI, MN, CO, NV, and OR. Var. *sitchana* (Steudel) Fernald is restricted to nw. North America. [= C; = *S. borealis* ssp. *borealis* – FNA, K; > *S. calycantha* (Ledebour) Bongard var. *floribunda* Fernald – F, G; > *S. calycantha* var. *isophylla* Fernald – F, G, WV, misapplied]

Stellaria corei Shinners, Tennessee Starwort. Mt (NC, VA, WV), Pd* (DE*): cove forests and seepages at moderate to high elevations, rarely escaped from cultivation; rare. April-June. W. VA, WV, and sw. PA west to OH and IN, south to w. NC, e. and c. TN, and n. AL. Cronquist (1991) reports that *S. corei* has a chromosome number of 2n = 60, as opposed to 2n = 30 for *S. pubera*. In mountain coves, *S. corei* and *S. pubera* sometimes grow intermixed; they are best regarded as species. Both species have an interesting seasonal growth form, producing short and relatively small-leaved flowering shoots in the spring (which wither following fruiting), followed by taller, more vigorous summer shoots with larger and tougher leaves and lacking flowers, which persist until autumn. Some of the description in various manuals of differences in petiole length and leaf size and shape between the two species is obscured or complicated by these seasonal differences; more careful observation is needed. [= RAB, FNA, K, W, WV; = *S. pubera* Michaux var. *silvatica* (Béguinot) Weatherby – C, F; = *S. silvatica* (Béguinot) Maguire – G, preoccupied; = *Alsine tennesseensis* (C. Mohr) Small – S, misapplied]

* ***Stellaria graminea*** Linnaeus, Common Stitchwort, Lesser Stitchwort. Mt (NC, SC, VA, WV), Pd (DE, NC, SC, VA), Cp (NC, SC, VA): fields, roadsides, pastures, disturbed areas; common (uncommon in DE), native of Europe. May-August. [= RAB, C, F, FNA, G, GW, K, W, WV; = *Alsine longifolia* (Muhlenberg ex Willdenow) Britton – S, misapplied]

* ***Stellaria holostea*** Linnaeus, Easter-bell, Greater Stitchwort. Cp? (NC): escaped or persistent from cultivation; rare, native of Europe. [= C, F, FNA, G, K]

Stellaria longifolia Muhlenberg, Longleaf Stitchwort. Mt (VA, WV), Pd (DE, VA), Cp (SC): meadows, floodplain forests, freshwater tidal marshes, moist disturbed areas; common (uncommon in SC and VA). Apparently circumboreal, in North America ranging south to e. SC, w. VA, e. TN, MO, KS, AZ, and CA. [= C, F, FNA, G, W, WV; > *S. longifolia* var. *longifolia* – K]

* ***Stellaria media*** (Linnaeus) Villars, Common Chickweed. Mt (GA, NC, SC, VA, WV), Pd (DE, GA, NC, SC, VA), Cp (DE, FL, NC, SC, VA): disturbed areas, gardens, fields; common (uncommon in DE Piedmont, rare in DE Coastal Plain), native of Europe. January-December. [= FNA; < *S. media* – RAB, C, G, W, WH, WV (also see *S. pallida*); < *S. media* var. *media* – F; = *S. media* ssp. *media* – K; < *Alsine media* Linnaeus – S]

* ***Stellaria neglecta*** Weihe. Mt (NC): disturbed areas; rare, native of Europe. Similar to *S. media* and *S. pallida*. It has been found at scattered localities in e. North America and will presumably eventually be found elsewhere in our area. [= FNA, G; < *S. media* (Linnaeus) Villars – RAB, C, W; < *S. media* var. *media* – F; = *S. media* ssp. *neglecta* (Weihe) Murbeck – K; = *Alsine neglecta* (Weihe) A. & D. Löve]

* ***Stellaria pallida*** (Dumortier) Piré, Lesser Chickweed. Cp (FL, NC, SC, VA), Mt (WV): disturbed areas, gardens, fields; common (rare in WV), native of Europe. January-December. Cronquist (1991) reports that *S. pallida* has a chromosome number of 2n = 22, as opposed to 2n = 40-44 for *S. media*. [= C, FNA; < *S. media* (Linnaeus) Villars – RAB, W, WH, WV; >< *S. media* var. *glaberrima* G. Beck – F, possibly misapplied; = *S. prostrata* – G, misidentified; *? S. apetala* Ucria ex Roemer – G, possibly misapplied; = *S. media* ssp. *pallida* (Dumortier) Ascherson & Graebner – K; < *Alsine media* – S; = *Alsine pallida* Dumortier]

Stellaria prostrata Baldwin. Cp (FL, GA, SC): moist soil along streams; rare. March-April. Apparently ranging from SC south to c. peninsular FL, west to c. TX. This species has been reported repeatedly for SC and sometimes for VA as well; the VA reports are referable to *S. pallida*. More information is needed about its occurrence in our area. [= K, WH; = *S. cuspidata* Willdenow ex Schlechtendahl ssp. *prostrata* (Baldwin) J.K. Morton – FNA; = *Alsine baldwinii* Small – S]

Stellaria pubera Michaux, Star Chickweed, Common Starwort, Giant Chickweed, Great Chickweed. Mt (GA, NC, SC, VA, WV), Pd (GA, NC, SC, VA), Cp (FL, NC, SC, VA): bottomland forests, moist slopes, coves, hammocks; common (uncommon

in Coastal Plain, uncommon in DE Piedmont, rare in FL). April-June. NJ west to IL, south to Panhandle FL and AL. See *S. corei* for comments. [= RAB, FNA, G, K, W, WH, WV; = *S. pubera* var. *pubera* – C, F; = *Alsine pubera* (Michaux) Britton – S]

Stellaria fontinalis (Short & Peter) B.L. Robinson is a native species of c. TN (Chester, Wofford, & Kral 1997) and c. KY, occurring in seepages and wet cliffs. Its generic placement has been controversial and uncertain (see synonymy). [= F, FNA, G, K; = *Sagina fontinalis* Short & Peter – C; = *Alsine fontinalis* (Short & Peter) Britton – S; = *Arenaria fontinalis* (Short & Peter) Shinners; = *Spergula fontinalis* (Short & Peter) Dietrich]

Stipulicida Michaux 1803 (Wire-plant)

A genus of a single species, herb, of se. North America. References: Judd (1983)=Z; Ward (2001)=Y; James (1957)=X; Swanson & Rabeler in FNA (2005); Bittrich in Kubitzki, Rohwer, & Bittrich (1993).

Identification notes: *Stipulicida* is immediately recognizable by its very wiry, dichotomously branched stems, the stem leaves reduced to subulate scales 0.5-2 mm long. Often overlooked are the basal rosette of spatulate leaves, to 15 mm long and 4 mm wide.

1 Sepal margin lacerate; outer sepal tips mucronate; [of FL].....***S. setacea*** *var.* ***lacerata***
1 Sepal margin entire or nearly so; outer sepal tips acute to obtuse; [of se. VA south to s. FL, west to LA] ..... ***S. setacea*** *var.* ***setacea***

Stipulicida setacea Michaux *var.* ***lacerata*** C.W. James. Cp (FL): xeric sands of sandhills, dry pine flatwoods, maritime forests; rare. May-August. Ne. FL south to s. FL; Cuba. [= FNA, K, WH, X, Y, Z; < *S. setacea* – S]

Stipulicida setacea Michaux *var.* ***setacea***, Wire-plant. Cp (FL, GA, NC, SC, VA): xeric sands of sandhills, dry pine flatwoods, maritime forests; common, rare in VA. May-August. Se. VA south to s. FL, west to e. LA (Florida parishes). A third variety, var. *filiformis* (Nash) D.B. Ward, endemic to c. Peninsular FL, is often considered a mere form of var. *setacea* (see synonymy and references). [= Y; < *S. setacea* var. *setacea* – FNA, K, WH, X, Z (including var. *filiformis*, but not var. *lacerata*); < *S. setacea* – RAB, C, S; < *S. setacea* – S (including var. *lacerata* but not var. *filiformis*)]

Vaccaria von Wolf 1781 (Cow-cockle, Cow-herb)

A genus of 1-4 species, herbs, of c. and e. Europe, Mediterranean, and temperate Asia. References: Thieret & Rabeler in FNA (2005); Bittrich in Kubitzki, Rohwer, & Bittrich (1993).

* ***Vaccaria hispanica*** (P. Miller) Rauschert, Cow-cockle, Cow-herb. Pd (DE, SC, VA), Mt (WV): fields, disturbed areas; rare, native of Europe. May-June. The record from VA (Arlington County) probably represents a waif. [= C, FNA, K; =*? V. pyramidata* Medikus – RAB; = *Saponaria vaccaria* Linnaeus – F, WV; =*? Vaccaria segetalis* Garcke ex Ascherson – G; = *Vaccaria vaccaria* (Linnaeus) Britton – S]

298. AMARANTHACEAE A.L. de Jussieu 1789 (Amaranth Family) [in CARYOPHYLLALES]

A family of about 175 genera and 2250 species, mostly herbs, but including shrubs and trees, , nearly cosmopolitan, but most diverse in subtropical and temperate regions (Judd & Ferguson 1999). References: Robertson & Clemants in FNA (2003b); Townsend in Kubitzki, Rohwer, & Bittrich (1993); Welsh, Crompton, & Clemants in FNA (2003b); Judd & Ferguson (1999)=Z; Kühn in Kubitzki, Rohwer, & Bittrich (1993). [including CHENOPODIACEAE]

{Note: several of the genera below have been treated in very different ways by various authors. Complicating the situation is the pantemperate or pantropical distribution of some species, questions of application of names having priority, and the use of technical characters not readily observed on herbarium specimens. The treatments below of *Salicornia, Sarcocornia, Atriplex*, and *Suaeda* may require considerable change prior to publication}

Subfamily Amaranthoideae
  Tribe Celosieae: *Celosia.*
  Tribe Amarantheae, subtribe Amaranthinae: *Amaranthus.*
  Tribe Amarantheae, subtribe Aervinae: *Achyranthes.*
Subfamily Gomphrenoideae
  Tribe Gomphrenae, subtribe Froelichiinae: *Alternanthera*, *Froelichia*, *Guellimenea.*
  Tribe Gomphrenae, subtribe Gomphreninae: *Gomphrena*, *Iresine.*

Former Chenopodiaceae

1 Leaves opposite, reduced to scales a few mm long, clasping and appressed against the succulent stem; flowers in groups of 3, sunken into the stem; [subfamily *Salicornioideae*, tribe *Salicornieae*].
  2 Annual from a taproot; central flower (of each group of 3) above the 2 lateral flowers.....***Salicornia***
  2 Perennial from a horizontal rhizome; central flower (of each group of 3) inserted at the same level as the 2 lateral flowers.....***Sarcocornia***

1 Leaves mostly or entirely alternate (the lower sometimes opposite), not reduced to appressed scales; flowers not usually grouped into groups of 3, not sunken into the stem.
  3 Fruit enclosed and concealed by paired accrescent bracteoles (these usually deltoid, diamond-shaped, or ovoid).
    4 Leaves pale green to silvery green; stigmas 2; plants without basal leaves, the stems freely and rather divergently branched; [native or introduced, primarily in saline situations]; [subfamily *Chenopodioideae*, tribe *Atripliceae*] ..... ***Atriplex***
    4 Leaves bright to dark green; stigmas 4-5; plants with basal leaves, the flowering stems erect, strict or with ascending branches in the inflorescence; [introduced, frequently cultivated as a garden vegetable, rarely escaped]; [subfamily *Chenopodioideae*, tribe *Atripliceae*] ..... ***Spinacia***
  3 Fruit enclosed by the persistent calyx.
    5 Leaves petiolate, lanceolate or wider, the larger leaves generally toothed, not succulent or only slightly so; [subfamily *Chenopodioideae*].
      6 Fruit dehiscent; ovary half-inferior; roots usually enlarged; [tribe *Beteae*] ..... ***Beta***
      6 Fruit indehiscent; ovary superior; roots not enlarged.
        7 Fruiting calyx not winged, the lobes flat, keeled, or hooded; [tribe *Chenopodieae*] ..... ***Chenopodium***
        7 Fruiting calyx winged horizontally; [tribe *Camphorosmeae*] ..... ***Cycloloma***
    5 Leaves sessile, linear, entire, succulent or not.
      8 Leaves spine-tipped; [subfamily *Salsoloideae*; tribe *Salsoleae*] ..... ***Salsola***
      8 Leaves not spine-tipped.
        9 Leaves pubescent to villous; [subfamily *Chenopodioideae*, tribe *Camphorosmeae*] ..... ***Bassia***
        9 Leaves glabrous; [subfamily *Salsoloideae*, tribe *Suaedeae*] ..... ***Suaeda***

Achyranthes Linnaeus 1753 (Chaff-flower)

A genus of 6-8 species, of warm temperate and tropical regions of the Old World. References: Robertson in FNA (2003b); Townsend in Kubitzki, Rohwer, & Bittrich (1993). Key based closely on FNA.

1 Pseudostaminode margins entire, denticulate, or slightly 2-lobed at the tip ..... ***A. japonica*** *var.* ***hachijoensis***
1 Pseudostaminode margins fimbriate at the tip.
  2 Leaf blades 1-4 (-6) cm long, 1-4 (-6) cm wide, obtuse to rounded and apiculate at the tip; tepals 3-4 mm long; utricles 2-2.5 mm long ..... ***A. aspera*** *var.* ***aspera***
  2 Leaf blades 4-20 cm long, 2-5 cm wide, acuminate at the tip; tepals 6-7 mm long; utricles 3-4 mm long ..... ***[A. aspera*** *var.* ***pubescens]***

* ***Achyranthes aspera*** Linnaeus *var.* ***aspera***. Cp (FL, SC): disturbed areas, waste areas around wool-combing mills; rare, native of Asia, perhaps merely a waif. [= FNA, K, WH; = *Centrostachys indica* (Linnaeus) Standley – S]

* ***Achyranthes japonica*** (Miquel) Nakai *var.* ***hachijoensis*** Honda, Japanese Chaff-flower. Mt (WV): disturbed areas, rare, native of e. Asia. Escaped in KY and WV (Mingo and Wayne counties) (Medley et al. 1985) and n. AL (Limestone County) (D. Spaulding, pers.comm.). It will likely become established in our area as well. [= FNA, K; < *A. japonica* – C]

* *Achyranthes aspera* Linnaeus var. *pubescens* (Moquin-Tandon) C.C. Townsend, Devil's-horsewhip. Reported for MD and s. FL (FNA, K). Native of West Indies and perhaps s. FL. [= FNA, K; = *Centrostachys aspera* (Linnaeus) Standley – S]

Alternanthera Forsskål 1775 (Chaff-flower, Joyweed)

A genus of about 100 species, tropical and warm temperate, especially in America. References: Clemants in FNA (2003b); Townsend in Kubitzki, Rohwer, & Bittrich (1993). Key based in part on Clemants in FNA (2003b).

1 Inflorescences borne on peduncles 1-7 cm long, these from the leaf axils or terminal
  2 Bracts keeled; tepals pilose; leaves not succulent, acute to acuminate at the tip ..... ***A. flavescens***
  2 Bracts not keeled; tepals glabrous; leaves somewhat succulent, obtuse to rounded at the tip ..... ***A. philoxeroides***
1 Inflorescences sessile, in the leaf axils.
  3 Tepals dimorphic; tepal hairs barbed.
    4 Leaf blades longer than broad; tepals 3-5 mm long, densely villous ..... ***A. caracasana***
    4 Leaf blades as broad as long; tepals 5-7 mm long, sparsely villous ..... ***A. pungens***
  3 Tepals monomorphic; tepal hairs not barbed.
    5 Mature fruit included within the tepals; spikes globular; stems sericeous ..... ***A. paronychioides***
    5 Mature fruit exserted between the tepals; spikes narrow, short-cylindric; stems glabrous to pubescent in lines (the nodes also pubescent) ..... ***A. sessilis***

* ***Alternanthera caracasana*** Kunth. Cp (FL, GA, NC, SC): disturbed areas; rare, native of South America. Reported for Coastal Plain of SC, and in s. Coastal Plain of GA (Jones & Coile 1988) and for NC (FNA, K) and MD (K). [= FNA, K, WH; = *Achyranthes repens* Linnaeus – S, misapplied]

Alternanthera flavescens Kunth, Yellow Joyweed. Cp (FL): hammocks, sandbars; rare. Widespread in the FL peninsula, north to ne. FL (Clay County) (Wunderlin & Hansen 2004). [= K; > *Achyranthes ramosissima* (Mart.) Stand. – S; > *Alternanthera floridana* (Chapman) Small] {add synonymy}

* ***Alternanthera paronychioides*** St.-Hilaire. Cp (FL, GA, NC, SC): disturbed areas; rare, native of tropical America. July-October. [= FNA, WH; > *Alternanthera paronychioides* St.-Hilaire var. *paronychioides* – K; = *Alternanthera polygonoides* (Linnaeus) R. Brown ex Sweet – RAB, G, misapplied; = *Achyranthes polygonoides* (Linnaeus) Lamarck – S, misapplied]

* ***Alternanthera philoxeroides*** (Martius) Grisebach, Alligator-weed. Cp (FL, GA, NC, SC, VA): floating in mats on the surface of the waters of blackwater rivers, sloughs, ditches, ponds, and in very moist soil of ditches and shores; common, native of tropical America. April-October. This plant is a serious weed of natural areas. [= RAB, C, FNA, K; = *Achyranthes philoxeroides* (Martius) Standley – S]

* ***Alternanthera pungens*** Kunth. Cp (FL, GA, VA): field edges, parking lots, other disturbed areas; rare, perhaps only a wif at least northwards, native of tropical America. Known from scattered locations in AL, FL, LA, NY, and TX (Clemants in FNA 2003b); native of tropical America. Reported for Sumter and Tift counties, GA (Carter, Baker, & Morris 2009). [= FNA, K, WH; > *Achyranthes leiantha* (Seubert) Standley – S; > *Achyranthes repens* Linnaeus – S]

* ***Alternanthera sessilis*** (Linnaeus) R. Brown ex A.P. de Candolle, Sessile Joyweed. Cp (FL, GA, SC): disturbed wet muck; uncommon (rare in GA and SC), native of the Tropics. First reported for SC by Nelson & Kelly (1997). Apparently now known in the Southeast from SC, FL, AL, MS, LA, TX (Brown & Marcus 1998) and GA (Jones & Coile 1988). [= FNA, GW, K]

Amaranthus Linnaeus 1753 (Amaranth, Pigweed)

A genus of about 60 species, all annual herbs, of tropical and temperate regions. References: Mosyakin & Robertson in FNA (2003b); Costea & Tardif (2003b)=Y; Henrickson (1999)=Z; Sauer (1955)=X; Costea, Sanders & Waines (2001a, 2001b); Townsend in Kubitzki, Rohwer, & Bittrich (1993). Key based closely on Mosyakin & Robertson in FNA (2003b) and Sauer (1955).

1 Plants dioecious; [subgenus *Acnida*]..... **Key A**
1 Plants monoecious (the pistillate and staminate flowers intermingled, or in separate inflorescences on the same plant); [subgenera *Albersia* and *Amaranthus*] .....**Key B**

Key A – *Amaranthus*, subgenus *Acnida*

1 Plants pistillate.
  2 Tepals present and well-developed (usually 5 present, at least the outer tepals >2 mm long and with a visible midvein).
    3 Tepals 1 or 2, lanceolate to linear; [subgenus *Acnida*, section *Acnida*] .....***A. tuberculatus***
    3 Tepals 5, at least the inner spatulate; [subgenus *Acnida*, section *Saueranthus*].
      4 Outermost tepal obtuse or notched (similar to the others), the midvein excurrent slightly or not at all .....***A. arenicola***
      4 Outermost tepal acute or acuminate (dissimilar to the inner obtuse tepals), the midvein excurrent into a rigid point.....***A. palmeri***
  2 Tepals lacking, or rudimentary (often only 1-2 present, these <1 (2) mm long and lacking a visible midvein); subgenus *Acnida*, section *Acnida*].
    5 Seeds 2-3 mm long; utricle 2.5-4 mm long.....***A. cannabinus***
    5 Seeds 0.7-1.2 mm long; utricle 1-2.5 mm long.
      6 Utricle with conspicuous and regular longitudinal ridges; bract > 1.5 mm long, with a stout midrib not far excurrent beyond the bract blade .....***A. australis***
      6 Utricle smooth or irregularly tuberculate; bract < 1.5 mm long, with a slender excurrent midrib
        7 Leaf blades narrow, all or nearly all < 1 cm wide .....***A. floridanus***
        7 Leaf blades broader, well-developed leaves 1-3 cm wide.....***A. tuberculatus***
1 Plants staminate (some identifications following this lead may not be reliable).
  8 Outer tepals with prominent midribs, usually longer than the inner tepals; bracts >2 mm long (or 1-2 mm long in *A. tuberculatus*), mostly with prominent midribs.
    9 Outer tepals with apex acute or obtuse; dark midribs not excurrent .....***A. arenicola***
    9 Outer tepals with apex acuminate; midribs excurrent as rigid spines.
      10 Bracts ca. 4 mm long, equaling or exceeding the outer tepals.....***A. palmeri***
      10 Bracts ca. 2 mm long, shorter than the outer tepals .....***A. tuberculatus***
  8 Outer tepals without prominent midribs, not appreciably longer than the inner tepals; bracts <2 mm long, the midribs usually not prominent (except sometimes in *A. australis*).
    11 Bracts < 1 mm long; midribs scarcely excurrent .....***A. cannabinus***
    11 Bracts > 1mm long; midribs often conspicuously excurrent.
      12 Leaf blades narrow, all or nearly all < 1 cm wide.....***A. floridanus***
      12 Leaf blades broader, well-developed leaves 1-3 cm wide
        13 Bracts with moderately prominent midribs; midribs of outer tepals excurrent.....***A. australis***
        13 Bracts with slender midribs; midribs of outer sepals not excurrent .....***A. tuberculatus***

Key B – *Amaranthus*, subgenera *Albersia* and *Amaranthus*

1 Inflorescences axillary clusters of glomerules (sometimes leafy terminal spikes also present); [subgenus *Albersia*].
  2 Pistillate flowers usually with 3 tepals; utricles usually regularly dehiscent (indehiscent in *A. blitum*).
    3 Utricles indehiscent; leaf blades usually deeply notched at the tip .....***A. blitum***
    3 Utricles dehiscent; leaf blades obtuse, acuminate, or very shallowly notched at the tip.

4 Tepals of pistillate flowers acute to short-acuminate at the tip, not reflexed; seeds 0.6-1.0 mm in diameter ..... ***A. albus***
4 Tepals of the pistillate flowers long-aristate at the tip, usually reflexed outward; seeds 1.0-1.4 mm in diameter ..... ***[A. thunbergii]***
2 Pistillate flowers usually with (4-) 5 tepals; utricles usually indehiscent or tardily dehiscent (regularly dehiscent in *A. blitoides*).
5 Inflorescence axes thickened, becoming indurate at maturity ..... ***A. crassipes*** *var.* ***crassipes***
5 Inflorescence axes not thickened, not indurate at maturity.
6 Utricles with regular, circumscissile dehiscence ..... ***A. blitoides***
6 Utricles indehiscent (or tardily and irregularly dehiscent).
7 Leaves crisped-erose, conspicuously undulate (non planar) ..... ***A. crispus***
7 Leaves entire or erose, plane or slightly undulate.
8 Leaves ovate, obovate-rhombic, to narrowly ovate or lanceolate; plants not fleshy; [alien of disturbed situations] ..... ***A. polygonoides***
8 Leaves orbicular or obovate; plants fleshy; [native of sea-beaches] ..... ***A. pumilus***
1 Inflorescences terminal spikes or panicles, leafless or nearly so at least in the distal portions (axillary spikes or clusters usually also present).
9 Utricles indehiscent; tepals of pistillate flowers usually 2-3 (5 in *A. spinosus*); inflorescence bracts shorter than the tepals.
10 Stems with paired nodal spines; tepals of pistillate flowers 5; [subgenus *Amaranthus*] ..... ***A. spinosus***
10 Stems lacking spines; tepals of pistillate flowers 2-3; [subgenus *Albersia*].
11 Utricles distinctly rugose, equaling or slightly exceeding the tepals; terminal inflorescences usually thin and interrupted ..... ***A. viridis***
11 Utricles smooth to faintly rugose (occasionally wrinkled or rugose in dried material), distinctly exceeding the tepals; terminal inflorescences usually thick and dense (or thin and interrupted in some forms of *A. blitum*).
12 Utricles subglobose to obovate, compressed; seeds filling the fruit almost completely; leaf blades usually deeply notched at the tip; annual ..... ***A. blitum***
12 Utricles ellipsoid, slightly to distinctly inflated; seeds filling only the proximal portions of the fruit; leaf blades shallowly notched at the tip; short-lived perennials, or annuals ..... ***A. deflexus***
9 Utricles dehiscent; tepals of pistillate flowers usually usually 5 (3-5 in *A. powellii*); inflorescence bracts exceeding the tepals (shorter than the tepals in some cultivated forms); [subgenus *Amaranthus*].
13 Fully developed inflorescences large and robust, usually brightly colored (red, purple, occasionally white or yellow, rarely green); bracts usually not exceeding style branches at maturity (occasionally longer than the style branches in *A. hypochondriacus*); seeds white, ivory, red, brown, or black; [cultivated, only weakly naturalized].
14 Inflorescences stiff, erect ..... ***A. hypochondriacus***
14 Inflorescences lax, erect to drooping.
15 Tepals of pistillate flowers (at least the inner tepals of the pistillate flowers) obovate or spatulate, the tip obtuse to slightly notched; style branches spreading or reflexed ..... ***A. caudatus***
15 Tepals of pistillate flowers oblong to lanceolate, the tip acute; style branches erect or slightly reflexed ..... ***A. cruentus***
13 Fully developed inflorescences moderately large, usually green (rarely with some whitish or reddish coloration); bracts exceeding the style branches and tepals; seeds brown or black; [wild and weedy].
16 Tepals of pistillate flowers obtuse, rounded, or slightly notched at the tip; plants rather densely pubescent ..... ***A. retroflexus***
16 Tepals of pistillate flowers acute, acuminate, or aristate at the tip; plants slightly pubescent when young, becoming glabrous or nearly so.
17 Bracts 2-4 mm long; inflorescences usually soft and lax, with spreading branches ..... ***A. hybridus***
17 Bracts 4-7 mm long; inflorescences usually stiff, with erect branches ..... ***A. powellii***

* ***Amaranthus albus*** Linnaeus, Tumbleweed Amaranth. Cp (DE, FL, VA), Pd (DE, VA), Mt (VA, WV), {GA, NC, SC}: disturbed areas, agricultural fields; common (rare in FL and WV), native of c. North America. July-October. [= C, FNA, G, K, W, WH, Y; < *Amaranthus graecizans* Linnaeus – RAB, misapplied; > *Amaranthus albus* var. *albus* – F]

* ***Amaranthus arenicola*** I.M. Johnston, Sandhill Amaranth. Cp, Pd (VA): disturbed areas; rare, native of w. North America. [= C, FNA, G, K, X; = *Amaranthus torreyi* A. Gray – F]

*? ***Amaranthus australis*** (A. Gray) J.D. Sauer, Southern Water-hemp, Careless. Cp (FL, GA, NC), Mt* (VA*): tidal marshes, ditches, disturbed areas; uncommon. E. NC, TN, AR, and TX south into West Indies, Mexico, and n. South America; perhaps adventive in most of our range, from an original distribution on the Gulf Coast, in FL, and southward into the New World tropics. This annual is alleged to get as large as 9 m tall and 30 cm diameter at the base of the stem! [= FNA, GW, K, WH, X; > *Acnida cuspidata* Bertero ex Sprengel – S; > *Acnida alabamensis* Standley – S]

Amaranthus blitoides S. Watson, Matweed Amaranth, Prostrate Pigweed. Pd* (DE*), Mt* (WV*), {GA, SC}: rare. [= C, FNA, K, S, Y; < *A. graecizans* Linnaeus – RAB, F, misapplied]

* ***Amaranthus blitum*** Linnaeus, Purple Amaranth, Livid Amaranth. Cp (FL, VA), Pd (DE, SC, VA), Mt (VA, WV), {GA, NC, VA}: disturbed habitats; uncommon (rare in DE and WV), native of the tropics. First reported from South Carolina by Hill & Horn (1997). [= C, FNA, K; = *Amaranthus lividus* – RAB, F, misapplied; > *Amaranthus blitum* – G; > *Amaranthus lividus* – G; > *Amaranthus blitum* Linnaeus ssp. *emarginatus* (Moquin-Tandon ex Uline & Bray) Carretero – WH, Y; > *Amaranthus blitum* ssp. *polygonoides* (Moquin-Tandon) Carretero]

Amaranthus cannabinus (Linnaeus) J.D. Sauer, Salt-marsh Water-hemp. Cp (DE, FL, GA, NC, SC, VA): salt, brackish, and freshwater tidal marshes, especially along the banks of tidal guts; common (rare in FL). July-December. ME south to ne. FL; AL? Extremely variable in size, flowering and fruiting at heights ranging from 3 dm to 4 m tall. The stem can reach 10 cm in diameter at the base. [= RAB, C, FNA, GW, K, WH, X; = *Acnida cannabina* Linnaeus – F, G, S]

* ***Amaranthus caudatus*** Linnaeus, Love-lies-bleeding. Cp (DE), Pd (DE): disturbed areas; rare, native of India. Cultivated and rarely escaped or persistent, as in TN (Chester, Wofford, & Kral 1997), and scattered in PA (Rhoads & Klein 1993). [= FNA, C, F, G, K, Y]

*? ***Amaranthus crassipes*** Schlechtendahl *var.* ***crassipes***, Spreading Amaranth. (SC): shores and wet areas; rare, probably introduced from tropical America. Var. *warnockii* (I.M. Johnston) Henrickson occurs in the Chihuahuan Desert region. [= Z; < *Amaranthus crassipes* – RAB, C, FNA, G, GW, K, S]

* ***Amaranthus crispus*** (Lespinasse & Thévenau) A. Braun, Crisp-leaved Amaranth. Cp (NC): disturbed areas, especially around seaports; rare, native of South America. Reported for VA by Massey (1961), but no documentation is known. [= FNA, C, F, G, K, S]

* ***Amaranthus cruentus*** Linnaeus, Red Amaranth, Blood Amaranth, Purple Amaranth. Mt (VA, WV), {NC, SC}: disturbed areas, old gardens; rare, native of Central America. [= RAB, C, F, FNA, K, S, WV, Y]

* ***Amaranthus deflexus*** Linnaeus, Large-fruit Amaranth, Argentine Amaranth. Cp (FL, VA), {GA}: disturbed areas; rare, native of South America. Reported for VA by Virginia Botanical Associates (2010). [= FNA, C, F, G, K, WH]

Amaranthus floridanus (S. Watson) Sauer, Florida Amaranth. Cp (FL): dunes, beaches; rare. Native, endemic to FL peninsula, north to Duval and Alachua counties (Wunderlin & Hansen 2004). [= FNA, K, WH; = *Acnida floridana* S. Watson – S]

* ***Amaranthus hybridus*** Linnaeus, Smooth Amaranth, Green Amaranth, Hybrid Amaranth, Smooth Pigweed. Cp (DE, FL, GA, NC, SC, VA), Pd (DE, GA, NC, SC, VA), Mt (GA, NC, SC, VA, WV): disturbed areas; common. July-October. [= RAB, C, F, FNA, G, K, S, W, WH; = *Amaranthus hybridus* ssp. *hybridus* – Y]

* ***Amaranthus hypochondriacus*** Linnaeus, Prince's-feather. (VA): Type locality is "Virginia". Possibly of hybrid origin, from *A. cruentus* × *powellii*. [= FNA, C, K]

* ***Amaranthus palmeri*** S. Watson, Careless-weed. Cp (FL, VA), Pd (VA), Mt (WV), {GA, NC, SC}: disturbed areas; uncommon (rare in VA and WV), native of c. North America. [= RAB, C, F, FNA, G, K, WH, X]

* ***Amaranthus polygonoides*** Linnaeus, Tropical Amaranth, Smartweed Amaranth. Cp (SC): disturbed areas; rare, native of tropical America. Reported for SC (FNA, K). [= FNA, K, S]

* ***Amaranthus powellii*** S. Watson, Green Amaranth, Powell's Amaranth. Mt (VA, WV), {GA, NC, SC, VA}: disturbed areas; rare. Widespread and common in PA (Rhoads & Klein 1993). Many earlier reports of *A. retroflexus* may actually pertain to this species. [= FNA, C, F, G, K; = *Amaranthus retroflexus* Linnaeus var. *powellii* (S. Watson) Boivin; = *Amaranthus powellii* ssp. *powellii* – Y]

Amaranthus pumilus Rafinesque, Seabeach Amaranth, Dwarf Amaranth. Cp (DE, NC, SC, VA): sea beaches, fore-dunes, island end flats, rarely on sound-side beaches; rare. Se. MA south to c. SC; presently known to be extant only from NC, n. SC, e. MD, DE (McAvoy 2002), se. NY (Long Island), VA, and NJ. Seeds of this plant require cold stratification, high temperatures, and light to germinate (Baskin & Baskin 1998); this is apparently responsible for the late seasonality of the species (germination in late spring and early summer) and its seed-banking. See Hancock & Hosier (2003) for discussion of the ecology of this interesting species. [= RAB, C, F, FNA, G, GW, K, S]

Amaranthus retroflexus Linnaeus, Rough Pigweed, Redroot. Mt (GA, NC, SC, VA, WV), Pd (DE, GA, NC, SC, VA), Cp (DE, GA, NC, SC, VA): common (rare in WV), native of c. and e. North America, now nearly worldwide in distribution and the original native range impossible to determine. July-October. [= RAB, C, F, FNA, G, K, S, W, Y; = *A. retroflexus* var. *retroflexus*]

* ***Amaranthus spinosus*** Linnaeus, Spiny Amaranth. Cp (DE, FL, GA, NC, SC, VA), Pd (DE, GA, NC, SC, VA), Mt (GA, NC, SC, VA, WV): fields, gardens, roadsides, barnyards, pastures; common, native of tropical America. July-October. [= RAB, C, F, FNA, G, K, S, W, WH, Y]

* ***Amaranthus tuberculatus*** (Moquin-Tandon) J.D. Sauer, Inland Water-hemp. Pd (DE), Mt (WV), {GA, NC, SC}: disturbed areas; uncommon (rare in DE), native of nw. North America. July-October. [= RAB, C, FNA, GW, W; > *Acnida altissima* (Riddell) Moquin-Tandon ex Standley var. *altissima* – F; > *Acnida altissima* var. *subnuda* (S. Watson) Fernald – F; > *Acnida altissima* var. *prostrata* (Uline & Bray) Fernald – F; > *Acnida altissima* – G; > *Acnida subnuda* (S. Watson) Standley – G, S; > *Acnida tamariscina* (Nuttall) Wood – G, S, misapplied; > *Amaranthus tuberculatus* – K, X; > *Amaranthus rudis* J.D. Sauer – K; > *Acnida concatenata* Moquin-Tandon – S; > *Amaranthus tamariscinus* Nuttall – X, misapplied]

* ***Amaranthus viridis*** Linnaeus, Slender Amaranth, Tropical Green Amaranth. Cp (FL, VA), Mt (VA), {GA, NC, SC}: disturbed areas; rare, native of South America. [= RAB, C, F, FNA, G, K, WH, Y; = *Amaranthus gracilis* Desfontaines – S]

* *Amaranthus thunbergii* Moquin-Tandon, Thunberg's Amaranth. Native of Africa. Collected from near wool-combing mills in SC; probably not naturalized. [= FNA, K]

Atriplex Linnaeus 1753 (Orach)

A genus of about 300 species, herbs and shrubs, of cosmopolitan distribution. References: Judd & Ferguson (1999)=Z; Clemants (1992)=Y; Welsh in FNA (2003b); Kühn in Kubitzki, Rohwer, & Bittrich (1993). Treatment based closely on Welsh in FNA (2003b)

Identification notes: There are a number of idiosyncratic characters that are used for the identification of the species of *Atriplex*. Many important characters are associated with the mature fruits. The fruit is closely invested by 2 **bracteoles**, which are variously shaped and ornamented. Mature seeds are dimorphic in most of our species, with **large, brown seeds** and **small, black seeds**. The **radicle** of the seeds is variously apical, lateral, or basal (which can be seen by observing the seed through the clarified bracteoles or with strong transmitted light).

1 Leaves white to gray, densely and finely scurfy, especially adaxially.
  2 Seeds dimorphic, black and brown; branches not angled; [introduced, of disturbed situations]; [subgenus *Atriplex*, section *Semibaccata*] .... ***[A. semibaccata]***
  2 Seeds monomorphic, brown; branches obtusely angled; [native, of coastal saline situations]; [subgenus *Obione*, section *Obione*, subsection *Arenariae*].
    3 Fruiting bracteoles (3.5-) 4.5-7 mm long, 3.5-5.6 mm wide, longer than broad; faces with or without appendages..... ***A. mucronata***
    3 Fruiting bracteoles 2.5-4.5 mm long, 2.6-5 mm wide, as wide as or wider than long; faces with appendages ..... ***A. pentandra***
1 Leaves usually green on both surfaces, glabrous or only sparingly powdery or scurfy; [subgenus *Atriplex*, section *Teutliopsis*].

4 Fruiting bracteoles not thickened with spongy tissue.
5 Bracteoles rhombic to diamond-shaped, broadly cuneate at the base; brown seeds broadly elliptic, (1.5-) 2.1-3.0 mm wide; seed radicle lateral; [of saline coastal habitats] ..... ***A. dioica***
5 Bracteoles triangular, nearly truncate across the bottom; brown seeds round, 2.5-3.1 (-3.7) mm wide; seed radicle subbasal; [primarily ruderal, of inland situations] ..... ***A. patula***
4 Fruiting bracteoles thickened with spongy tissue, especially toward the base.
6 Seeds ellipsoid, wider than long; leaves thickened in texture ..... ***A. dioica***
6 Seeds disc-shaped, as wide as long; leaves thin in texture.
7 Lower leaves linear or ovate-lanceolate; brown seeds 2.0-2.8 mm wide; black seeds 1.5-2.0 mm wide; [of MD and PA northward] ..... ***[A. littoralis]***
7 Lower leaves triangular-hastate; brown seeds 1.0-2.5 mm wide; black seeds 1.0-1.5 mm wide; [widespread in our area, primarily in the outer Coastal Plain] ..... ***A. prostrata***

Atriplex dioica Rafinesque. Cp (NC, VA?), Mt (VA): brackish flats; rare? July-frost. NL (Newfoundland) west to AK, south to NC and CA. [= FNA; = *Atriplex subspicata* (Nuttall) Rydberg – K, Y; < *A. littoralis* Linnaeus – C, misapplied; < *A. patula* Linnaeus var. *littoralis* (Linnaeus) A. Gray – F, misapplied]

Atriplex mucronata Rafinesque, Seabeach Orach. Cp (DE, FL, NC, VA): ocean beaches, island-end flats; uncommon. July-frost. NH south to FL west to TX. This species and *A. pentandra* are closely related, and have been variously treated as species, subspecies, varieties, and forms. [= FNA; < *A. arenaria* Nuttall – RAB, C, G, GW, S, Y (also see *A. pentandra*); < *A. cristata* Humboldt and Bonpland ex Willenow – K (also see *A. pentandra*); < *A. pentandra* ssp. *arenaria* H.M. Hall & Clements]

* ***Atriplex patula*** Linnaeus, Spear Orach. Pd (VA), Mt (VA, WV): disturbed areas, inland saline areas; rare, native of Eurasia. July-frost. [= C, FNA, K, S, Y; < *A. patula* Linnaeus – RAB, W (also see *A. prostrata*); = *A. patula* var. *patula* – F, G]

Atriplex pentandra (Jacquin) Standley in N.L. Britton et al., Seabeach Orach. Cp (FL, GA, NC, SC): ocean beaches, island-end flats; uncommon. July-frost. NC to FL, west to TX; West Indies; South America. This species and *A. mucronata* are closely related, and have been variously treated as species, subspecies, varieties, and forms. [= FNA; < *A. arenaria* Nuttall – RAB, C, G, GW, S, Y (also see *A. mucronata*); < *A. cristata* Humboldt and Bonpland ex Willenow – K (also see *A. mucronata*); = *A. pentandra* ssp. *pentandra*]

* ***Atriplex prostrata*** Boucher ex A.P. de Candolle, Thinleaf Orach, Fat-hen. Cp (DE, NC, SC, VA), Mt (VA?, WV): marsh edges, brackish flats; uncommon (rare in WV). July-frost. Widespread in e. North America, also in w. North America and Eurasia, usually considered to be native of Eurasia. {Is Saltville VA occurrence of *Atriplex* this taxon?} [= FNA, K, Y; *? A. hastata* Linnaeus – C, S, misapplied; < *A. patula* Linnaeus – RAB, W, in part; *? A. patula* var. *hastata* (Linnaeus) A. Gray – F, G, GW]

Atriplex acadiensis . Saltville VA.

* *Atriplex littoralis* Linnaeus, Narrow-leaved Atriplex. Cp (VA): Introduced south to PA (FNA) and MD (Kartesz 1999). [= FNA, K; < *A. littoralis* Linnaeus – C; < *A. patula* Linnaeus var. *littoralis* (Linnaeus) A. Gray – F]

* *Atriplex semibaccata* R. Brown, Australian Saltbush, Berry Saltbush. Introduced at various localities in North America, including DC (FNA). [= FNA, K]

* *Atriplex tatarica* Linnaeus, Tatarian Orach. Introduced on ballast at scattered localities, including AL, FL (Escambia County), NJ, and PA (FNA). [= FNA; *? A. lampa* Gillies – K, S, misapplied] {not keyed}

Bassia Allioni 1766 (Bassia)

A genus of about 21 species, herbs and dwarf shrubs, of Europe, Asia, Africa, and North America. All or part (the annuals) of *Kochia* are now sometimes merged into *Bassia* (Judd & Ferguson 1999). References: Judd & Ferguson (1999)=Z; Mosyakin in FNA (2003b); Blackwell, Baechle, & Williamson (1978)=Y; Collins & Blackwell (1979)=X; Kühn in Kubitzki, Rohwer, & Bittrich (1993).

1 Calyx segments (1 lower and 2 upper) bearing stout knobs ..... ***B. hirsuta***
1 Calyx segments (all 5) bearing a horizontal wing ..... ***B. scoparia***

* ***Bassia hirsuta*** (Linnaeus) Ascherson, Bassia. Cp (DE, VA): beaches, salt marshes; uncommon, native of Eurasia. August-October. [= C, F, FNA, G, K, X, Z]

* ***Bassia scoparia*** (Linnaeus) A.J. Scott, Summer-cypress. Pd (VA), Mt (VA, WV), Cp (DE, SC, VA): waste ground, particularly along railroad tracks, also in waste areas near wool-combing mill; uncommon (rare in DE and WV), native of Eurasia. Reported for SC (Berkeley Co.) by Pittillo & Brown (1988). [= Z; = *Kochia scoparia* (Linnaeus) Schrader – C, F, G, K, W, Y; > *Kochia scoparia* ssp. *scoparia* – FNA]

Beta Linnaeus 1753 (Beet)

A genus of about 6-12 species, herbs, of Mediterranean region and w. and c. Asia. References: Schultz in FNA (2003b); Judd & Ferguson (1999)=Z; Kühn in Kubitzki, Rohwer, & Bittrich (1993).

* ***Beta vulgaris*** Linnaeus *ssp.* ***vulgaris***, Garden Beet, Swiss Chard, Ruby Chard, Mangel-wurzel. Cp (NC, SC, VA), Pd (NC, SC, VA), Mt (NC, SC, VA, WV): commonly cultivated, rarely escaped or persisting, native of Eurasia. [= FNA; > *B. vulgaris* var. *vulgaris* – G; > *B. vulgaris* var. *cicla* – G; < *B. vulgaris* – K, Z; *? B. vulgaris* – S]

Celosia Linnaeus 1753 (Cockscomb)

A genus of about 45 species, of tropical and warm temperate regions of America and Africa. References: Robertson (1981)=Z; Robertson in FNA (2003b); Townsend in Kubitzki, Rohwer, & Bittrich (1993).

1 Style ca. 0.2 mm long; inflorescence of lax, interrupted panicles ..... ***C. trigyna***
1 Style 3-4 mm long; inflorescence very dense.
  2 Inflorescence of crowded spikes ..... ***C. argentea***
  2 Inflorescence crested, fanlike, or elaborately lobed ..... ***C. cristata***

* ***Celosia argentea*** Linnaeus. Mt (NC, WV), Pd (NC), Cp (NC): commonly cultivated, rarely escaped or persistent in disturbed areas, such as along creeks; rare, native of the Tropics. July-November. [= RAB, C, FNA, G, K, Z; = *C. argentea* var. *argentea* – F; < *C. argentea* – WH]

* ***Celosia cristata*** Linnaeus, Cockscomb. Pd (NC): commonly cultivated, rarely escaped or persistent in disturbed areas; rare, native of the Tropics. July-November. *C. cristata* is clearly closely related to and likely derived from *C. argentea*; it has been variously treated as a species, variety, or form. It is popular in gardens and institutional landscaping, but is not universally appreciated; Stace (2010) calls it "probably the world's ugliest plant." [= C, FNA, G, K, Z; = *C. argentea* Linnaeus var. *cristata* (Linnaeus) Kuntze – F; < *C. argentea* Linnaeus – WH]

* ***Celosia trigyna*** Linnaeus, Woolflower. Cp (FL): distiurbed areas; rare, native of tropical Africa. [= FNA, K, WH]

Chenopodium Linnaeus 1753 (Goosefoot, Lamb's-quarters, Pigweed)

A genus of about 140 species, herbs, shrubs, and small trees, of nearly cosmopolitan distribution. References: Clemants & Mosyakin in FNA (2003b); Judd & Ferguson (1999)=Z; Wahl (1954)=Y; Mosyakin & Clemants (1996); Kühn in Kubitzki, Rohwer, & Bittrich (1993). Draft key based closely on Clemants & Mosyakin in FNA (2003b). [also see *Dysphania*]

1 Seeds arranged vertically or both horizontally and vertically in the fruit; leaf blades glabrous or occasionally sparsely farinose; [subgenus *Blitum*].
  2 Perianth segments 5; plants perennial; [subgenus *Blitum*, section *Agathophytum*] ..... ***[C. bonus-henricus]***
  2 Perianth segments 3; plants annual.
    3 Leaves lancolate or oblong, glaucous on the lower surface ..... ***C. glaucum***
    3 Leaves triangular or rhombic, green on the lower surface.
      4 Leaves farinose on the lower surface; [subgenus *Blitum*, section *Degenia*] ..... ***C. macrospermum***
      4 Leaves glabrous on the lower surface.
        5 Glomerules 3-10 mm in diameter, borne sessile on unbranched terminal and occasionally axillary spikes; perianth segments fleshy and red at maturity; [subgenus *Blitum*, section *Blitum*] ..... ***C. capitatum*** *var.* ***capitatum***
        5 Glomerules 2-5 mm in diameter, borne sessile on lateral branched spikes; perianth segments membranaceous, green at maturity; [subgenus *Blitum*, section *Pseudoblitum*] ..... ***[C. rubrum]***
1 Seeds arranged horizontally in the fruit; leaf blades usually farinose; [subgenus *Chenopodium*].
  6 Flowers individually disposed in panicles; leaf blades glabrous; [subgenus *Chenopodium*, section *Grossefoveata*] ..... ***C. simplex***
  6 Flowers in loose or dense glomerules; leaf blades usually farinose; [subgenus *Chenopodium*, section *Chenopodium*].
    7 Primary leaves linear, linear-lanceolate, at least 2-3× as long as wide, usually untoothed and unlobed (but often with 2 basal lobes in *C. foggii*); [subsection *Leptophylla*].
      8 Leaves 2-3× as long as wide ..... ***C. atrovirens***
      8 Leaves > 3× as long as wide.
        9 Perianth spreading from fruit at maturity; plants strictly erect ..... ***C. pratericola***
        9 Perianth enclosing the fruit at maturity; plants erect to spreading.
          10 Plants usually spreading; perienth segments obtuse; leaf blades usually unlobed ..... ***[C. desiccatum]***
          10 Plants erect; perianth segments acute; leaf blades often with basal lobes ..... ***C. foggii***
    7 Primary leaves ovate, rhombic, triangular, or lanceolate, usually with basal lobes and often also with additional teeth on the margins.
      11 Seeds honeycomb-pitted; [subsection *Favosa*].
        12 Seeds 1.2-2.0 mm in diameter.
          13 Style bases with yellow area; seeds 1.2.1.5 mm in diameter ..... ***C. berlandieri*** *var.* ***zschackei***
          13 Style bases without yellow area; seeds 1.3-2.0 mm in diameter.
            14 Inflorescences large and drooping; seeds 1.7-2.0 mm in diameter ..... ***C. berlandieri*** *var.* ***bushianum***
            14 Inflorescences small and erect; seeds 1.3-1.9 mm in diameter ..... ***C. berlandieri*** *var.* ***macrocalycium***
        12 Seeds 1.0-1.3 mm in diameter.
          15 Leaves rhombic-triangular, usually without basal lobes; inflorescences becoming bractless ..... ***C. berlandieri*** *var.* ***boscianum***
          15 Leaves 3-lobed; inflorescences with or without bracts.
            16 Inflorescences bractless ..... ***[C. berlandieri*** *var.* ***berlandieri]***
            16 Inflorescences with leafy bracts ..... ***C. berlandieri*** *var.* ***zschackei***
      11 Seeds smooth or areolate.
        17 Leaves triangular.

18 Seeds 1.0-1.5 mm in diameter, the seed margin sharp; leaf blades without basal lobes; [subsection *Undata*] ..... ***C. murale***
18 Seeds 0.8-1.2 mm in diameter, the seed margin rounded; leaf blades often with basal lobes; [subsection *Urbica*] ..... ***C. urbicum***
17 Leaves ovate to broadly ovate, rhombic, or lanceolate, variously lobed or toothed.
19 Leaf blades without teeth, except for the often present basal lobes or teeth.
20 Leaves not aromatic; flowers in each glomerule in markedly different stages of development; [subsection *Standleyana*] ..... ***C. standleyanum***
20 Leaves strongly malodorous; flowers in each glomerule in similar stages of development; [subsection *Chenopodium*] ..... ***C. vulvaria***
19 Leaf blades with lateral teeth and often basal lobes; [subsection *Chenopodium*].
21 Leaves widely ovate, 1× as long as wide; lateral leaf lobes as large as the terminal lobe ..... ***C. opulifolium***
21 Leaves ovate, rhombic, or lanceolate, >1× as long as wide; lateral leaf lobes smaller than the terminal lobe (or absent).
22 Leaf margins tapering to an acute apex; leaves ovate, rhombic, or lanceolate; inflorescence branched (spicate or cymose) . ..... ***C. album***
22 Leaf margins more or less parallel below the obtuse apex; leaves lanceolate yo narrowly elliptic; inflorescence generally moniliform, not profusely branched ..... ***C. strictum***

Chenopodium album Linnaeus, Lamb's-quarters, Pigweed. Cp (DE, GA, NC, SC, VA), Pd (DE, GA, NC, SC, VA), Mt (GA, NC, SC, VA, WV): disturbed soils, gardens; common. June-November. As broadly interpreted, this species includes both native and alien races and is now distributed nearly worldwide. [= FNA, W; < *C. album* – RAB, in part (also including *C. berlandieri* and all vars); > *C. album* Linnaeus var. *album* – K; > *C. album* Linnaeus var. *missouriense* (Aellen) I.J. Bassett & C.W. Crompton – K; > *C. album* – C; < *C. album* – G; > *C. missouriense* Aellen – C, Y; > *C. paganum* – F, S, misapplied; < *C. album* – FNA, G; > *C. album* var. *album* – Y; > *C. album* var. *lanceolatum* (Muhlenberg ex Willdenow) Coss. & Germ. – Y; > *C. giganteum* Don – Y; > *C. lanceolatum* Muhlenberg ex Willdenow]

* ***Chenopodium atrovirens*** Rydberg. Cp (SC): waste areas near wool-combing mills; rare, perhaps merely a waif, native of w. North America. [= FNA, K]

*? ***Chenopodium berlandieri*** Moquin-Tandon *var.* ***boscianum*** (Moquin-Tandon) H.A. Wahl. Cp (GA, NC, SC, VA): beaches, marshes; uncommon. August-September. FL west to e. TX; with scattered occurrences further north (these of unknown nativity). [= FNA, K, Y; < *C. album* – RAB]

Chenopodium berlandieri Moquin-Tandon *var.* ***bushianum*** (Aellen) Cronquist, Soybean Goosefoot. Cp (NC, SC, VA), Mt (WV): disturbed areas, alluvial forests; rare. June-November. ME west to ND, south to VA, TN, LA, and KS. [= C, FNA, K; < *C. album* – RAB, G; < *C. berlandieri* – S; = *C. bushianum* Aellen – Y]

Chenopodium berlandieri Moquin-Tandon *var.* ***macrocalycium*** (Aellen) Cronquist. Cp (NC, SC, VA): coastal sands, beaches; rare. August-October. NS south to FL. [= C, FNA, K; < *C. album* – RAB, G; = *C. macrocalycium* Aellen – Y]

* ***Chenopodium berlandieri*** Moquin-Tandon *var.* ***sinuatum*** (J. Murr) H.A. Wahl. Cp (SC): waste areas near wool-combing mills; rare, perhaps merely a waif, native of sw. North America. [= FNA, K, Y] {not yet keyed}

*? ***Chenopodium berlandieri*** Moquin-Tandon *var.* ***zschackei*** (J. Murr) J. Murr ex Ascherson. Mt (VA), {NC, SC}. ON west to AK, south to LA, CA, and Mexico; scattered eastern occurrences may be introduced. [= C, FNA, K, Y; < *C. album* – RAB]

Chenopodium foggii H.A. Wahl. Mt (NC, VA): rocky, mountain slopes; rare. July. ME and ON south to w. VA and w. NC. [= FNA, K, Y; < *C. pratericola* Rydberg – C]

* ***Chenopodium fremontii*** S. Watson. Cp (SC): waste areas near wool-combing mills; rare, perhaps merely a waif, native of w. North America. [= FNA; = *C. fremontii* var. *fremontii* – K, Y] {not yet keyed}

* ***Chenopodium glaucum*** Linnaeus, Oakleaf Goosefoot. Pd (DE, VA), Mt (WV), {SC}: disturbed areas; rare, native of ne. North America and Europe. [= FNA, K; < *C. glaucum* – C, F, G, WV; = *C. glaucum* var. *glaucum* – Y]

* ***Chenopodium incanum*** (S. Watson) Heller *var.* ***incanum.*** Cp (SC): waste areas near wool-combing mills; rare, perhaps merely a waif, native of w. North America. [=FNA, K; *? C. incanum* – Y] {not keyed}

* ***Chenopodium macrospermum*** Hooker f. Cp (NC): disturbed areas; rare, native of South America. Reported for NC (FNA 2003b). [= FNA; > *C. macrospermum* Hooker f. var. *farinosum* (S. Watson) J.T. Howell – K; > *C. macrospermum* Hooker f. var. *halophilum* (Phil.) Standley – K, Y]

* ***Chenopodium murale*** Linnaeus, Nettleleaf Goosefoot, Sowbane. Cp (GA, NC, SC, VA), Pd (DE), Mt (WV): disturbed areas; rare, native of Europe, Asia, and n. Africa. May-November. [= RAB, C, F, FNA, G, K, S, W, Y]

* ***Chenopodium opulifolium*** Schrader ex Koch & Ziz, Gray Goosefoot. Pd (DE), Cp (NC): disturbed areas, on ship's ballast; rare, native of s. Europe. [= RAB, C, FNA, K]

Chenopodium pratericola Rydberg, Narrowleaf Goosefoot. Cp (GA, NC, SC, VA), Mt (WV): sandy soils, roadsides, disturbed areas; uncommon. May-November. Maine and ON west to YT, south to FL, TX, and CA. [= FNA, K; = *C. desiccatum* A. Nelson var. *leptophylloides* (J. Murray) H.A. Wahl – RAB, W, misapplied; < *C. pratericola* – C (also see *C. foggii*); *? C. leptophyllum* – F, G, misapplied; = *C. pratericola* var. *pratericola* – Y]

Chenopodium simplex (Torrey) Rafinesque, Mapleleaf Goosefoot. Mt (NC, VA, WV), Pd (DE, VA), Cp (DE): in shaded situations, generally at cliff bases; common (uncommon in WV, rare in NC and VA). July-October. NS west to AK, south to nw. NC, LA, TX, and UT. [= FNA, K; = *C. gigantospermum* Aellen – C, W, Y; = *C. hybridum* Linnaeus var. *gigantospermum* (Aellen) Rouleau – F; < *C. hybridum* – G; = *C. hybridum* Linnaeus ssp. *gigantospermum* (Aellen) Hultén]

Chenopodium standleyanum Aellen, Woodland Goosefoot. Mt (VA, WV), Pd (VA), Cp (VA), {GA, NC, SC}: rock outcrops, steep slopes, shaded disturbed soils; uncommon (rare in WV). QC west to ND, south to FL and e. TX. [= RAB, C, FNA, G, K, W; < *C. boscianum* – F, S, misapplied]

* ***Chenopodium urbicum*** Linnaeus, City Goosefoot. Mt (WV), Pd (DE): disturbed areas; rare, native of Eurasia. Introduction in waste ground south to MD, s. PA (Rhoads & Klein 1993), WV, KY, and TN (Kartesz 1999, FNA 2003b). [= C, FNA, K, Y]

* ***Chenopodium vulvaria*** Linnaeus, Stinking Goosefoot. Pd (DE); disturbed areas; rare, native of Eurasia. Introduced at scattered locations in eastern North America, as in MD, PA, DE, FL (FNA 2003b). [= C, FNA, K, Y]

Chenopodium berlandieri Moquin-Tandon var. *berlandieri*. (SC, VA). Reported for SC and VA by Kartesz (1999), but not attributed to our area by FNA (2003b). [= FNA, K]

* *Chenopodium bonus-henricus* Linnaeus, Good King Henry, is cultivated and is known from as far south as MD and PA. [= FNA, C, K, Y]

Chenopodium capitatum (Linnaeus) Ascherson var. *capitatum*, Indian-paint, Strawberry-blite, a native, occurs south to scattered locations in PA (Rhoads & Klein 1993). [= FNA, Y; < *C. capitatum* – C; = *C. capitatum* – K, in a narrow sense; *Blitum capitatum* Linnaeus]

* *Chenopodium desiccatum* A. Nelson. (SC?, VA?). (VA Watch List). {Resolve against *C. pratericola*}. [= FNA; = *C. pratericola* var. *oblongifolium* (S. Watson) H.A. Wahl – Y]

* *Chenopodium rubrum* Linnaeus, Red Goosefoot, alien, reported as far south as MD and in other widely scattered sites (such as AL) (Kartesz 1999) and PA (FNA). [= C, K; > *C. rubrum* var. *rubrum* – FNA, Y]

* ***Chenopodium strictum*** Roth. Scattered locations south to se. PA. Reported for SC (Kartesz 1999). [= FNA; = *Chenopodium album* Linnaeus var. *striatum* (Krašan) comb. nov. ined. – K; > *Chenopodium strictum* ssp. *glaucophyllum* (Aellen) Aellen & Just.; > *Chenopodium strictum* Roth var. *glaucophyllum* (Aellen) H.A. Wahl – Y]

Cycloloma Moquin 1840 (Winged-pigweed)

A monotypic genus, an annual herb, native of c. and w. North America. References: Mosyakin in FNA (2003b); Judd & Ferguson (1999)=Z; Kühn in Kubitzki, Rohwer, & Bittrich (1993).

* ***Cycloloma atriplicifolium*** (Sprengel) Coulter, Winged-pigweed. Cp (NC, SC, VA), Mt (WV): sandy fields, railroad banks, maritime dunes; uncommon (rare in NC, VA, and WV), native of w. North America, adventive in our area. May-frost. [= RAB, C, F, FNA, G, GW, K, S, WV]

Dysphania R. Brown 1810

A genus of about 32 species, annual and perennial herbs, nearly cosmopolitan, mostly in the tropics, subtropics, and warm temperate areas. References: Clemants & Mosyakin in FNA (2003b); Wahl (1954)=Y.

1 Leaves deeply pinnately lobed, the lobes linear; plant perennial; mature calyx shallowly toothed, obovoid-urceolate, reticulate-veiny; [section *Adenois*] ..... ***D. multifida***
1 Leaves serrate to sinuate-pinnatifid, the lobes broad-based and triangular-tapered; plant annual; mature calyx deeply lobed, neither reticulate nor prominently veined.
2 Flowers in a slender thyrsoid inflorescence of lateral cymes; [section *Botryoides*] ..... ***D. botrys***
2 Flowers in dense glomerules arranged in spikes and panicles.
3 Leaf blades 2-8 cm long; seeds mostly horizontal; stems 3-15 dm tall; [section *Adenois*].
4 Inflorescences foliose throughout ..... ***D. ambrosioides***
4 Inflorescences leafless (leaves in the inflorescence absent or shorter than the glomerules) ..... ***D. anthelmintica***
3 Leaf blades 0.5-2.7 cm long; seeds vertical; stems 0.5-5 dm tall; [section *Orthospora*].
5 Perianth segments keeled and crested ..... ***D. cristata***
5 Perianth segments rounded ..... ***D. pumilio***

*? ***Dysphania ambrosioides*** (Linnaeus) Mosyakin & Clemants, Mexican-tea, Epazote. Cp (DE, GA, NC, SC, VA), Pd (DE, GA, NC, SC, VA), Mt (GA, NC, SC, VA, WV): disturbed habitats; common, probably native southward. Widespread in North America to South America, the original range unclear. [= FNA; < *Chenopodium ambrosioides* – RAB, C, G, W, Y (also see *Dysphania anthelminitica*); = *C. ambrosioides* var. *ambrosioides* – F; < *C. ambrosioides* var. *ambrosioides* – K (also see *Dysphania anthelmintica*); < *Ambrina ambrosioides* (Linnaeus) Spach – S (also see *D. anthelmintica*); < *Teloxys ambrosioides* (Linnaeus) W.A. Weber]

Dysphania anthelmintica (Linnaeus) Mosyakin & Clemants, Wormseed, Epazote. Cp (GA, NC, SC, VA): dunes; common. NY south to FL, west to TX; Mexico, West Indies, Bermuda, Central America; scattered inland in North America probably as an introduction. [= FNA; < *C. ambrosioides* – RAB, C, G, W, Y; = *C. ambrosioides* var. *anthelminticum* (Linnaeus) A. Gray – F; < *C. ambrosioides* var. *ambrosioides* – K; < *Ambrina ambrosioides* (Linnaeus) Spach – S]

* ***Dysphania botrys*** (Linnaeus) Mosyakin & Clemants, Jerusalem-oak, Feather-geranium. Cp (DE, NC, VA), Pd (DE), Mt (WV): disturbed areas, ship's ballast; uncommon (rare in NC and VA), native of Eurasia. August-October. [= FNA; = *Chenopodium botrys* Linnaeus – RAB, C, F, G, K, Y; = *Botrydium botrys* (Linnaeus) Small – S; = *Teloxys botrys* (Linnaeus) W.A. Weber]

* ***Dysphania cristata*** (F. Mueller) Mosyakin & Clemants, Crested Goosefoot. Cp (SC): wool mill waste areas; rare, native of Australia. July. [= FNA; = *Chenopodium cristatum* (F. Mueller) F. Mueller – K]

* ***Dysphania multifida*** (Linnaeus) Mosyakin & Clemants, Cutleaf Goosefoot, Scented Goosefoot. Cp (GA, NC, SC, VA), Pd (GA, NC, SC): disturbed areas, rare, native of South America. [= FNA; = *Chenopodium multifidum* Linnaeus – C, K, Y; = *Roubieva multifida* (Linnaeus) Moquin-Tandon – RAB, F, S; = *Teloxys multifida* (Linnaeus) W.A. Weber]

* ***Dysphania pumilio*** (R. Brown) Mosyakin & Clemants, Clammy Goosefoot. Pd (DE, GA, SC, VA): disturbed areas; rare, native of Australia. First reported for South Carolina by Hill & Horn (1997). Also known from DC. [= FNA; = *Chenopodium pumilio* R. Brown – C, G, K, Y; < *C. carinatum* R. Brown – F, misapplied; = *Teloxys pumilio* (R. Brown) W. A. Weber]

Froelichia Moench 1794 (Cottonweed, Snake-cotton)

A genus of about 18 species of tropical and subtropical America. References: McCauley in FNA (2003b); Robertson (1981)=Z; Townsend in Kubitzki, Rohwer, & Bittrich (1993).

1 Calyx conical in fruit, ca. 3-4 mm long; plant 2-7 dm tall, branching from the base ..... ***F. gracilis***
1 Calyx flask-shaped in fruit, ca. 5 mm long; plant 3-20 dm tall, not branching from the base
2 Hairs of the peduncles <0.5 mm long; plants typically 3-10 dm tall; [of w. KY Mississippi Embayment westward]..... ***F. campestris***
2 Hairs of the the peduncles mostly 1-2 mm long; plants typically 10-20 dm tall; [of the Southeastern Coastal Plain]..... ***F. floridana***

Froelichia campestris Small, Plains Cottonseed. Cp (KY): disturbed areas; rare. OH, MN, and CO south to w. KY, AR, and TX. [= *F. floridana* var. *campestris* (Small) Fernald – C, F, G, K, Z; < *F. floridana* – FNA]

Froelichia floridana (Nuttall) Moquin-Tandon, Florida Cottonseed, Common Cottonweed. Cp (DE*, FL, GA, NC, SC): sandhills, sandy fields, sandy roadsides; common (rare in NC, uncommon in DE). June-October. S. NC south to FL, and west to LA, north in the interior to w. TN; disjunct (probably introduced) in DE and e. MD. *F. campestris* Small is more midwestern, ranging from OH, IN, WI, and SD south to KY, AR, and TX; it is sometimes treated as a variety of *F. floridana*, but seems amply distinct in morphology, and with an allopatric distribution. [= RAB, S; = *F. floridana* var. *floridana* – C, F, G, K, Z; < *F. floridana* – FNA, WH]

* ***Froelichia gracilis*** (Hooker) Moquin-Tandon, Slender Cottonweed. Cp (DE, GA, NC, SC, VA), Pd (GA, NC, SC, VA), Mt (NC, VA, WV): vacant lots, sandy fields, railroad banks; uncommon (rare in GA, NC, SC, VA, and WV), native of mw. United States. June-October. [= RAB, C, F, FNA, G, K, W, WV, Z]

Gomphrena Linnaeus 1753 (Globe-amaranth)

A genus of about 100-120 species, of the tropics and subtropics of America and Australia (naturalized elsewhere). References: Clemants in FNA (2003b); Townsend in Kubitzki, Rohwer, & Bittrich (1993). Key based on Clemants in FNA (2003b).

1 Heads 20-28 mm in diameter; stems erect ..... ***G. globosa***
1 Heads 8-16 mm in diameter; stems prostrate or decumbent..... ***G. serrata***

* ***Gomphrena globosa*** Linnaeus, Globe-amaranth. Cp (SC) {VA?}: disturbed areas; rare, native of s. Asia. Introduced and known from scattered locations in s. PA (Rhoads & Klein 1993). Also reported for VA (Kartesz 1999) and MD (Reed1961b). [= FNA, C, F, G, K]

Gomphrena serrata Linnaeus, Arrasa con todo. Cp (FL, GA, VA): sandy woodlands and disturbed areas; rare, native of tropical America. Reported for chrome ore piles in Newport News, VA (Reed 1961, Virginia Botanical Associates 2010, where presumably only a waif. [= FNA, K, WH; > *G. dispersa* Standley – S]

Guilleminea Kunth 1823

A genus of 2-5 species of sw. North America, Central America, and South America. References: Clemants in FNA (2003b); Henrickson (1987)=Z; Townsend in Kubitzki, Rohwer, & Bittrich (1993).

* ***Guilleminea densa*** (Humboldt & Bonplandt ex Willdenow) Moquin-Tandon *var.* ***aggregata*** Uline & Bray. Cp (SC): sandy disturbed area; rare, native of sw. United States. First reported for SC by Nelson & Kelly (1997). [= FNA, K, Z]

Iresine P. Browne 1856 (Bloodleaf)

A genus of about 80 species of tropical and temperate regions (especially America). References: Clemants in FNA (2003b); Townsend in Kubitzki, Rohwer, & Bittrich (1993).

1 Plant an annual to weak perennial, 4-30 dm tall, with fibrous roots; tepals 0.6-0.8 mm long, the tips obtuse to rounded..... ***I. diffusa***
1 Plant a perennial, 3-10 dm tall, with stolons; tepals 1.0-1.3 mm long, the tips acute to acuminate ..... ***I. rhizomatosa***

Iresine diffusa Humboldt & Bonpland ex Willdenow, Judas-bush. Cp (FL): hammocks, disturbed areas; rare. Reported for NC by Small (1933), so far as is known in error. Ne. FL, Panhandle FL, south to s. FL. [= FNA, K, WH; < *Iresine celosia* Linnaeus – S]

Iresine rhizomatosa Standley. Cp (FL, GA, NC, SC, VA), Pd (VA): moist interdune thickets, hammocks, edges of maritime forests, moist thickets inland, floodplain forests, bluff forests of the Coastal Plain; rare. August-October. MD south to FL, west to se. TX; also inland from KY and TN west and south to KS and n. TX. [= RAB, C, F, FNA, G, K, S, WH]

Salicornia Linnaeus 1753 (Glasswort)

A genus of about 10-20 species, succulent herbs, of cosmopolitan distribution. References: Judd & Ferguson (1999)=Z; Ball in FNA (2003b); Kadereit et al. (2007); Kühn in Kubitzki, Rohwer, & Bittrich (1993). [also see *Sarcocornia*]

1 Scale-leaves below the spikes mucronate; spikes mostly 4.5-6 mm in diameter ..... ***S. bigelovii***
1 Scale-leaves below the spike obtuse to slightly acute; spikes mostly 1.5-4.5 mm in diameter ..... ***S. virginica***

Salicornia bigelovii Torrey, Dwarf Glasswort, Dwarf Saltwort. Cp (DE, GA, NC, SC, VA): salt pannes in coastal marshes; common (rare in DE). July-October. ME (NS?) south to FL, west to TX; also West Indies; also CA. [= RAB, C, F, FNA, G, GW, K, S, Z]

Salicornia virginica Linnaeus, Samphire. Cp (DE, GA, NC, SC, VA), Mt (VA): salt pannes in coastal marshes; common. July-October. NS and QC south to FL. It is unclear whether our eastern North American plants are distinct from European plants of the *S. europaea* complex. Recent European workers recognize multiple species in the *S. europaea* complex. *S. europaea* (in the narrow sense) is a diploid species; our plants are apparently all tetraploid and may or may not be conspecific with one of the European tetraploid entities in this complex. Until further studies are completed, it seems best to recognize our plants as distinct. The oldest name available for the American plants is *Salicornia virginica* Linnaeus, which has unfortunately been generally misapplied to the perennial glasswort, *Sarcocornia perennis*. [= K; = *Salicornia depressa* Standley in N.L. Britton et al. – FNA; < *Salicornia europaea* Linnaus – RAB, C, G, GW, S, W, Z, misapplied; >< *Salicornia europaea* var. *europaea* – F]

Salicornia maritima Wolff & Jefferies, Sea Saltwort, supposedly occurs south to MD (Kartesz (1999); FNA (2003b) does not map it south of the Canadian Maritimes. [= FNA, K] {not keyed; synonymy incomplete}

Salsola Linnaeus 1753 (Saltwort, Russian-thistle)

A genus of about 116 species, herbs and shrubs, of Europe, Asia, n. Africa, and America. References: Mosyakin in FNA (2003b); Judd & Ferguson (1999)=Z; Kühn in Kubitzki, Rohwer, & Bittrich (1993). Treatment based on Mosyakin in FNA (2003b).

1 Leaf blades not fleshy in fresh material, narrowly linear to filiform, < 1 mm wide in herbarium material; leaves with a weak apical spine ..... ***S. tragus***
1 Leaf blades fleshy in fresh material, linear, 1-2 mm wide in dried specimens; leaves with a strong apical spine.
  2 Perianth segments with a weak non-spiny apex and obscure midvein; bracteoles connate at base, swollen ..... ***S. caroliniana***
  2 Perianth segments with a subspinose apex and prominent midvein; bracteoles distinct, not swollen ..... ***S. kali***

*? ***Salsola caroliniana*** Walter, Southern Saltwort. Cp (AL*, DE?, GA, NC, SC, VA): upper beaches, fore-dunes, and island-end flats, rarely inland in disturbed areas; uncommon. June-frost. MA to FL, west to TX and Mexico; Eurasia, n. Africa; introduced on the west coast of North America. Generally considered to be introduced in North America, but it may well be a native. [< *S. kali* Linnaeus – RAB, C, S, Z; = *S. kali* var. *caroliniana* (Walter) Nuttall – F; < *S. kali* Linnaeus ssp. *pontica* (Pallas) Mosyakin – FNA, K; < *S. kali* var. *kali* – G]

*? ***Salsola kali*** Linnaeus, Northern Saltwort. Cp (DE?, NC, SC, VA): upper beaches, fore-dunes, and island-end flats; uncommon. June-frost. NL (Newfoundland) to SC; Europe. Generally considered to be introduced in North America, but it may well be a native. [< *S. kali* Linnaeus – RAB, C, S, Z; = *S. kali* var. *kali* – F; = *S. kali* ssp. *kali* – FNA, K; < *S. kali* var. *kali* – G; = ***Kali soda*** Moench; ? *Kali australis* (R. Brown) Akhani & E.H. Roalson]

* ***Salsola tragus*** Linnaeus, Russian Thistle, Tumbleweed. Mt (VA, WV), Pd (GA?, NC, SC?, VA): disturbed areas; rare, native of Eurasia. June-frost. [= C, FNA, K; < *S. kali* Linnaeus – RAB; = *S. kali* var. *tenuifolia* Tausch – F, G, WV; = *S. pestifer* A. Nelson – S, Z; = *S. iberica* Sennen & Pau; = ***Kali tragus*** (Linnaeus) Scopoli]

Sarcocornia A.J. Scott 1978 (Woody Glasswort)

A genus of about 15 species, dwarf shrubs. Of controversial and uncertain taxonomic status, *Sarcocornia* is sometimes included in *Salicornia*, sometimes in *Arthrocnemum*, and sometimes maintained as a separate genus. References: Judd & Ferguson (1999)=Z; Ball in FNA (2003b); Kühn in Kubitzki, Rohwer, & Bittrich (1993).

Sarcocornia pacifica (Standley) A.J. Scott, Woody Glasswort, Perennial Glasswort. Cp (DE, GA, NC, SC, VA): coastal salt marshes; common (uncommon in DE). July-October. NH south to FL; CA south into w. Mexico. Ball in FNA (2003b) treats all North American *Sarcocornia* as *Sarcocornia pacifica*, which is also present on the Pacific coast of North America. *Sarcocornia perennis* is restricted to the Pacific and Atlantic coasts of North America, as well as being in Europe, sw. Asia, and Africa. [= FNA; ? *Sarcocornia perennis* (P. Miller) A.J. Scott – K, apparently misapplied to East Coast material; ? *Salicornia virginica* Linnaeus – RAB, C, F, G, GW, misapplied; ? *Salicornia perennis* P. Miller – S, Z, apparently misapplied to East Coast material; ? *Arthrocnemum perenne* (P. Miller) Moss; ? *Salicornia ambigua* Michaux]

Spinacia Linnaeus 1753 (Spinach)

A genus of 3 species, herbs, of n. Africa and w. Asia. References: Judd & Ferguson (1999)=Z; Schultz in FNA (2003b); Kühn in Kubitzki, Rohwer, & Bittrich (1993).

* ***Spinacia oleracea*** Linnaeus, Spinach. Mt (NC, SC, VA), Pd (NC, SC, VA), Cp (NC, SC, VA): commonly grown in gardens, rarely persisting, native of Eurasia. [= F, FNA, G, K, S, Z]

Suaeda Forsskål ex Scopoli 1777 (Sea-blite)

A genus of about 100 species, herbs and subshrubs, of cosmopolitan distribution. References: Judd & Ferguson (1999)=Z; Ferren & Schenk in FNA (2003b); Hopkins & Blackwell (1977)=Y; Fisher et al. (1997); Kühn in Kubitzki, Rohwer, & Bittrich (1993).

1 Calyx segments keeled on the back; flowers in 1-3-flowered glomerules, these aggregated in a dense panicle; seeds dimorphic, black seeds shiny, 1-1.8 mm in diameter, brown seeds dull, 1.5-2.6 mm in diameter ..... ***S. linearis***
1 Calyx segments rounded or obscurely keeled on the back; flowers in axillary glomerules of 1-3 (-4) flowers; seeds monomorphic, reddish brown or black, 1-2.2 mm in diameter ..... ***S. maritima***

Suaeda linearis (Elliott) Moquin, Southern Sea-blite. Cp (DE, FL, GA, NC, SC, VA), Mt* (WV*): island-end flats, marsh edges, brackish flats, rarely adventive inland in disturbed areas; uncommon (rare in WV). August-frost. ME south to FL, west to TX; West Indies. [= C, F, FNA, G, GW, K, WH, Y, Z; = *Dondia linearis* (Eliott) Heller – S]

*? ***Suaeda maritima*** (Linnaeus) Dumortier, White Sea-blite. Cp (DE, VA): salt marsh edges and disturbed saline habitats; common (uncommon in DE), possibly native, introduced, or a combination. Usually considered (as by C, GW, S) to be naturalized from Eurasia, but Ferren & Schenk (2003b) consider *S. maritima* in North America to include native and naturalized components. [= C, F, FNA, G, GW, Y, Z; > *S. maritima* ssp. *maritima* – K; = *Dondia maritima* (Linnaeus) Druce – S]

304. AIZOACEAE Rudolphi 1830 (Fig-marigold Family) [in CARYOPHYLLALES]

A family of about 128 genera and about 1850-2500 species, mostly succulent herbs and subshrubs, of tropical and subtropical regions, especially in s. Africa and Australia. References: Boetsch (2002); Vivrette, Bleck, & Ferren in FNA (2003b); Hartmann in Kubitzki, Rohwer, & Bittrich (1993). [also see *MOLLUGINACEAE*]

1 Leaves opposite, connate-perfoliate around the stem, triangular in cross-section; fruit a fleshy, indehiscent berry; [subfamily *Ruschioideae*] ... ***Carpobrotus***
1 Leaves opposite or alternate, sessile or short-petiolate, flattened in cross-section (though often succulent-thickened); fruit **either** a dry, indehiscent nut **or** a capsule.
  2 Leaves linear, lanceolate, or oblanceolate, the blade > 3× as long as wide; [subfamily *Sesuvioideae*] ..... ***Sesuvium***
  2 Leaves orbicular, obovate, or triangular-ovate, the blade < 2.5× as long as wide.
    3 Leaves opposite to subopposite; fruit a circumcissile capsule; [subfamily *Sesuvioideae*] ..... ***Trianthema***
    3 Leaves alternate; fruit **either** a loculicidal capsule **or** an indehiscent nut.
      4 Fruit a loculicidal capsule; ovary superior; stems densely covered with white scales; [subfamily *Aizoideae*] ..... ***Galenia***
      4 Fruit an indehiscent nut; ovary inferior; stems green; [subfamily *Tetragonioideae*] ..... ***Tetragonia***

Carpobrotus N.E. Brown 1925 (Fig-marigold)

A genus of 13 species, succulent subshrubs, native of s. Africa. References: Vivrette in FNA (2003b); Hartmann in Kubitzki, Rohwer, & Bittrich (1993).

* ***Carpobrotus edulis*** (Linnaeus) N.E. Brown, Hottentot-fig. Cp (FL): dunes, disturbed sandy sites; rare, native of s. Africa. [= FNA, WH]

Galenia Linnaeus 1753

A genus of 15-25 species, perennial subshrubs, native of s. Africa and Australia. References: Vivrette in FNA (2003b); Hartmann in Kubitzki, Rohwer, & Bittrich (1993).

* ***Galenia secunda*** (Linnaeus f.) Sonder. Cp (FL): disturbed areas; rare, native of s. Africa. [= FNA, S, WH]

Sesuvium Linnaeus 1759 (Sea-purslane)

A genus of about 8-12 species, especially in tropical and subtropical coastal areas. References: Boetsch (2002)=Z; Ferren in FNA (2003b); Hartmann in Kubitzki, Rohwer, & Bittrich (1993).

1 Flowers and fruits on pedicels (3-) 5-20 mm long ..... ***S. portulacastrum***
1 Flowers and fruits sessile (or on pedicels to 1 mm long).
  2 Stamens numerous, in fascicles; leaves 3-6 cm long, 10-20× as long as wide; [rare waif] ..... ***S. crithmoides***
  2 Stamens 5, distinct; leaves 1-3.5 cm long, 3-10× as long as wide; [native] ..... ***S. maritimum***

* ***Sesuvium crithmoides*** Welwitsch, Tropical Sea-purslane. Cp (GA): disturbed area; rare, waif, native of Africa. Reported for GA by Small (1933) and Boetsch (2002) based on collections in Brunswick, GA in 1902 by Roland Harper. [= FNA, K, S, Z]

Sesuvium maritimum (Walter) Britton, Sterns, & Poggenburg, Small Sea-purslane, Slender Sea-purslane. Cp (DE, FL, GA, NC, SC, VA): island end flats and sea beaches, salt flats; uncommon (rare south of DE). May-December. NY south to s. FL, west to TX; also in the West Indies. [= RAB, C, F, FNA, G, GW, K, S, WH, Z]

Sesuvium portulacastrum (Linnaeus) Linnaeus, Large Sea-purslane, Shoreline Sea-purslane. Cp (FL, GA, NC, SC): island end flats and sea beaches; uncommon (rare in NC). May-December. A pantropical coastal species, in North America from e. NC south to s. FL, west to e. TX; also in the West Indies and south into the tropics (introduced on ballast in se. PA). [= RAB, FNA, GW, K, S, WH, Z]

Tetragonia Linnaeus 1753 (New Zealand Spinach)

A genus of about 60-85 species, mostly tropical and warm temperate. *Tetragonia* is sometimes segregated into the Tetragoniaceae. References: Boetsch (2002)=Y; Vivrette in FNA (2003b); Taylor (1994)=Z; Hartmann in Kubitzki, Rohwer, & Bittrich (1993).

* ***Tetragonia tetragonoides*** (Pallas) Kuntze, New Zealand Spinach. Pd (NC), Mt (WV): persistent after cultivation; rare, native of e. Asia. July-November. *T. tetragonoides* is a member of subgenus *Tetragonioides* (Taylor 1994). [= *T. tetragonioides* – C, F, FNA, G, K, Y, Z, orthographic variant; = *T. expansa* Murray – RAB, S, WV]

Trianthema Linnaeus 1753 (Horse-purslane)

A genus of about 17-20 species, of tropical and warm temperate areas, especially Australia. References: Boetsch (2002)=Z; Ferren in FNA (2003b); Hartmann in Kubitzki, Rohwer, & Bittrich (1993).

* ***Trianthema portulacastrum*** Linnaeus, Horse-purslane. Cp (GA, NC, SC, VA): disturbed areas; rare, native of the Gulf Coast and the tropics. April-November. [= RAB, C, F, FNA, G, GW, K, S, Z]

305a. PHYTOLACCACEAE R. Brown 1818 (Pokeweed Family) [in CARYOPHYLLALES]

A family of about 18 genera and 70 species, herbs, shrubs, vines, and trees, of tropical and warm temperate regions, especially America. References: Nienaber & Thieret in FNA (2003b); Rohwer in Kubitzki, Rohwer, & Bittrich (1993). [also see *PETIVERIACEAE*]

Phytolacca Linnaeus 1753 (Pokeweed)

A genus of about 25 species, herbs, shrubs, and trees, of tropical and warm temperate regions. References: Caulkins & Wyatt (1990)=Z; Hardin (1964a)=Y; Rogers (1985)=X; Nienaber & Thieret in FNA (2003b); Rohwer in Kubitzki, Rohwer, & Bittrich (1993).

1 Fruiting pedicels (6-) 7-12 (-15) mm long; raceme (not including the peduncle) 10-20 (-25) cm long, divergent or drooping in flower and fruit (or erect in flower); [widespread in our area] ..... ***P. americana***

1 Fruiting pedicels (2-) 4-6 (-7) mm long; raceme (not including the peduncle) (3-) 6-9 (-13) cm long, erect (rarely divergent) in flower and fruit; [restricted in our area to maritime habitats] ..... ***P. rigida***

Phytolacca americana Linnaeus, Common Pokeweed. In a wide variety of natural and disturbed habitats, usually associated with exposed mineral soil. May-frost. An abundant "native weed" occurring throughout e. North America, *P. americana* is widely dispersed by birds and quickly colonizes exposed mineral soil even in undisturbed forests, such as on tree-fall tip-up mounds or flood scours. It is most abundant, however, as a weed of urban, suburban, and agricultural disturbances. The berries and mature stems are poisonous; the young stems have been used as a potherb and the purple berries as a source of ink. [= C, F, G, S, W, WV, X, Y; < *P. americana* – RAB, GW, WH (also see *P. rigida*); = *P. americana* var. *americana* – FNA, K, Z]

Phytolacca rigida Small, Maritime Pokeweed. Dune slacks, dune slopes, edges of tidal marshes, disturbed areas on barrier islands, xeric sandhills near the coast. May-frost. DE (reportedly), se. VA south to FL and west to TX in the Southeastern Coastal Plain. In the northern parts of our area, in NC and VA, *P. rigida* is rather rare, limited to the vicinity of the coast, and less weedy than *P. americana*. Caulkins and Wyatt (1990) reduce *P. rigida* to a variety of *P. americana*, but it seems distinct at the species level. [= S, X, Y; < *P. americana* – RAB, GW, WH; = *P. americana* var. *rigida* (Small) Caulkins & Wyatt – FNA, K, Z]

305b. PETIVERIACEAE C. Agardh 1824 (Petiveria Family) [in CARYOPHYLLALES]

A family of about 9 genera and 13 species, herbs, vines, and trees, of tropical areas. Sometimes included in the Phytolaccaceae.

Rivina Linnaeus 1753 (Rouge-plant)

A monotypic genus, an herb, of the American tropics.

Rivina humilis Linnaeus, Rouge-plant, Baby-pepper. Hammocks. January-December. Neotropics, north to ne. FL, LA, AR, OK, TX, NM, and AZ. [= K1, K2, S, WH]

307. NYCTAGINACEAE A.L. de Jussieu 1789 (Four-o'clock Family) [in CARYOPHYLLALES]

A family of about 31 genera and 400 species, trees, shrubs, vines, and herbs, of tropical, subtropical, and (less commonly) warm temperate regions, especially diverse in the New World. Both our genera are in tribe Nyctagineae (Douglas & Spellenberg 2010). References: Bogle (1974)=Z; Spellenberg in FNA (2003b); Bittrich & Kühn in Kubitzki, Rohwer, & Bittrich (1993).

1 Flowers < 3 mm long, lacking involucral bracts subtending the petaloid calyx ..... ***Boerhavia***
1 Flowers > 10 mm long, with involucral bracts (simulating a calyx) subtending the petaloid calyx ..... ***Mirabilis***

Boerhavia Linnaeus 1753 (Spiderling)

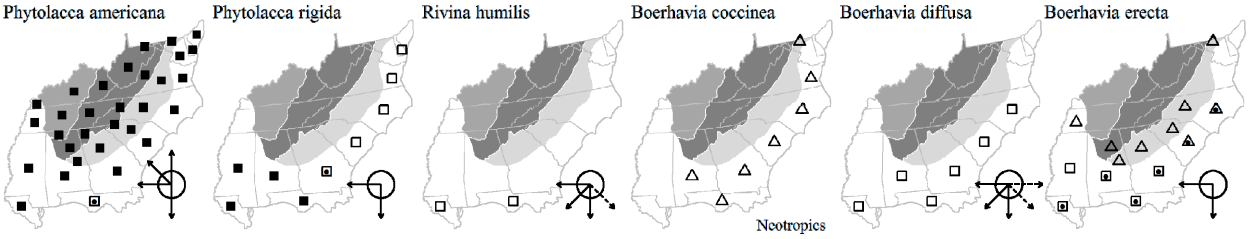
A genus of about 20-40 species, annual and perennial herbs, of tropical, subtropical, and warm temperate regions of the Old and New World. References: Spellenberg in FNA (2003b); Bogle (1974)=Z; Bittrich & Kühn in Kubitzki, Rohwer, & Bittrich (1993). Key based on Spellenberg in FNA.

1 Fruit truncate at the apex, glabrous, with longitudinal ribs acute and winglike; annual ..... ***B. erecta***
1 Fruit rounded at apex, stipitate-glandular, with longitudinal ribs rounded; perennial.
  2 Leaves well-distributed throughout the plant; inflorescences axillary and terminal; branches spreading-villous or hispid to minutely and finely pubescent ..... ***B. coccinea***
  2 Leaves mostly concentrated in the basal ½ of the plant; inflorescences mostly terminal; branches glabrate or glabrous ..... ***B. diffusa***

* ***Boerhavia coccinea*** P. Miller, Wineflower. Disturbed areas, adventive on ballast; native of tropical America. June-September. Contrary to the statement in RAB that this species is "apparently not established," it is well established on the Wilmington (New Hanover County, NC) waterfront. [= RAB, FNA, K; = *Boerhaavia coccinea* – S, orthographic variant]

Boerhavia diffusa Linnaeus, Red Spiderling, Spreading Hogweed. Vacant lots, road shoulders, other disturbed areas. Pantropical and subtropical. [= FNA, K, Z]

Boerhavia erecta Linnaeus, Erect Spiderling. Sandy fields, roadsides, disturbed areas, railroad yards. May-October. NC south to FL, west to TX and AZ, perhaps only introduced in our area, at least in the Carolinas. [= RAB, FNA, K, Z; = *Boerhaavia erecta* – G, S, orthographic variant]



Mirabilis Linnaeus 1753 (Umbrella-wort, Four-o'clock)

A genus of about 55-60 species, annual and perennial herbs, of warm temperate America and s. Asia. References: Spellenberg in FNA (2003b); Le Duc (1995); Bittrich & Kühn in Kubitzki, Rohwer, & Bittrich (1993).

1 Petaloid calyx with a narrow tube 3-4 cm long, the spreading portion to 5 cm in diameter; involucre with 1 flower, not expanding in fruit; [section *Mirabilis*] ..... ***M. jalapa***
1 Petaloid calyx with a broad tube < 0.5 cm long, the spreading portion < 1.5 cm in diameter; involucre with 3-5 flowers, expanding in fruit; [section *Oxybaphus*].
  2 Leaves linear to narrowly lanceolate, 0.1-1 cm wide, 7-15× as long as wide ..... ***M. linearis*** *var.* ***linearis***
  2 Leaves lanceolate to ovate, 1-8 cm wide, 1-6× as long as wide.
    3 Leaves cordate at the base, 1-2× as long as wide; [introduced, of disturbed habitats] ..... ***M. nyctaginea***
    3 Leaves cuneate at the base, 2.5-6× as long as wide; [native, of dry sandy habitats in s. SC southward] ..... ***M. albida***

Mirabilis albida (Walter) Heimerl, Wild Four-o'clock, Pale Umbrella-wort. Sandhills, adjacent disturbed sandy soils. May-August. S. SC south to GA, west to TX, north in the interior to c. TN, IA, and KS. [= RAB, C, F, K, Z; = *Oxybaphus albidus* (Walter) Sweet – G; = *Allionia albida* Walter – S]

* ***Mirabilis jalapa*** Linnaeus, Garden Four-o'clock, Marvel-of-Peru. Disturbed areas, or persistent at former garden sites; native of tropical America. June-November. [= RAB, C, F, G, K, S, Z]

* ***Mirabilis linearis*** (Pursh) Heimerl *var.* ***linearis***. Disturbed areas; native of c. North America, scattered further east as a rare introduction. [= FNA; < *M. linearis* – C, F, K; < *Oxybaphus linearis* (Pursh) B.L. Robinson – G]

* ***Mirabilis nyctaginea*** (Michaux) MacMillan, Heart-leaved Umbrella-wort, Wild Four-o'clock. Railroad embankments, other disturbed areas; native of c. North America. May-October. [= RAB, C, F, K, W, WV, Z; = *Oxybaphus nyctagineus* (Michaux) Sweet – G; = *Allionia nyctaginea* Michaux – S]

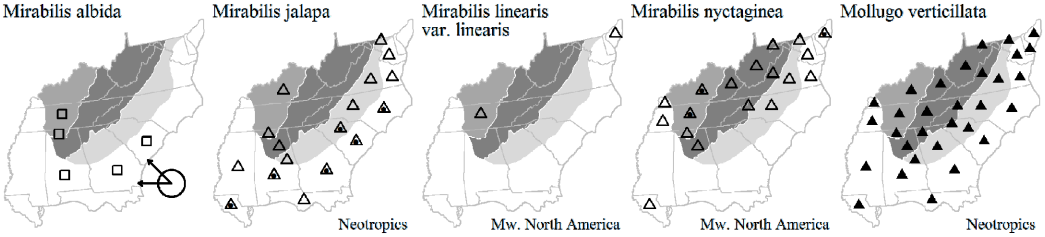
308. MOLLUGINACEAE Hutchinson 1926 (Carpetweed Family) [in CARYOPHYLLALES]

A family of about 13-14 genera and 120-125 species, herbs, of tropical and warm temperate areas. References: Vincent in FNA (2003b); Boetsch (2002)=Z; Endress & Bittrich in Kubitzki, Rohwer, & Bittrich (1993).

Mollugo Linnaeus 1753 (Carpetweed)

A genus of about 35 species, annual herbs, of tropical and subtropical regions of both hemispheres, introduced in temperate regions. References: Endress & Bittrich in Kubitzki, Rohwer, & Bittrich (1993).

* ***Mollugo verticillata*** Linnaeus, Carpetweed, Indian-chickweed. Fields, disturbed areas, drawdown zones on river- and pond-shores; native of tropical America. May-November. [= RAB, C, F, FNA, G, GW, K, S, W, WV, Z]



309. MONTIACEAE Rafinesque 1820 (Montia Family) [in CARYOPHYLLALES]

A family of about 14 genera and 250 species, annual and perennial herbs and subshrubs, primarily of the Southern Hemisphere, but also occurring in North America and e. Asia. References: Packer in FNA (2003b); Nyffeler & Eggli (2010); Carolin in Kubitzki, Rohwer, & Bittrich (1993).

1 Leaves terete, alternate; subshrubs with woody bases ..... ***Phemeranthus***
1 Leaves flat, opposite or alternate; herbs.
  2 Stems with 2 opposite cauline leaves; petals 6-14 mm long ..... ***Claytonia***
  2 Stems with > 2 leaves, opposite or alternate; petals 1-6 mm long ..... ***Montia***

Claytonia Linnaeus 1753 (Spring-beauty)

A genus of about 30 species, perennial herbs, of North America and e. Asia. References: Miller & Chambers (2006)=Y; Miller in FNA (2003b); Davis (1966)=Z; Lewis & Suda (1968); Lewis, Oliver, & Suda (1967); Carolin in Kubitzki, Rohwer, & Bittrich (1993).

1 Cauline leaves **either** fused together, perfoliate, the pair together nearly round, **or** not fused but each broadly ovate; annual, from fibrous roots with minute tubers; [cultivated, rarely naturalizing].
  2 Basal rosette leaves erect or ascending, the blade 1-7 cm long ..... ***C. perfoliata*** *ssp.* ***perfoliata***
  2 Basal rosette leaves flattened against the ground, the blade 0.5-1.5 cm long ..... ***C. rubra*** *ssp.* ***rubra***
1 Cauline leaves not fused, each linear, lanceolate, or ovate; perennial, from tubers 1-2 cm in diamter; [native, of moist forests].
  3 Cauline leaves 3-6 (-11) cm long (including the evident petiole), the blade narrowly diamond-shaped, 2.5-6 (-8)× as long as wide; leaves 10-15 (-30) mm wide ..... ***C. caroliniana***
  3 Cauline leaves (5-) 7-20 cm long (including the poorly differentiated petiole), the blade > 8× as long as wide; leaves 1-10 (-20) cm wide.
    4 Broadest leaves on a plant 1-2 (-4) mm wide ..... ***C. virginica*** *var.* ***acutiflora***
    4 Broadest leaves on a plant 5-10 (-20) mm wide ..... ***C. virginica*** *var.* ***virginica***

Claytonia caroliniana Michaux, Carolina Spring-beauty. Moist forests, especially northern hardwood forests and cove forests at moderate to high elevations. March-May. NS west to MN, south to w. NC, e. TN, and n. GA; disjunct in AR. [= RAB, C, F, FNA, G, S, W, Y, Z; > *C. caroliniana* var. *caroliniana* – K; > *C. caroliniana* Michaux var. *lewisii* McNeill – K]

* ***Claytonia perfoliata*** Donn ex Willdenow *ssp.* ***perfoliata***, Miners'-lettuce. Disturbed areas, lawns, gardens; native of w. North America. [= FNA, K]

* ***Claytonia rubra*** (Howell) Tidestrom *ssp.* ***rubra***, Miners'-lettuce. Disturbed areas; native of w. North America. Naturalizing in Arlington County, VA (Steury 2010). [= FNA, K]

Claytonia virginica Linnaeus *var.* ***acutiflora*** A.P. de Candolle, Southern Spring-beauty. Mt (GA, NC, SC, VA), Pd (GA, NC, SC, VA), Cp (GA, NC, SC, VA): moist forests; common. (January-) February-April. VA west to IL, south to sw. GA and TX. This variety has chromosome numbers of n=6, n=7, and polyploid and polyploid/aneuploid derivatives of those numbers. [= C, K; < *C. virginica* – RAB, F, FNA, G, W, Y; = *C. virginica* – S; = *C. virginica* var. *simsii* (Sweet) R.J. Davis – Z; = *C. simsii* Sweet]

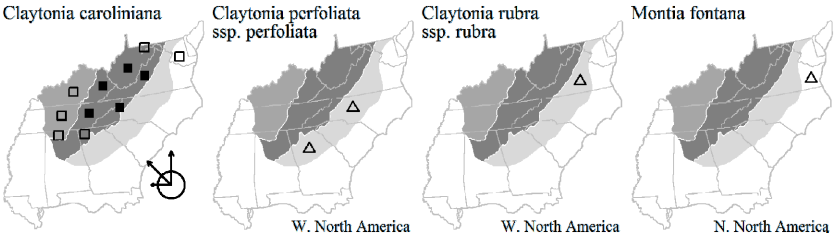
Claytonia virginica Linnaeus *var.* ***virginica***, Eastern Spring-beauty. Mt (DE, GA, NC, SC, VA, WV), Pd (NC, SC, VA), Cp (DE, NC, SC, VA): moist forests. (January-) February-April. NS west to MN, south to GA and TX. This variety has chromosome numbers of n=8 and polyploid and polyploid/aneuploid derivatives of that number. [= K, Z; < *C. virginica* – RAB, F, FNA, G, W, Y; < *C. virginica* var. *virginica* – C; = *C. media* (A.P. de Candolle) Link – S]

Montia Linnaeus 1753 (Blinks, Montia)

A genus of about 10 species, annual herbs, of nearly cosmopolitan distribution in temperate regions. References: Miller in FNA (2003b); Carolin in Kubitzki, Rohwer, & Bittrich (1993).

1 Leaves opposite ..... ***M. fontana***
1 Leaves alternate ..... ***M. linearis***

* ***Montia fontana*** Linnaeus, Water Blinks. Cp (VA): wet places; rare, native of northern North America and Eurasia. [= FNA; > *M. fontana* var. *fontana* – C; > *M. fontana* ssp. *fontana* – K]



* ***Montia linearis*** (Douglas ex Hooker) Greene, Narrow-leaved Montia. Pd (NC), Cp (VA): lawns, disturbed areas; rare, native of western North America. Also in c. TN (Chester, Wofford, & Kral 1997). [= FNA, K]

Phemeranthus Rafinesque 1814 (Rock-pink, Fameflower)

A genus of about 20 species, herbs and dwarf shrubs, of America. Our North American "Talinums" are not closely related to the broad-leaved type of *Talinum* and are transferred to *Phemeranthus* (Kiger 2001). Adaptation of our native species of *Phemeranthus* to different rock substrates is discussed by Ware & Pinion (1990). References: Kiger in FNA (2003b); Wilson (1932)=X; Ware (1967)=Y; Kiger (2001)=Z; Murdy & Carter (2001)=Q; Carter & Murdy (1985); Rose & Standley (1911); Carolin in Kubitzki, Rohwer, & Bittrich (1993); Hershkovitz & Zimmer (2000).

1 Stamens 4-8; flowers open in late afternoon ..... ***[P. parviflorus]***
1 Stamens 12-80; flowers variously open from early or late afternoon.
  2 Style 2-3.5 mm long, shorter than or about the same length as the stamens; stamens 12-30; flowers open from (3-) 3:30 to 7 p.m. E.D.S.T. ..... ***P. teretifolius***
  2 Style 3.8-7 mm long; stamens 25-80 (-90); flowers open from about 1 to 7 p.m. E.D.S.T.
    3 Stigma distinctly 3-lobed; mature seeds covered with a dull gray coating; [of calcareous rock outcrops] ..... ***P. calcaricus***
    3 Stigma subcapitate; mature seeds brown-black and lustrous; [of noncalcareous rocks].
      4 Stamens (40-) 50-80 (-90); [of granite and sandstone from SC southward] ..... ***P. mengesii***
      4 Stamens 25-42; [of mafic and ultramafic rocks, known from nc. NC and sc. VA] ..... ***P. species 1***

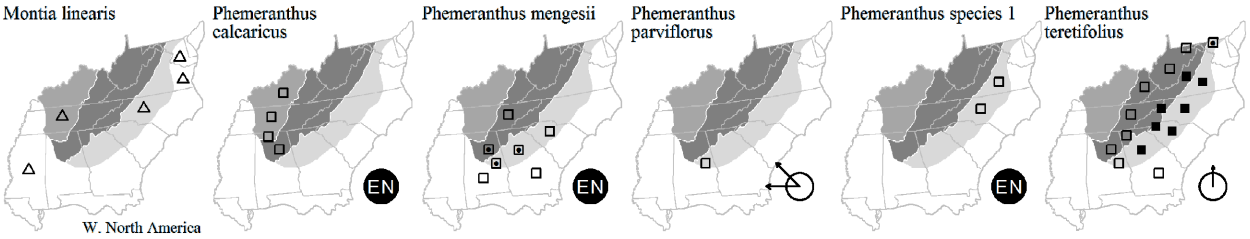
Phemeranthus calcaricus (S. Ware) Kiger, Cedar-glade Rock-pink. Calcareous glades. C. TN south to n. AL. A tetraploid species, probably derived from *P. calycinus* Engelmann. [= FNA, Z; = *Talinum calcaricum* S. Ware – K, Q, Y]

Phemeranthus mengesii (W. Wolf) Kiger, Large-flowered Rock-pink. Pd (GA, SC), Cp (GA): in shallow soil over felsic rocks (granite) or sandstone (in GA and AL), or Altamaha Grit (GA), where periodically wet by seepage; rare (locally common in GA). June-September. C. SC south to c. GA (where it extends into the Coastal Plain on outcrops of Altamaha Grit), west to n. AL and sc. TN. *P. mengesii* and *P. parviflorus* Nuttall of the midwestern United States (and disjunct as far east as AL) are apparently the parents of the allotetraploid *P. teretifolius*. Diploid and tetraploid populations are known of this taxon; further investigation is needed to determine if the tetraploids are allotetraploids or autotetraploids. [< *Phemeranthus mengesii* – FNA, Z (also see *P. species 1*); = *Talinum mengesii* W. Wolf – Q, S, X, Y; < *Talinum mengesii* – K (also see *P. species 1*)]

Phemeranthus parviflorus (Nuttall) Kiger, Small-flowered Rock-pink. More western, occurs as an eastern disjunct in n. AL. A diploid species. [= FNA, Z; = *Talinum parviflorum* Nuttall – C, F, G, K, Q, X; > *Talinum parviflorum* – Y; > *Talinum appalachianum* W. Wolf – Y]

Phemeranthus species 1. Pd (NC, VA): in periodic seepage on mafic or ultramafic rocks; rare. (June?) July-September. This taxon was discovered at a diabase glade in Granville County, NC and ultramafic barrens in Franklin County, VA, floristically rich in other species of disjunct and relict distribution. [< *Talinum mengesii* – K; < *Phemeranthus mengesii* – FNA, Z]

Phemeranthus teretifolius (Pursh) Rafinesque, Appalachian Rock-pink. Mt (GA, NC, SC, VA, WV), Pd (DE, GA, NC, SC, VA), Cp (GA): in shallow soil over felsic or mafic rocks (granite, gneiss, schist, granite, diabase, greenstone, metabasalt, sandstone, Altamaha grit), especially where periodically wet by seepage (often in mats of the moss *Grimmia*); common (rare in WV). June-September. DE (at least formerly), se. PA, and WV, south to se. TN, GA (where it extends into the Coastal Plain on outcrops of Altamaha Grit), and AL, in the Appalachians and adjacent provinces. *P. teretifolius* is an allotetraploid, probably derived from hybridization followed by polyploidization of the diploids *P. mengesii* and *P. parviflorus*. [= FNA, Z; = *Talinum teretifolium* Pursh – RAB, C, F, G, K, Q, S, W, WV, X, Y]



311. BASELLACEAE Moquin-Tandon 1840 (Madeira-vine Family) [in CARYOPHYLLALES]

A family of 4 genera and about 20 species, fleshy perennial vines and herbs, of the tropics and subtropics. References: Vincent in FNA (2003b); Sperling & Bittrich in Kubitzki, Rohwer, & Bittrich (1993); Nyffeler & Eggli (2010).

1 Filaments free nearly to base, adnate for < ¼ of their length to the petals.....***Anredera***
1 Filaments adnate for > ½ of their length to the petals .....***Basella***

Anredera Jussieu (Madeira-vine)

A genus of about 12 species, perennial vines, of tropical and subtropical Americas. References: Vincent in FNA (1993b); Sperling & Bittrich in Kubitzki, Rohwer, & Bittrich (1993).

* ***Anredera cordifolia*** (Tenore) Steenis, Madeira-vine. Cp (FL): disturbed areas; rare, native of South America. In Panhandle FL (Leon County) and n. peninsular FL (Alachua County) (Wunderlin & Hansen 2004). [=FNA, K1, K2, WH; < *Boussingaultia leptostachya* Moquin – S]

Basella Linnaeus 1753

A genus of 5 species, perennial vines, of the tropics and subtropics. References: Sperling & Bittrich in Kubitzki, Rohwer, & Bittrich (1993)

Basella alba Linnaeus. Disturbed areas, grown as a vegetable, and rarely found as a waif; native of s. Asia. Reported for Calhoun County, AL (AL Atlas in prep.; Kartesz 2010). [= K2]

313. TALINACEAE Doweld 2001 (Fameflower Family) [in CARYOPHYLLALES]

A family of about 2 genera and 35 species, herbs and shrubs, primarily of the Southern Hemisphere, but also occurring in North America and e. Asia. References: Packer in FNA (2003b); Carolin in Kubitzki, Rohwer, & Bittrich (1993); Nyffeler & Eggli (2010).

1 Leaves linear, terete, 1-2 mm wide; plants to 5 dm tall; [native].....***[Phemeranthus* in *MONTIACEAE]***
1 Leaves obovate or elliptic, 20 mm or more wide; plants to 8 dm tall; [alien, persistent or escaped].....***Talinum***

Talinum Adanson 1763 (Jewels-of-Opar)

A genus of about 15 species, herbs, and dwarf shrubs, mainly of Africa but with 2 species of the New World tropics). References: Kiger in FNA (2003b); Wilson (1932)=X; Carolin in Kubitzki, Rohwer, & Bittrich (1993). [also see *Phemeranthus*]

* ***Talinum paniculatum*** (Jacquin) Gaertner, Jewels-of-Opar. Fairly commonly cultivated, locally escaped to disturbed areas and garden edges; native of the West Indies. June-September. [= FNA, S, X; ? *T. paniculatum* var. *paniculatum* – K]

314. PORTULACACEAE A.L. de Jussieu 1789 (Purslane Family) [in CARYOPHYLLALES]

A family of 1 genus and 40-100 species, annual and perennial herbs, primarily of the Southern Hemisphere, but also occurring in North America and e. Asia. References: Packer in FNA (2003b); Carolin in Kubitzki, Rohwer, & Bittrich (1993); Nyffeler & Eggli (2010).

1 Flowers sessile or subsessile; capsule circumscissile ..... ***Portulaca***
1 Flowers pedicelled; capsule opening longitudinally.
2 Flowers borne on a scape, with cymose branching ..... [see ***TALINACEAE***]
2 Flowers solitary or in racemes ..... [see ***MONTIACEAE***]

Portulaca Linnaeus 1753 (Purslane, Portulaca)

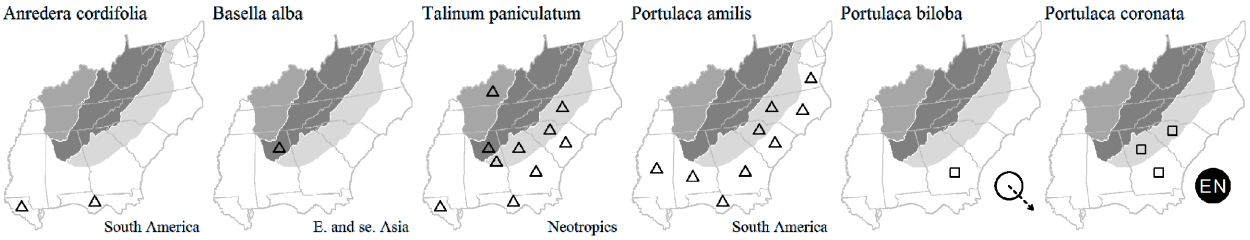
A genus of about 40-100 species, annual and perennial herbs, nearly cosmopolitan, but especially in tropical, subtropical, and warm temperate regions. *Portulaca* flowers open only for a few hours each on sunny days (Matthews & Levins 1985). References: Matthews in FNA (2003b); Matthews & Levins (1985)=Z; Matthews, Faircloth, & Allison (1991); Matthews & Levins (1986); Matthews, Ketron, & Zane (1992a, 1992b, 1993); Matthews & Ketron (1991); Carolin in Kubitzki, Rohwer, & Bittrich (1993). Key based closely on Matthews in FNA (2003b).

1 Plants in flower.
2 Petals yellow, orange, copper, bronze, or white.
3 Flowers > 25 mm across (single petals > 15 mm long).
4 Leaves terete; capsule not encircled by an expanded, membranaceous wing ..... ***P. grandiflora***
4 Leaves flat; capsule encircled by an expanded, membranaceous wing ..... ***P. umbraticola***
3 Flowers < 20 mm across (single petals < 12 mm long).
5 Leaf blades terete or hemispheric in cross-section, linear, usually < 2 mm wide; [rare waif] ..... ***P. halimoides***
5 Leaf blades flattened in cross-section, obovate or spathulate, > 2.5 mm wide; [collectively common].
6 Capsule encircled by an expanded membranaceous wing; [native to granitic and sandstone outcrops in SC and GA] ..... ***P. coronata***
6 Capsule not encircled by an expanded membranaceous wing; [exotic weed, usually seen in disturbed soils] ..... ***P. oleracea***
2 Petals pink to purple.
7 Flowers > 25 mm across (single petals > 15 mm long) ..... ***P. grandiflora***
7 Flowers < 20 mm across (single petals < 12 mm long).
8 Leaves flattened in cross-section, > 2.5 mm wide, obovate to spatulate ..... ***P. amilis***
8 Leaves terete to hemispherical in cross-section, usually < 2 mm wide, linear to lanceolate.
9 Petals deeply bilobed; stamens > 40; [of sandstone (Altamaha Grit) outcrops in s. GA] ..... ***P. biloba***
9 Petals not bilobed; stamens usually < 30; [collectively widespread and of various habitats].
10 Petals dark pink to purple; seeds < 0.6 mm wide, round ..... ***P. pilosa***
10 Petals medium to pale pink; seeds > 0.6 mm wide, elongate ..... ***P. smallii***
1 Plants in fruit.
11 Capsule encircled by an expanded membranaceous wing.
12 [Native in our area, in thin soil on granitic and sandstone outcrops in SC and GA] ..... ***P. coronata***
12 [Introduced cultivar, persistent to weakly spreading from plantings] ..... ***P. umbraticola***
11 Capsule not encircled by an expanded membranaceous wing.
13 Leaves flattened in cross-section, > 2.5 mm wide, obovate to spatulate.
14 Trichomes at nodes conspicuous; seeds round, < 0.6 mm wide ..... ***P. amilis***
14 Trichomes at nodes inconspicuous; seeds elongate, > 0.6 mm long ..... ***P. oleracea***
13 Leaves terete to hemispherical in cross-section, usually < 2 mm wide, linear to lanceolate.
15 Nodes and inflorescences with inconspicuous trichomes ..... ***P. biloba***
15 Nodes and inflorescences with conspicuous trichomes
16 Seeds > 0.65 mm wide.
17 Longest leaves mostly > 20 mm long; capsules mostly > 4 mm in diameter; [introduced, usually in obviously disturbed sites] ..... ***P. grandiflora***
17 Longest leaves mostly < 17 mm long; capsules mostly < 3.5 mm in diameter; [native, on granitic or diabase flatrocks] ..... ***P. smallii***
16 Seeds < 0.65 mm wide
18 Capsules 1.1-2.0 mm in diameter; seeds 0.3-0.5 mm in diameter ..... ***P. halimoides***
18 Capsules 1.5-5 mm in diameter; seeds (0.4-) 0.5-0.6 mm in diameter ..... ***P. pilosa***

* ***Portulaca amilis*** Spegazzini, Broadleaf Pink Purslane. Sandy fields, lawns, and other dry, sandy, disturbed habitats; native of South America. May-September. Matthews & Levins (1985) describe the spread of this alien species in North America, apparently from an introduction in North Carolina (the earliest North American collection in 1932 in Robeson County, NC). Reported for Lowndes County, MS (Whitson 2010). [= FNA, K, WH, Z]

Portulaca biloba Urban, Grit Purslane. Outcrops of Altamaha Grit. This species has been collected repeatedly on outcrops of the Altamaha Grit in s. GA (Matthews, Faircloth, & Allison 1991); it also occurs in Cuba. Matthews, Faircloth, & Allison (1991) hypothesize introduction to the United States by hurricane. [= FNA, K; < *Portulaca teretifolia* ssp. *cubensis* (Urban) Ortega]

Portulaca coronata Small, Flatrock Portulaca. On or around granitic flatrocks, usually under *Juniperus virginiana*, and on Altamaha Grit outcrops. June-September. SC south to GA, endemic to granitic and sandstone outcrops in the Piedmont and rarely Altamaha grit (sandstone outcrops in the upper Coastal Plain). Matthews & Levins (1985) includes this taxon in *P. umbraticola*. Later, Matthews & Ketron (1991) and Matthews, Ketron, & Zane (1992) treated our southeastern material as *P. umbraticola* ssp. *coronata*. While the distinctive nature of the capsule unifies the southeastern "*coronata*," southwestern "*lanceolata*," and Central and South and Central American "*umbraticola*," the difference in chromosome number and flower color, associated with disjunctly allopatric distributions renders specific recognition equally plausible. [= RAB, S; < *P. umbraticola* Kunth – Z; = *P. umbraticola* Kunth ssp. *coronata* (Small) J.F. Matthews & Ketron – FNA, K]



* ***Portulaca grandiflora*** Hooker, Rose-moss. In sandy soil or around granitic flatrocks; native of Argentina. [= RAB, C, FNA, G, K, S, Z]

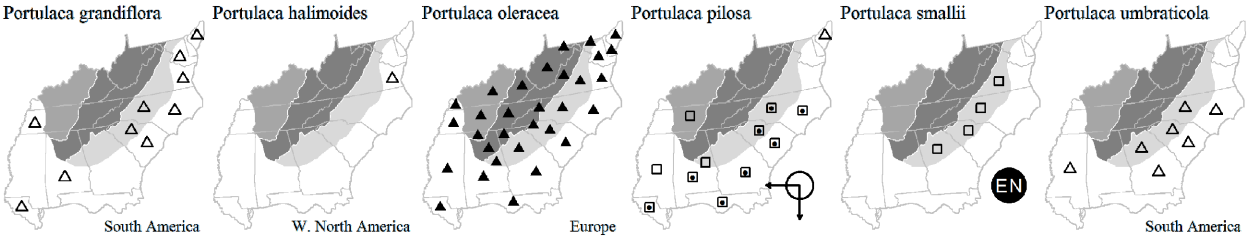
* ***Portulaca halimoides*** Linnaeus. Waste area along railroad; probably only a waif, native of sw. North America. Reported by Reed (1964). [= FNA, K; > *P. parvula* A. Gray]

* ***Portulaca oleracea*** Linnaeus, Common Purslane, Garden Purslane, Pussley. Mt (GA, NC, SC, VA, WV), Pd (DE, GA, NC, SC, VA), Cp (DE, FL, GA, NC, SC, VA): gardens, disturbed areas, cracks in sidewalks; common (uncommon in DE and FL), originally native (apparently) of Asia, probably introduced to North America from Europe. May-October. The various subspecies recognized may or may not be taxonomically significant; a decision awaits an analysis of variation worldwide, or, at least, in the native range of the species. In North America, *P. oleracea* is a widespread, sometimes noxious weed, probably representing numerous introductions of various genotypes, treated as multiple subspecies by some authors. In North America, these genotypes appear to have intermixed; in our area (at least), the recognition of infraspecific taxa has been considered unwarranted, difficult, and unmeaningful (see Matthews, Ketron, & Zane 1993); see Danin & Anderson (1986) for a contrasting opinion. During the Great Depression, *P. oleracea* was eaten extensively in the Valley of Virginia as a potherb. [= RAB, C, F, FNA, G, K, S, W, WH, WV, Z]

Portulaca pilosa Linnaeus, Kiss-me-quick. Disturbed sandy soils. June-October. NC south to s. FL, west to NM, north in the interior to c. TN, AR, and OK, and in Central America; the native range perhaps obscure. See Matthews, Ketron, & Zane (1992a) for a further discussion of this species. [= RAB, FNA, K, S, WH, Z]

Portulaca smallii P. Wilson, Small's Portulaca. In thin soils on granitic and diabase flatrocks, sometimes locally spreading to adjacent fields, mowed areas, or other disturbed areas. June-October. Sc. VA south to c. GA. Generally considered an endemic limited to granitic flatrocks, *P. smallii* also occurs on a diabase flatrock, growing with an interesting mixture of granite flatrock and limestone cedar glade species (LeGrand 1987, Schafale & Weakley 1990). [= RAB, FNA, K, S, Z]

* ***Portulaca umbraticola*** Kunth. Disturbed areas, spreading weakly or persistent following cultivation; native of South America and the West Indies. See *P. coronata* for further discussion. [< *P. umbraticola* Kunth – Z; = *P. umbraticola* Kunth ssp. *umbraticola* – K]



316. CACTACEAE A.L. de Jussieu 1789 (Cactus Family) [in CARYOPHYLLALES]

A family of about 100 genera and 1500 species, herbs, shrubs, vines, and trees, of tropical, subtropical, and temperate America (a single species occurring as well in Africa, Madagascar, and Ceylon), with centers of diversity in sw. United States-Mexico, s. South America, and West Indies. References: Parfitt & Gibson in FNA (2003b); Barthlott & Hunt in Kubitzki, Rohwer, & Bittrich (1993); Anderson (2001); Nyffeler & Eggli (2010).

Opuntia P. Miller 1754 (Prickly-pear Cactus)

A genus of about 200 species, widespread in America, from s. Canada to Patagonia. References: Pinkava in FNA (2003b); Ward (2009e)=X; Doyle (1990)=Z; Benson (1982)=Y; Barthlott & Hunt in Kubitzki, Rohwer, & Bittrich (1993). Key based on Y and Z.

Identification notes: New joints sometimes bear reduced leaves and have not yet developed spines; look for spines 1 or 2 joints back from the growing tip.

1 Spines absent.
2 Joints narrowly obovate, narrowly elliptic, or oblong, mostly 12-25 (-35) cm long, 7.5-10 (-20) cm broad; [of the Coastal Plain]..... ***O. stricta* var. *stricta***
2 Joints orbiculate to obovate, 5-7.5 (12.5) cm long, 4-6 (-7.5) cm broad; [widespread in our area].
3 Joints mostly 7.5-10 (-15) cm long, 5-9 (-12.5) cm broad; hypanthium with 7 or more areoles; style diameter < 3.5 mm; petals > 3 cm long; [of the Coastal Plain] ..... ***O. humifusa* var. *austrina***
3 Joints mostly 5-7.5 (-12.5) cm long, 4-6.2 (-7.5) cm broad; hypanthium with 6 or fewer areoles; style diameter > 3.5 mm; petals < 3 cm long; [widespread in our area]..... ***O. humifusa* var. *humifusa***
1 Spines present.
4 Spines strongly and retrorsely barbed; joints slender, (2-) 3-6 (-13) cm long, 2-5 (-7) cm broad, easily detached from the plant; spines to 3.7 cm long, 0-2 per areole (usually some areoles on a plant with 2 well-developed spines); [of coastal dunes]..... ***O. pusilla***
4 Spines not strongly and retrorsely barbed; joints broad, 10-30 cm long, 7.5-12.5 cm broad, not easily detached from the plant; spines to 7.5 cm long, 0-2 (-12) per areole; [of various habitats, including coastal dunes].
5 Spines (at least the larger) flattened throughout or basally, narrowly elliptic in cross-section, 0-11 per areole.
6 Spines white, tan or pale-brown at maturity; pads (22.5-) 30-60 cm long, 20-40 cm broad; [rare introduction]..... ***O. ficus-indica***
6 Spines yellow at maturity; pads 10-30 cm long, 5-15 (-25) cm broad; [common native in the southern part of our area].
7 Spines 1-11 per areole, 1.2-4 (-6) cm long; pads 20-30 cm long, 5-12 cm broad..... ***O. stricta* var. *dillenii***
7 Spines 0 (-1 per areole only in marginal areoles), usually < 2 cm long; pads 10-30 cm long, 7-15 (-25) cm broad ..... ***O. stricta* var. *stricta***
5 Spines needle-like, not flattened, elliptic to circular in cross-section, 1-6 (-12) per areole.
8 Plants not mat-forming or prostrate, rising the height of several joints, commonly 3-20 dm tall; largest joints (7.5-) 10-30 cm long, (5-) 7.5-12.5 cm broad; spines gray, reddish-brown, or yellowish-brown; fruit 5-7.5 cm long, 4-5 cm in diameter; [introduced, rarely spread or persistent from cultivation]..... ***O. monacantha***
8 Plants low and mat-forming, usually prostrate and < 3 dm tall, the joints usually in series of 3-5; largest joints 3.8-10 cm long, 4-6 cm broad; spines white, gray, or brown; fruit 2.5-4 cm long, 2-3 cm in diameter; [native].
9 Joints mostly 7.5-10 (-15) cm long, 5-9 (-12.5) cm broad; spines to 8 cm long; hypanthium with 7 or more areoles; style diameter < 3.5 mm; petals > 3 cm long; [of the Coastal Plain]..... ***O. humifusa* var. *austrina***
9 Joints mostly 5-7.5 (-12.5) cm long, 4-6.2 (-7.5) cm broad; spines to 3 cm long; hypanthium with 6 or fewer areoles; style diameter > 3.5 mm; petals < 3 cm long; [widespread in our area]..... ***O. humifusa* var. *humifusa***

*? *Opuntia cantabrigiensis* Lynch. Small (1933) also reports *O. cantabrigiensis* Lynch from dunes near Beaufort, NC, based on a fragmentary 1930 collection accompanied by a photograph. Similar plants were apparently seen near Beaufort by Engelmann, prior to 1856. Benson (1982) refers the collection tentatively to *O. lindheimeri* Engelmann var. *cuija* (Griffiths & Hare) L. Benson, treated in K as *O. engelmannii* Salm-Dyck var. *cuija* Griffiths & Hare, a native of Mexico. Benson (1982) also states, however, that it could also be var. *lindheimeri* (primarily of TX and Mexico), or, indeed, *O. tuna* (Linnaeus) P. Miller (native to the West Indies). Benson (1982) failed to relocate the plant in the field in 1956, but stated there was "insufficient time for a thorough search." Unless relocated (and hope is fading for that, with the extensive destruction of maritime vegetation in the vicinity of Beaufort by construction), the identity of the plant will probably remain a mystery, as well as whether it represents a native species, an established population from aboriginal use, or a more recent introduction or adventive. [= S] {excluded; not keyed}

* ***Opuntia ficus-indica*** (Linnaeus) P. Miller, Indian-fig, Mission Prickly-pear, Tuna Cactus. Cp (FL): disturbed areas; rare, native of tropical America. [= FNA, K, WH, X, Y]

Opuntia humifusa (Rafinesque) Rafinesque *var. **austrina*** (Small) Dress, Southern Prickly-pear. Cp (FL, GA, SC): dunes, shell middens, and other dry sandy soils, mostly but not entirely on barrier islands; rare. Var. *austrina* (Small) Linnaeus Benson occurs throughout FL, and at scattered locations north to se. SC and west to se. TX; Ward (2009e) considers this (as *O. austrina*) to be endemic to FL. A third variety, var. *ammophila* (Small) L. Benson, is apparently endemic to FL, occurring in most of the state; it might occur in the southern portion of our area. It has more elongate joints than the other two varieties, the joints with a length-to-width ratio of 2-4 (vs. 1-2) and is a more erect plant, often 3-4 joints high. [= K, Y, Z; < *O. humifusa* var. *humifusa* – FNA; > *O. austrina* – S; > *O. cumulicola* Small – S; = *O. austrina* Small – X; = *O. compressa* (Salisbury) J.F. Macbride var. *austrina* (Small) L. Benson]

Opuntia humifusa (Rafinesque) Rafinesque *var. **humifusa***, Eastern Prickly-pear. Cp (DE, FL, GA, NC, SC, VA), Pd (GA, NC, SC, VA), Mt (GA, NC, SC, VA, WV): dry open places, such as in thin soil around rock outcrops, sandhill forests and woodlands, dry barrens and woodlands, barrier island dunes, dry pastures; common (uncommon in Piedmont and Mountains). May-June; August-October. The only cactus widespread in e. North America, var. *humifusa* ranges from MA, MI, and e. IA, south to s. FL and c. TX, with some outlying stations farther west. Various authors, including Small (1933) and Ward (2009e), separate the Coastal Plain *O. pollardii* from the inland *O. humifusa* (s.s.); this may have merit. Ward (2009e) separates *O. pollardii* as always having spines, these 2-3 cm long, leaves prior to shedding 6-8 mm long, fruits 2-2.5 cm long (vs. often lacking spines, when present these fewer and < 1 cm long, leaves 2-3 mm long, fruits 1-1.5 cm long in *O. humifusa*). Where growing in proximity to *O. pusilla*, the two species hybridize rather freely, sometimes producing hybrid swarms. See Doyle (1990) for discussion of the correct nomenclature for this taxon (*O. compressa* vs. *O. humifusa*). [= K, Y, Z; < *O. humifusa* var. *humifusa* – FNA; > *O. compressa* (Salisbury) J.F. Macbride var. *compressa* – G; < *O. compressa* – RAB; < *O. humifusa* (Rafinesque)

Rafinesque – C, F, W; > *O. pollardii* Britton & Rose – G, S, X; > *O. humifusa* – X; > *O. impedita* Small – S; > *O. macrarthra* Gibbes – S; > *O. opuntia* (Linnaeus) Karten – S; > *O. compressa* – WV; > *O. calcicola* Wherry – WV]

* ***Opuntia monacantha*** (Willdenow) Haworth, Common Prickly-pear. Cp (FL?, NC): frequently cultivated, rarely escaped or persistent; rare, native of n. South America. May-June; August-October. [= FNA, K; ? *O. vulgaris* P. Miller – RAB, X, Y; = *O. monacanthos* – WH]

Opuntia pusilla (Haworth) Nuttall, Dune Prickly-pear, Sand-bur Prickly-pear, Little Prickly-pear, Creeping Cactus. Cp (FL, GA, NC, SC): dunes on barrier islands; uncommon. May-June; August-October. A Southeastern Coastal Plain endemic: NC (Dare County) south to c. peninsular FL and west to se. TX, nearly always within a few hundred meters of the sea. As mentioned by Small (1933) and RAB, this little coastal cactus is inconspicuous and often becomes attached by its retrorsely barbed-spines to the pants or shoes of people walking through the dunes. It can inflict painful wounds, the spines not easily removed from flesh or clothing because of the retrorse barbs. *O. pusilla* sometimes forms hybrid swarms with *O. humifusa* on coastal dunes (see Y for additional discussion). [= FNA, K, WH, X, Z; = *O. drummondii* Graham – RAB, S]

Opuntia stricta (Haworth) Haworth *var.* ***dillenii*** (Ker-Gawler) L. Benson. Cp (FL, GA, NC?, SC): dunes on barrier islands; rare. Se. SC south to s. peninsular FL. This taxon was reported from NC by Small (1933), as *O. tunoidea* Gibbes. Benson (1982) and Doyle (1990) do not verify this distribution, showing var. *dillenii* reaching its northern limit along the coast in se. SC. [= K, X, Y, Z; < *O. stricta* – FNA, WH; > *O. tunoidea* Gibbes – S]

Opuntia stricta (Haworth) Haworth *var.* ***stricta***. Cp (FL, GA, NC, SC, VA?): dunes, shell middens, sandhills, dry woodlands; rare. Sc. NC (Robeson County) and c. SC south to s. peninsular FL, with a single collection from Isle of Wight County, VA (Benson 1982), mostly near the coast. Small (1933) describes the habitat of *O. stricta* as "shell mounds, kitchenmiddens, and aboriginal village sites" and identifies it as the "the prickly-pears the early Spanish records tell us the aborigines feasted on for three months of each year and also cured, like figs, for food when out of season." [= K, X, Y, Z; < *O. stricta* – FNA, WH; > *O. stricta* – S]

320a. CORNACEAE (Berchtold & J. Presl) Dumortier 1829 (Dogwood Family) [in CORNALES]

A family of 2 genera and about 85 species, trees, shrubs, lianas, and subshrubs, semicosmopolitan (mainly northern hemisphere). The Cornaceae is best circumscribed to exclude *Nyssa* (Xiang et al. 2002). References: Xiang et al. (2002); Kubitzki in Kubitzki (2004).

Cornus Linnaeus 1753 (Dogwood, Cornel)
(contributed by Z.E. Murrell & A.S. Weakley)

A genus of about 65 species, trrees, shrubs, and subshrubs, mainly north temperate. The generic limits are controversial. Phylogenetic analyses show that *Cornus* is monophyletic, but various clades within it are also monophyletic and have levels of genetic and morphologic divergence often regarded as warranting generic distinction. Zhang et al. (2008) estimate the time of divergences of the various subgenera as having been from the Paleocene to the Oligocene. At very least, the subgenera are well-marked. References: Godfrey (1988)=Z; Wilson (1965); Murrell (1993); Zhang et al. (2008); Xiang et al. (2006); Fan & Xiang (2001); Eyde (1987); Xiang, Soltis, & Soltis (1998); Ferguson (1966c, 1966d)=Y; Kubitzki in Kubitzki (2004).

1 Leaves alternate (the internodes typically short and therefore the leaves looking nearly whorled); [subgenus *Mesomora*] ..... ***C. alternifolia***
1 Leaves opposite.
  2 Herb or dwarf shrub from a woody rhizome, to 2 dm tall; leaves in 2-4 pairs below the inflorescence; [of NJ and montane VA and WV northward]; [subgenus *Arctocrania*] ..... ***C. canadensis***
  2 Shrub or tree, much taller than 2 dm when mature; leaves many; [collectively widespread].
    3 Inflorescence subtended by 4 showy (white, creamy, or pink) bracts.
      4 Showy bracts subtending the inflorescence rounded and notched; fruits separate in a compact cluster; [common native small tree]; [subgenus *Cynoxylon*] ..... ***C. florida***
      4 Showy bracts subtending the inflorescence acute; fruits fused together; [exotic uncommonly planted, rarely escaped or persistent]; [subgenus *Syncarpea*] ..... ***[C. kousa]***
    3 Inflorescence lacking bracts; [subgenus *Kraniopsis*].
      5 Veins usually 5 or more per leaf side.
        6 Bark of older branches and stems splitting longitudinally, appearing braided; leaves without tufts of trichomes in axils of secondary veins on abaxial surface.
          7 Abaxial leaf surface not coronulate, trichomes appressed and rigid, and erect and curling, on the same leaf, leaf base usually rounded or truncate ..... ***C. amomum***
          7 Abaxial leaf surface coronulate, trichomes all appressed and rigid, leaf base usually cuneate ..... ***C. obliqua***
        6 Bark of older branches and stems smooth, with scattered protruding lenticels; leaves with tufts of trichomes in axils of secondary veins on the abaxial surface.
          8 Area surrounding lenticels suffused with purple; leaves suborbicular or broadly ovate; 7-9 veins per leaf side; tertiary veins usually prominent ..... ***C. rugosa***
          8 Area surrounding lenticels not differentiated; leaves lanceolate, elliptic, or ovate; 5-7 veins per leaf side; tertiary veins not prominent ..... ***C. stolonifera***
      5 Veins usually 3-4 per leaf side.
        9 Trichomes erect on abaxial surface.
          10 Petioles 3-7 mm long; leaf veins evenly spaced ..... ***C. asperifolia*** [or ***C. asperifolia* × *stricta***]

10 Petioles 8-25 mm long; leaf veins emanate from the basal half of the leaf ..... ***C. drummondii***
9 Trichomes appressed or slightly raised on abaxial leaf surface.
11 Rhizomatous, forming large colonies; lenticels protrude slightly, older stems appear verrucose; fruit white ..... ***C. racemosa***
11 Multiple stems from a single rootstock (occasionally appearing rhizomatous from decumbent stems); lenticels not protruding, bark swelling between lenticels; fruit blue ..... ***C. stricta***

Cornus alternifolia Linnaeus f., Alternate-leaf Dogwood, Pagoda Cornel, Pagoda Dogwood. Moist forests. May-June; August-September. NL (Newfoundland) west to MN, south to Panhandle FL, AL, s. MS, and AR. [= RAB, C, F, G, K, W, WH, WV, Y, Z; = *Svida alternifolia* – S; = ***Swida alternifolia*** (Linnaeus f.) Small]

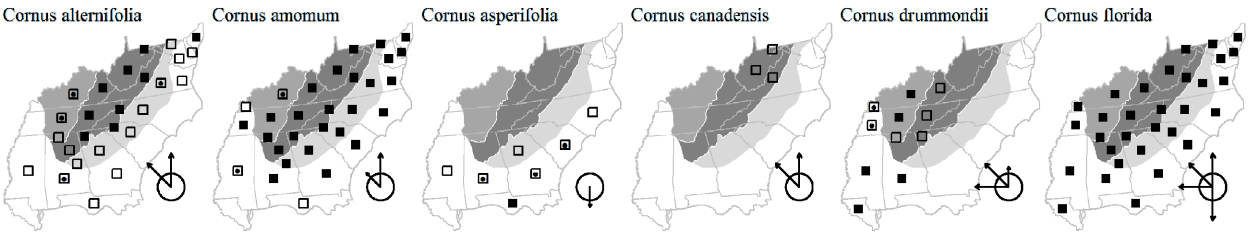
Cornus amomum P. Miller, Silky Dogwood. Shores, streams, bottomlands. May-July; August-September. NY and MA west to IN, south to GA, Panhandle FL, and MS. [= RAB, F, G, K, W, WV; = *Cornus amomum* var. *amomum* – C; = *Cornus amomum* P. Miller ssp. *amomum* – GW, Y, Z; = *Svida amomum* – S; = ***Swida amomum*** (P. Miller) Small]

Cornus asperifolia Michaux, Eastern Roughleaf Dogwood. Mesic calcareous forests and thickets, shell middens, calcareous hammocks. May-June; August-September. Se. NC south to n. peninsular FL, west to s. AL. Nash (1896) collected *C. asperifolia* Michaux at River Junction, Florida; based upon conflicting reports of fruit colors given by Chapman (1860) and Coulter and Evans (1890) for the two rough-leaved dogwoods (*C. asperifolia* and *C. drummondii*), Nash decided to name the rough-leaved dogwood with blue fruit as *C. microcarpa*. However, Michaux's (1803) description, even without reference to fruit color, is clearly attributable to this species, since its locality was given as "Carolinae inferioris." The populations of this rough-leaved dogwood in NC and SC have morphology intermediate between *C. stricta* and *C. asperifolia* and these should possibly be attributed to a hybrid origin. More analysis needs to done on this complex. [= RAB, K, Y, Z; = *Cornus foemina* P. Miller ssp. *microcarpa* (Nash) J.S. Wilson – GW; = *Svida microcarpa* (Nash) Small – S; = ***Swida asperifolia*** (Michaux) Small]

Cornus canadensis Linnaeus, Bunchberry, Dwarf Cornel, Dwarf Dogwood. High elevation forests, in humus or on talus, under *Betula cordifolia*, *Picea rubens*, or *Pinus rigida*. Greenland west to AK, south to NJ, VA, WV, and CA. [= C, F, G, K, W, WV, Y; = ***Chamaepericlymenum canadense*** (Linnaeus) Ascherson & Graebner]

Cornus drummondii C.A. Meyer, Midwestern Roughleaf Dogwood. Open woodlands and glades over calcareous rocks (limestone, calcareous shale). NY, ON, and SD south to e. TN, nw. GA, LA, and TX. [= C, G, GW, K, Y; > *Cornus drummondii* – F; > *Cornus priceae* Small – F; > *Svida priceae* (Small) Small – S; > *Svida asperifolia* – S, misapplied; = ***Swida drummondii*** (C.A. Meyer) Soják]

Cornus florida Linnaeus, Flowering Dogwood. Dry to moist forests and woodlands. March-May; September-October. ME west to MI, south to c. peninsular FL; disjunct in montane ne. Mexico (Veracruz and Nuevo Léon). The Mexican plants may warrant recognition as *C. urbaniana*. *C. florida* has been impacted since the 1980s by widespread infection by the dogwood anthracnose fungus (*Discula destructiva*). [= RAB, C, F, G, K, W, WH, WV, Y, Z; = ***Cynoxylon floridum*** (Linnaeus) Rafinesque ex B.D. Jackson – S; ***Benthamidia florida*** (Linnaeus) Spach]



* *Cornus kousa* Hance, Kousa Dogwood. Suburban areas, sometimes planted as an ornamental and may persist or seed down in the immediate vicinity of the parent tree. [= K; ***Benthamidia japonica*** (Siebold & Zuccarini) Hara; = ***Cynoxylon kousa*** (Hance) Nakai] {not mapped; rejected as a component of our flora}

Cornus obliqua Rafinesque, Silky Dogwood. Swamps, moist thickets, (in VA) rocky rivershores where periodically scoured. May-July. ME and QC west to MN, south to VA, KY, c. TN, AR, and OK. Some material intermediate between *C. amomum* and *C. obliqua* has been found in the Mountains of nw. NC and w. VA. These plants are recognizable by leaves intermediate between the putative parents, ovate with an attenuate base, abaxial surface papillose; abaxial and adaxial surfaces with mostly appressed ornamented trichomes, but with scattered unornamented trichomes with erect arms on both blade surfaces and midvein and secondary veins. [= F, K, WV; = *Cornus amomum* P. Miller var. *schuetzeana* (C.A. Meyer) Rickett – C; = *Cornus purpusii* Koehne – G; = *Cornus amomum* P. Miller ssp. *obliqua* (Rafinesque) J.S. Wilson – GW, Y; = *Swida amomum* var. *schuetzeana* (C.A. Meyer) A. Haines; = ***Swida obliqua*** (Rafinesque) Moldenke]

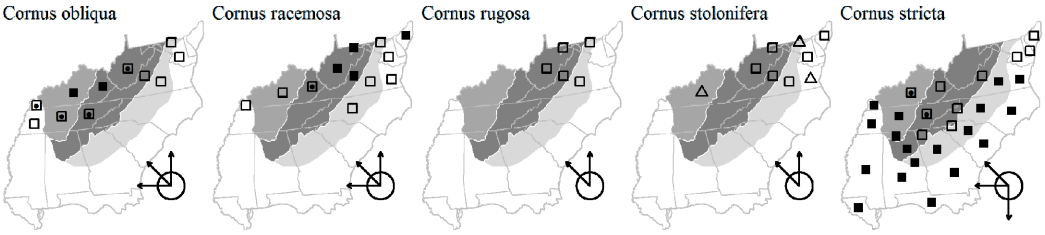
Cornus racemosa Lamarck, Northern Swamp Dogwood. Wet to moist forests and thickets. May-July; August-September. ME and s. QC west to s. MB, south to VA, nc. NC, s. IL, and MO. [= RAB, C, F, G, K, WV; = *Svida femina* (P. Miller) Small – S, misapplied; = *Cornus foemina* P. Miller ssp. *racemosa* (Lamarck) J.S. Wilson – W, Y; = ***Swida racemosa*** (Lamarck) Moldenke]

Cornus rugosa Lamarck, Roundleaf Dogwood. At high elevations, usually on talus (greenstone, quartzite, sandstone). QC to MB, south to NJ, PA, w. VA, OH, IN, and IL. [= C, F, G, K, W, WV; = ***Swida rugosa*** (Lamarck) Rydberg]

Cornus stolonifera Michaux, Red Osier Dogwood. Shrub swamps, bottomlands, suburban areas. At least some of the occurrences in VA represent horticultural introductions. NL (Labrador) and AK south to VA, WV, KY (Clark et al. 2005), IL, NM, AZ, and CA. Attempts to link the name *C. sericea* Linnaeus to the red-osier dogwood have focused on the Linnaean description of "foliis subtus sericeis" and "ramis rubicundis." The reference to the red branches has been emphasized to rule out any other species, yet *C. amomum* and *C. obliqua* also have reddish-maroon branches. The description of "fructo nigro-caeruleo" cannot be dismissed as a reference to individuals of the red-osier dogwood which have pale blue fruit, often considered to be due to hybridization with *C. amomum* or *C. obliqua*. It seems clear that the description fits *C. obliqua* better than it does the red-osier dogwood. Although there is a specimen in the Linnaean herbarium which has been identified as the red-osier dogwood, it is

neither dated nor is the label of *C. sericea* in Linnaeus' hand. Also, considering the similarity of the red-osier dogwood and *C. alba* Linnaeus, it is doubtful Linnaeus would have described the red-osier dogwood without reference to *C. alba*. Therefore, we agree with Rickett's rejection of *C. sericea* as a *nomen dubium*. This species is also sometimes considered to be indistinguishable form the Eurasian *C. alba*. [= G, W, WV; = *C. sericea* Linnaeus – C, nomen dubium; = *Cornus stolonifera* Michaux – G, W; > *Cornus stolonifera* var. *stolonifera* – F; > *Cornus stolonifera* var. *baileyi* (Coulter & Evans) Drescher – F; > *C. sericea* ssp. *sericea* – K, nomen dubium; = *Swida sericea* (Linnaeus) Holub, nomen dubium; = ***Swida stolonifera*** (Michaux) Rydberg; < *C. alba* Linnaeus]

Cornus stricta Lamarck, Southern Swamp Dogwood. Swamps, streambanks, marshes, alluvial forests. April-May; July-August. DE south to s. FL, west to TX, and north in the interior to TN, s. IN, s. IL, AR, and se. OK. Although the name *C. foemina* P. Miller predates *C. stricta* Lamarck, it is very unclear what plant was intended by that name (the description is very obscure and no type is available), so *C. foemina* is best rejected as a *nomen dubium*. [= RAB, C, G; = *Cornus foemina* P. Miller – F, K, WH, Z; = *Cornus stricta* Lamarck – RAB, C, G; = *Svida stricta* (Lamarck) Small – S; = *Cornus foemina* P. Miller ssp. *foemina* – GW, W, Y; = *Swida foemina* (P. Miller) Rydberg; = ***Swida stricta*** (Lamarck) Small]



320b. NYSSACEAE A.L. de Jussieu ex Dumortier 1829 (Tupelo Family) [in CORNALES]

A family of 5 genera and 22 species, trees and shrubs, of e. Asia, se. Asia, e. North America, and Central America. The circumscription and recognition of this family has been controversial; Nyssaceae has sometimes been included in a broadly circumscribed Cornaceae, but this appears to be phylogenetically incorrect (Xiang et al. 2002). References: Xiang et al. (2002).

Nyssa Linnaeus 1753 (Tupelo, Sour Gum, Black Gum)

A genus of about 8-10 species, trees and shrubs, of e. North America, e. Asia, se. Asia, and Central America. The only other members of the genus are 2-4 e. and se. Asian species and a recently discovered species of Costa Rica (Hammel & Zamora 1990, Wen & Stuessy 1993). References: Burckhalter (1992)=Z; Wen & Stuessy (1993)=Y; Eyde (1966)=X; Ward (2008b)=V.

Identification notes: *Nyssa sylvatica* is often mistaken (especially as seedlings, saplings, or fire-sprouts) for *Diospyros virginiana*, because of their similar, alternate, glossy-green, acuminate leaves. *Nyssa* can be distinguished by its three vascular bundle scars per leaf scar (vs. one *Diospyros*), leaves often with a few irregular teeth (vs. never toothed), leaves pale to medium green beneath (vs whitish-green beneath), leaves lacking dark glands on the midrib above and the outer petiole (vs. present), and leaves glabrous or nearly so below (vs. glabrate to tomentose with curly hairs) (McKenney 1967).

1 Petioles of mature leaves 3-6 cm long; leaves to 30 cm long and 15 cm wide, at least the larger on a tree normally > 8 cm wide, often with a few irregular teeth, these typically located near the widest part of the blade.....***N. aquatica***
1 Petioles of mature leaves 0.5-2.0 (-2.5 cm) long; leaves to 18 cm long and 10 cm wide, the largest leaves on a tree rarely > 7 cm wide, generally entire, rarely with a few irregular teeth, these typically located toward the leaf apex.
  2 Fruits 20-40 mm long, yellow, orange, or red when mature, the stone winged; pistillate flowers and fruits 1 per peduncle; trees often multiple-trunked, the trunks crooked; mature leaves densely pubescent beneath.....***N. ogeche***
  2 Fruits 6-15 mm long, blue-black when mature, the stone slightly ridged to nearly smooth; pistillate flowers (1-) 2-5 per peduncle; trees typically single-trunked, the trunk fairly straight; mature leaves glabrous to pubescent beneath.
    3 Pistillate flowers and fruits (2-) 3-5 (-8) per peduncle; leaves with thin texture, pliable, typically widest near the middle, the apex typically acuminate, the margins often with a few irregular teeth near the apex (though sometimes an entire tree with no toothed leaves); trunk not swollen or buttressed at base (even when growing in moist or wet habitats); bark of large trees rough, divided by deep vertical and horizontal furrows into a pattern of squarish checks; [trees of dry to mesic upland forests, less commonly in bottomlands or other wetlands, where flooding occurs at most occasionally and is of short duration; throughout our area].....***N. sylvatica***
    3 Pistillate flowers and fruits (1-) 2 (-3) per peduncle; leaves with thick texture, rather stiff, typically widest beyond the middle, the apex typically obtuse, the margins entire (rarely with a few teeth on vigorous sprouts); trunk swollen or buttressed at base; bark of large trees rough, a vertical ridge-furrow pattern most prominent; [trees of swamps with periodic or seasonal flooding; mostly on the Coastal Plain].
      4 Tree; leaves 5-14 cm long, 1.5-4 cm wide; fruit ovoid, 7-14 mm long; [widespread in our area].....***N. biflora***
      4 Shrub or small tree, 1-3 (-5) m tall; leaves 3-6 cm long, 1-2 cm wide; fruit globose, 6-11 mm long; [restricted to c. FL Panhandle (Apalachicola lowlands region, Bay, Calhoun, Franklin, Gulf, Liberty, and Wakulla counties)].....***N. ursina***

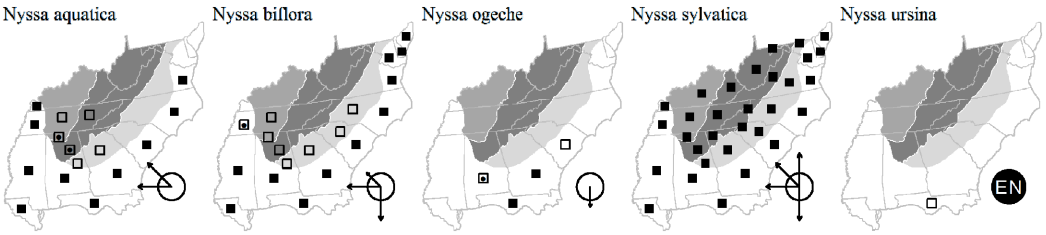
Nyssa aquatica Linnaeus, WaterTupelo, Tupelo Gum, Cotton Gum. River swamps, where inundated for substantial periods of time. April-May; September-October. Se. VA south to Panhandle FL, west to se. TX, north in the Mississippi Embayment to se. MO, s. IL, and e. KY, primarily on the Coastal Plain, but with scattered locations in other physiographic provinces, such as in sc. TN. [= RAB, C, F, GW, K, S, V, WH, X, Y, Z; = *N. uniflora* Wangenheim – G]

Nyssa biflora Walter, Swamp Tupelo, Water Gum, Swamp Black Gum. Blackwater river swamps, depressions in pinelands, pocosins, either where inundated for substantial periods of time or in more-or-less permanently saturated organic peaty soils. April-June; August-October. NJ south to s. FL, west to e. TX, primarily on the Coastal Plain, but scattered inland to c. NC, w. SC, c. TN, w. KY (Clark et al. 2005), se. MO, and c. AR. [= G, K, S, Z; = *N. sylvatica* Marshall var. *biflora* (Walter) Sargent – RAB, C, F, X, Y; < *N. sylvatica* Marshall var. *biflora* (Walter) Sargent – GW, WH; = *N. biflora* var. *biflora* – V]

Nyssa ogeche Bartram ex Marshall, Ogeechee Lime, Ogeechee Tupelo, Ogeechee Plum. River swamps and wet forests with peaty soils, also in upland depression ponds. April; August-October. A Southeastern Coastal Plain endemic: se. SC south to c. peninsular FL, west to s. AL. [= RAB, GW, K, V, WH, X, Y, Z; > *N. acuminata* Small – S; > *N. ogeche* – S]

Nyssa sylvatica Marshall, Sour Gum, Black Gum, Pepperidge. Dry or mesic upland forests, less commonly in bottomlands, pine savannas, or upland depressions, where occasionally inundated briefly. April-June; August-October. S. ME west to MI and se. WI, south to c. peninsular FL, west to e. TX and e. OK. *N. sylvatica* is quite variable in morphology and ecology, at least some of the morphologic variation correlated with geography and ecology. The status of varieties recognized by previous authors (such as Fernald 1950) needs reassessment. In the Mountains of our area *N. sylvatica* is typically found in dry woodlands, such as pine-oak/heath, with xerophytic species such as *Pinus virginiana* and *Quercus montana*. In the outer Coastal Plain of the Carolinas, *N. sylvatica* often occurs in wet savannas with *Pinus serotina*, where often mistaken (because of the wetland habitat) for *N. biflora*. The leaves turn a brilliant orange-red in fall (often a few on any tree turning prematurely in July or August). [= G, K, S, V, WV, Z; = *N. sylvatica* var. *sylvatica* – RAB, C, GW, WH, X, Y; > *N. sylvatica* var. *sylvatica* – F; > *N. sylvatica* var. *dilatata* Fernald – F; > *N. sylvatica* var. *caroliniana* (Poiret) Fernald – F]

Nyssa ursina Small, Bear Tupelo, Apalachicola Tupelo. Stringers, flatwoods depressions. Endemic to Panhandle FL (Apalachicola lowlands region; Bay, Calhoun, Franklin, Gulf, Liberty, and Wakulla counties). A 2-5 m tall shrub or small tree, intricately branched, related to *N. biflora*. Because of the co-occurrence of this and *N. biflora* in the FL Panhandle, it seems best to recognize this taxon at the species level. [= K, S, Z; < *N. sylvatica* Marshall var. *biflora* (Walter) Sargent – GW, WH, X; = *N. biflora* Walter var. *ursina* (Small) D.B. Ward – V; = *N. sylvatica* Marshall var. *ursina* (Small) Wen & Stuessy – Y]



321. HYDRANGEACEAE Dumortier 1829 (Hydrangea Family) [in CORNALES]

A family of about 17 genera and 190-220 species, trees, shrubs, vines, and herbs, primarily north temperate. As here interpreted, the family Hydrangeaceae includes two well-marked groups, the Hydrangeae (including *Decumaria* and *Hydrangea*) and the Philadelpheae (including *Deutzia* and *Philadelphus*). This group has been shown by molecular research to be unrelated to the Saxifragaceae, and to have its closest affinities to the Loasaceae, Cornaceae, and Nyssaceae (Xiang et al. 2002; Soltis, Xiang, & Hufford 1995; Morgan & Soltis 1993). References: Spongberg (1972); Soltis, Xiang, & Hufford (1995); Morgan & Soltis (1994); Xiang et al. (2002); Hufford in Kubitzki (2004).

1 Woody vine, climbing by aerial rootlets; petals 7-10; [tribe *Hydrangeae*] ..... ***Decumaria***
1 Shrub; petals 5 (rarely 10 in the cultivars of the alien *Deutzia*).
  2 Pubescence of leaves and twigs stellate; stamens 10; [a cultivated alien, rarely escaped]; [tribe *Philadelpheae*] ..... ***Deutzia***
  2 Pubescence of leaves and twigs simple; stamens 8-10 (*Hydrangea*) or 25-90 (*Philadelphus*); [natives and aliens].
    3 Leaf blades 10-30 cm long; inflorescences of 25-many flowers; stamens 8-10; [tribe *Hydrangeae*] ..... ***Hydrangea***
    3 Leaf blades 3-8 cm long; inflorescences of 1-7 flowers; stamens 25-90; [tribe *Philadelpheae*] ..... ***Philadelphus***

Decumaria Linnaeus (Climbing Hydrangea, Woodvamp)

A genus of 2 species, vines, of e. North America and e. Asia (China). References: Hufford in Kubitzki (2004).

Identification notes: *Decumaria* is readily distinguished from the other opposite-leaved, woody vines in our flora (*Gelsemium, Trachelospermum, Lonicera, Bignonia*, *Campsis*, and *Clematis*) by its leaves (simple, ovate, and usually serrate) and climbing structures (adventitious roots).

Decumaria barbara Linnaeus, Climbing Hydrangea, Woodvamp. Swamp forests and bottomlands, moist forests in the mountains. May-June; July-October. Se. VA south to FL and west to LA and e. TX (Singhurst, Keith, & Holmes 2005), inland to nw. SC, se. TN, and w. TN. This handsome vine climbs to the tops of trees via adventitious roots. The opposite leaves are somewhat fleshy in texture. [= RAB, C, F, G, GW, K, S, W]

Deutzia Thunberg (Deutzia)

A genus of about 60 species, shrubs, mainly Asian. References: Hufford in Kubitzki (2004).

* ***Deutzia scabra*** Thunberg, Deutzia, Pride-of-Rochester. Fairly commonly cultivated, persistent around old homesites and escaping to adjacent woodlands; native of Japan and China. First reported for NC (Jackson Co., NC) by Pittillo & Brown (1988); now known from scattered sites. *D. crenata* Siebold & Zuccarini, Chinese Deutzia, is reported as introduced in GA by Kartesz (1999); this may not be taxonomically distinct from *D. scabra*. [= C, F; > *D. scabra* – K; > *D. crenata* Siebold & Zuccarini – K; > *D. scabra* var. *candisissima* (Froebel) Rehder]

Hydrangea Linnaeus (Hydrangea, Sevenbark)

A genus of about 25 species, shrubs, of e. North America and e. Asia. Molecular analyses suggest that *Hydrangea* as usually interpreted is polyphyletic (Soltis, Xiang, & Hufford 1995); future taxonomic changes are to be expected. See Dirr (2004) and van Gelderen & van Gelderen (2004) for information on cultivated hydrangeas. References: Pilatowski (1982)=Z; McClintock (1957)=Y; Hufford in Kubitzki (2004).

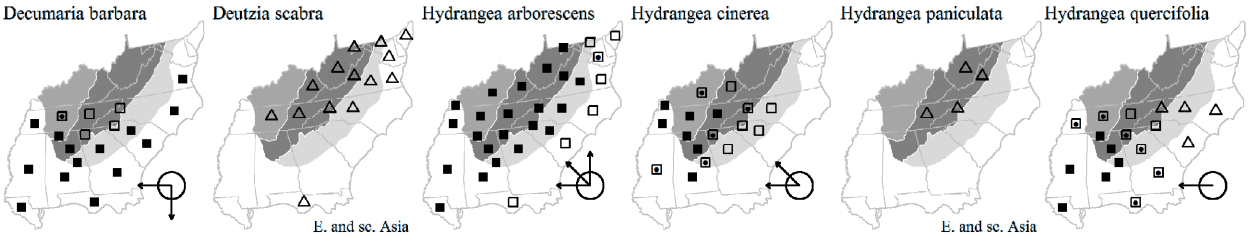
1 Leaves pinnately lobed, the lobes toothed; inflorescence a panicle; large sterile flowers many (> 20 per inflorescence), borne throughout the inflorescence ..... ***H. quercifolia***
1 Leaves unlobed, merely toothed; inflorescence a corymb (except *H. paniculata*); large sterile flowers absent to relatively few (0-15 per inflorescence), borne around the periphery of the corymb (except *H. paniculata*).
  2 Inflorescence a panicle; large sterile flowers many (> 20 per inflorescence), borne throughout the inflorescence; [large shrub to small tree, to 8 m tall and 10 cm trunk diameter]; [alien, cultivated and sometimes persistent] ..... ***H. paniculata***
  2 Inflorescence a corymb; large sterile flowers absent to relatively few (0-15 per inflorescence), borne around the periphery of the corymb; [small to medium shrub, to 3 m tall and 2 cm trunk diameter]; [native].
    3 Lower leaf surface glabrous or inconspicuously puberulent, appearing green; trichomes of the lower leaf surface restricted to the midrib and major veins; sterile flowers absent, or, if present, usually < 1 cm in diameter ..... ***H. arborescens***
    3 Lower leaf surface variously pubescent, appearing white or gray; trichomes of the lower leaf surface on veins and interveinal areas; sterile flowers usually present, large and showy, usually greater than 1 cm in diameter.
      4 Lower leaf surface velutinous, pilose, or tomentose, appearing gray; trichomes usually not dense enough to entirely mask the green leaf surface; trichomes with prominent tubercles (as seen at 40× magnification); sterile flowers generally very few (0-3 per inflorescence) ..... ***H. cinerea***
      4 Lower leaf surface densely floccose-velutinous, felt-like, appearing bright white or silver; trichomes dense enough to entirely mask the green leaf surface; trichomes without tubercles, or with small and inconspicuous tubercles (as seen at 40× magnification); sterile flowers generally fairly many (2-15 per inflorescence) ..... ***H. radiata***

Hydrangea arborescens Linnaeus, Smooth Hydrangea. Forests, especially around rock outcrops and along streambanks. May-July. NJ, s. NY, OH, IN, IL, MO, and se. KS south to e. NC, c. SC, c. GA, Panhandle FL, s. AL, LA, and OK. [= K, S, W, WH, Z; = *H. arborescens* ssp. *arborescens* – RAB, Y; = *H. arborescens* var. *arborescens* – C, G, WV; > *H. arborescens* var. *arborescens* – F; > *H. arborescens* var. *oblonga* Torrey & A. Gray – F]

Hydrangea cinerea Small, Ashy Hydrangea. Rocky forests and rock outcrops, roadbanks, perhaps strictly or mostly associated with mafic or calcareous rocks. May-July. Sw. NC, c. IN, c. IL, and c. MO south to n. SC, sc. AL, and c. AR. [= K, S, W, Z; = *H. arborescens* ssp. *discolor* (Seringe) McClintock – RAB, Y; = *H. arborescens* var. *discolor* Seringe – C, G; = *H. arborescens* var. *deamii* E. St. John – F]

* ***Hydrangea paniculata*** Siebold, Panicle Hydrangea. Persistent after cultivation at old home-sites, sometimes appearing naturalized; native of e. Asia. July-August. [= C, F, G, K]

Hydrangea quercifolia Bartram, Oakleaf Hydrangea. Native in hammocks, moist forests, also in disturbed areas, thickets, or forests adjacent to urban or suburban areas. May-July. C. and sw. TN, south through w. GA, AL, and MS to Panhandle FL and e. LA; scattered elsewhere as a remnant or escape from cultivation. Boufford & Wood (1977) describe a purportedly native occurrence in nw. SC, but it seems more likely to be n escape from cultivation (R. Clark, pers. comm.). This southeastern native is a spectacular garden plant, frequently planted, rarely escaping or persisting. [= C, F, G, K, S, WH]



Hydrangea radiata Walter, Snowy Hydrangea, Silverleaf. Mt (GA, NC, SC), Pd (NC, SC): rocky forests and rock outcrops, often common and conspicuous on roadbanks; common. May-July. A Southern Appalachian endemic: sw. NC (in the valley of the French Broad River and to its southwest), nw. SC, ne. GA, and se. TN, with outliers (perhaps escaped from cultivation?) in Stokes County, NC and Calhoun County, SC. This attractive species is especially typical of the escarpment gorge region near the tricorner of NC, SC, and GA, in the vicinity of the towns of Highlands, Cashiers, and Rosman, NC, where it is conspicuous along roadbanks. [= K, S, W, Z; = *H. arborescens* ssp. *radiata* (Walter) McClintock – RAB, Y]

Philadelphus Linnaeus (Mock-orange)

A genus of 65 (or fewer) species, shrubs, of north temperate areas. The most recent monographer of the genus, Hu (1954-1955) recognizes many species and varieties on the basis of minor differences in pubescence. Many of the recognized taxa are based only on cultivated material. The native distributions of the varieties have little phytogeographic coherence, and several varieties are often reported from the same site, suggesting that they reflect merely variation within a population (if genetically based at all). For instance, Hu recognizes three varieties in *P. hirsutus* and five in *P. inodorus*, but these seem to be no more than forms. As Hu writes, "the formerly recognized species, *P. grandiflorus* Willd., and *P. laxus* Schrad., are merely different forms of a species with heterogeneous leaf shape, size, and margins. Fostered by growers, propagated and distributed through cuttings, these forms have maintained their distinction in gardens since their discoveries. But when they are projected on the spectrum of variations exhibited by a large number of specimens collected from the homeland of *P. inodorus* Linn. they appear to be nothing but a few transitional forms. In this paper, these forms are treated as varieties." Hu's "varieties" should be treated as forms or cultivars, if recognized at all. I have taken a conservative approach, though variation in several of our native species could use additional study. References: Weakley & Henrickson in FNA (in press); Hu (1954-1956)=Z; A.E. Weakley (2002); Hufford in Kubitzki (2004).

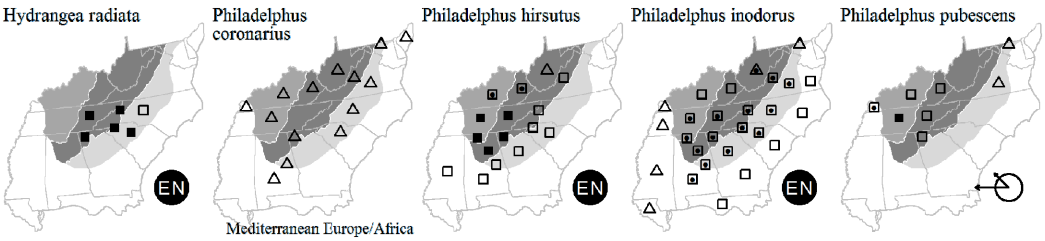
1 Axillary buds exposed above the petiole base (best observed in mature long-shoot leaves, not always visible in axils of young leaves or on short-shoot leaves); twigs of the current year villous-hirsute; seeds not caudate; [subgenus *Deutzioides*, section *Deutzioides*]..... ***P. hirsutus***
1 Axillary buds contained within a distinct pouch directly below the petiole (best observed in mature, long-shoot leaves); twigs of the current year glabrous; seeds with caudate tails about as long as the embryo; [subgenus *Philadelphus*].
2 Flowers 1-3 (-9) in a cymule; stamens 60-90; [subgenus *Philadelphus*, section *Pauciflorus*] ..... ***P. inodorus***
2 Flowers 5-9 in a determinate raceme; stamens 20-50; [subgenus *Philadelphus*, section *Philadelphus*].
3 Bark of the current year brown, exfoliating in its second year; flowers fragrant..... ***P. coronarius***
3 Bark of the current year gray, not exfoliating later; flowers not fragrant or only slightly so ..... ***P. pubescens***

* ***Philadelphus coronarius*** Linnaeus, European Mock-orange. Cultivated (though moreso in the past than now), and sometimes escaped or persisting around old homesites; native of Europe. May-July. *P. coronarius* is the most commonly cultivated *Philadelphus* in our area, though it is currently considered rather old-fashioned. [= C, FNA]

Philadelphus hirsutus Nuttall, Hairy Mock-orange, Cumberland Mock-orange. Bluffs, rock outcrops, rocky woodlands, often with seepage, over mafic or calcareous rocks. April-May; June-August. A Southern Appalachian species: sw. VA and KY south and west to w. NC, TN, n. GA, and n. AL. *P. sharpianus* Hu, known from e. TN and nc. AR, is similar to *P. hirsutus*, allegedly differing in the hypanthium glabrous (vs. more or less pubescent), the leaves strigose-pilose above, glabrous or sparsely strigose or with the nerves only villous beneath (vs. scabrous-hirsute above, uniformly villous beneath); it is probably best considered only a form of *P. hirsutus*. *P. hirsutus* is cultivated and it may escape outside of the range stated. [= RAB, C, F, FNA, G, S, W; > *P. hirsutus* – K, Z; > *P. sharpianus* Hu – K, Z; > *P. hirsutus* var. *intermedius* Hu – Z; > *P. hirsutus* var. *nanus* Hu – Z; > *P. sharpianus* Hu var. *parviflorus* Hu – Z]

Philadelphus inodorus Linnaeus, Appalachian Mock-orange. Rich forests and woodlands, rocky bluffs over mafic or calcareous rocks, and also cultivated and persistent. April-May; June-August. VA and TN south to Panhandle FL (Gadsden, Liberty, and Jackson counties), GA, and s. AL (and according to C, also in e. PA). *P. floridus* Beadle, known from nw. GA, is similar to *P. inodorus*, allegedly differing in the pedicels and hypanthium pubescent (vs. glabrous); it is probably only a form of *P. inodorus*. [= RAB, C, FNA, G, W, WH; > *P. inodorus* var. *inodorus* – F, S, Z; > *P. inodorus* var. *carolinus* Hu – Z; > *P. inodorus* var. *grandiflorus* (Willdenow) A. Gray – F, Z; > *P. inodorus* var. *laxus* (Schrader) Hu – Z; > *P. inodorus* var. *strigosus* Beadle – S, Z; > *P. grandiflorus* Willdenow – S; > *P. gloriosus* Beadle – S; > *P. inodorus* – K; > *P. floridus* Beadle – K, S, Z]

Philadelphus pubescens Loiseleur, Ozark Mock-orange, Hairy Mock-orange. Limestone bluffs. E. TN, KY, nw. GA (Jones & Coile 1988), AL, MO, OK, and AR, west of the Blue Ridge. It has been documented from TN counties adjacent to both VA and NC, and is likely to be found in VA, at least. [= FNA; > *P. intectus* Beadle – S; > *P. latifolius* Schrader ex A.P. de Candolle – S; > *P. intectus* var. *intectus* – Z; > *P. intectus* var. *pubigerus* Hu – Z; > *P. pubescens* var. *verrucosus* (Schrader) Hu – Z; > *P. pubescens* var. *pubescens* – K, Z; > *P. pubescens* var. *intectus* (Beadle) A.H. Moore – K]



322. LOASACEAE A.L. de Jussieu 1804 (Loasa Family) [in CORNALES]

A family of 20 genera and 260-330 species, mainly herbs, primarily of America. References: Weigend in Kubitzki (2004).

Mentzelia Linnaeus (Blazingstar)

A genus of about 80 species, herbs, shrubs, and trees, of America, especially in sw. United States and Mexico. References: Weigend in Kubitzki (2004).

Mentzelia floridana Nuttall ex Torrey & A. Gray, Stickleaf. Hammocks, shell middens, dunes, other dry sands. Ne. FL (Duval County) south to s. FL. [= K, S, WH]

323. BALSAMINACEAE A. Richard 1822 (Touch-me-not Family) [in ERICALES]

A family of 2 genera and 850-1000 species, primarily of the Old World tropics. References: Fischer in Kubitzki (2004).

Impatiens Linnaeus (Jewelweed, Touch-me-not, Snapweed, Balsam)

A genus of 850-1000 species, herbs and subshrubs, primarily tropical and north temperate Old World. References: Fischer in Kubitzki (2004).

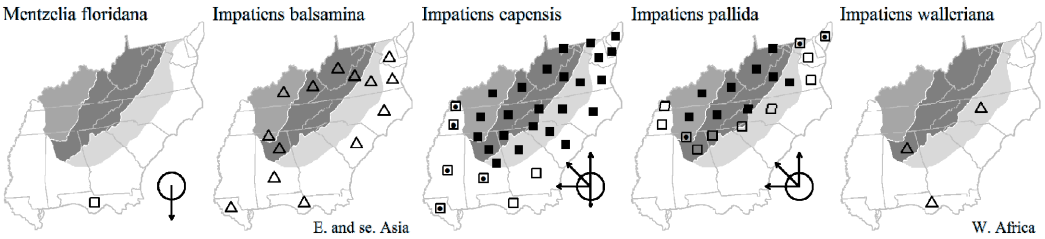
1 Corolla purple, pink, or white; plants 3-6 (-8) dm tall; stems puberulent or glabrous; [cultivated alien, rarely escaped].
  2 Sepal spur strongly recurved; stems puberulent ..... ***I. balsamina***
  2 Sepal spur slightly curved; stems glabrous or with widely scattered hairs ..... ***I. walleriana***
1 Corolla yellow or orange (rarely cream or white); plant mostly 5-25 dm tall; stems glabrous; [native].
  3 Flowers orange (rarely orange-yellow or white); calyx spur (colored) 7-10 mm long, curved forward parallel to the calyx sac .... ***I. capensis***
  3 Flowers yellow (rarely cream or white); calyx spur (colored) 4-6 mm long, at a right angle to the calyx sac ..... ***I. pallida***

* ***Impatiens balsamina*** Linnaeus, Garden Balsam. Frequently cultivated, sometimes escaped as a waif or "throw-out"; native of s. Asia. June-November. [= RAB, C, F, G, K, S, WH, WV]

Impatiens capensis Meerburgh, Orange Jewelweed, Orange Touch-me-not, Spotted Touch-me-not. Moist forests, bottomlands, cove forests, streambanks, bogs. May-November. NL (Newfoundland) west to SK, NT, and BC, south to SC, Panhandle FL, AL, TX, CO, ID, and OR. Within the portion of our area where *I. capensis* and *I. pallida* overlap, the two species often occur in mixed populations. *I. capensis* tends to have the leaf apices and crenulations more rounded than *I. pallida*, but the character is overlapping and variable. [= RAB, C, F, GW, K, W, WV; = *I. biflora* Walter – G, S]

Impatiens pallida Nuttall, Yellow Jewelweed, Yellow Touch-me-not, Pale Touch-me-not. Cove forests, streambanks, seepages, moist forests, bogs, roadsides. July-September. NS and QC west to SK, south to e. VA, wc. NC, TN, WV, MO, and OK. [= RAB, C, F, G, GW, K, S, W, WV]

* ***Impatiens walleriana*** Hooker f., Garden Impatiens. Suburban woodlands, weakly spreading from horticultural plantings; native of Africa. [= K, WH]



327. POLEMONIACEAE A.L. de Jussieu 1789 (Jacob's-ladder Family) [in ERICALES]

A family of 18 genera and 350-380 species, herbs, vines, and shrubs (rarely trees), mainly of temperate North America, but extending into tropical America and also in Eurasia. References: Wilson (1960a); Grant (1997); Grant (1998); Prather, Ferguson, & Jansen (2000); Wilken in Kubitzki (2004).

1 Leaves simple; [tribe *Polemoniae*] ..... ***5. Phlox***
1 Leaves compound.
  2 Leaf segments ovate or elliptic, 5-16 mm wide; corolla blue; [tribe *Polemoniae*] ..... ***4. Polemonium***
  2 Leaf segments linear, ca. 1 mm wide; corolla red, yellow, or blue; [tribe *Gilieae*]
    3 Inflorescences elongate; flowers red or yellow ..... ***3. Ipomopsis***
    3 Inflorescences spherical; flowers blue or white
      4 Inflorescence bracts not spinose; inflorescence on a long peduncle; flowers blue; plant 1-9 dm tall ..... ***1. Gilia***
      4 Inflorescence bracts spine-tipped; inflorescence not long-pedunculate, subtended by bracts; flowers white; plant < 1 dm tall ..... ***2. Navarretia***

1. Gilia Ruíz & Pavón 1794 (Gilia)

A genus of about 40 species, herbs, of w. North America.

Gilia capitata Sims *ssp.* ***capitata***, Bluehead Gilia. Disturbed areas, uncommonly cultivated; native of nw. North America. Reported for Hampshire County, WV (Harmon, Ford-Werntz, & Grafton 2006). [= K]

2. Navarretia Ruíz & Pavón 1794 (Navarretia)

A genus of ca. 30 species, herbs, of w. North America and South America. References: Wilken in Kubitzki (2004).

* ***Navarretia intertexta*** (Bentham) Hooker *ssp.* ***propinqua*** (Suksdorf) Day, Needle-leaf Pincushion-plant. Disturbed areas; native of w. North America. [= K]

3. Ipomopsis Michaux 1803 (Standing-cypress)

A genus of about 30 species, herbs, mainly of w. North America (1 species in se. North America, 1 in w. South America); an example of the affinities of the Sandhill flora to that of the dry sw. United States. References: Grant (1956)=Z; Wilken in Kubitzki (2004).

Ipomopsis rubra (Linnaeus) Wherry, Standing-cypress. Sandhills, sand rims of Carolina bays, dunes, roadbanks, disturbed areas. June-August; August-September. Sc. NC south to c. peninsular FL, west to TX and OK, spread from cultivation in other areas to the north (including sites in the Piedmont and Mountains of GA and NC). [= RAB, K, W, WH, Z; = *Gilia rubra* (Linnaeus) A.A. Heller – C, F, G, S]

4. Polemonium Linnaeus 1753 (Jacob's-ladder)

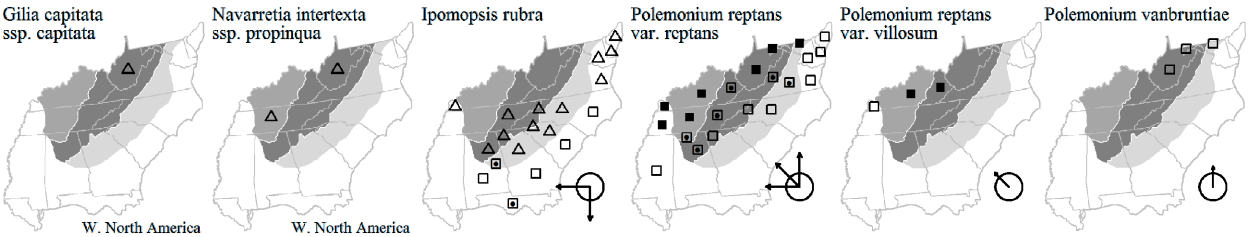
A genus of about 25 species, of temperate regions of North America and Eurasia. References: Worley, Ghazvini, & Schemske (2009); Davidson (1950); Wilken in Kubitzki (2004).

1 Stamens exserted 5-7 mm from the corolla; flowers in a compact panicle, the pedicels usually shorter than the calyx; flowering in July ..... ***P. vanbruntiae***
1 Stamens included in the corolla; flowers in a diffuse, corymbiform panicle, the pedicels usually longer than the calyx; flowering in April-May.
  2 Inflorescence minutely puberulent; corolla 12-16 mm long ..... ***P. reptans*** *var.* ***reptans***
  2 Inflorescence densely glandular-villous; corolla 8-12 (-13) mm long ..... ***P. reptans*** *var.* ***villosum***

Polemonium reptans Linnaeus *var.* ***reptans***, Spreading Jacob's-ladder. Moist, nutrient-rich forests, such as bottomlands and rich slopes. April-May; June. NY west to MN, south to VA, nc. NC, nw. GA, AL, and e. OK. [= C, K; < *P. reptans* – RAB, F, G, S, W, WV]

Polemonium reptans Linnaeus *var.* ***villosum*** E.L. Braun. Moist forests. Appalachian Plateau and vicinity, in s. OH and e. KY. [= C, K; < *P. reptans* – F, G]

Polemonium vanbruntiae Britton. Calcareous fens, swamps, and streambanks. May-July. ME, VT, and n. NY south to se. PA, sw. PA, and e. WV. [= K; = *P. van-bruntiae* – C, F, G, WV, orthographic variant]



5. Phlox Linnaeus 1753 (Phlox)

A genus of about 70 species, herbs (to subshrubs), of temperate North America (with 1 species in ne. Asia). References: Wherry (1955)=Z; Ferguson, Krämer, & Jansen (1999); Wilken in Kubitzki (2004). Key based on C and Z.

1 Stems woody or suffrutescent, trailing or decumbent; leaves to 25 mm long (-60 mm long in *P. bifida*), to 3 (-5) mm wide, generally with short-shoots or fascicles of leaves in the axils of leaves of the sterile shoots.
  2 United portion of the style 5-12 mm long, the cleft portion ca. 1 mm long.
    3 Larger leaves > 3 cm long; nodes 4-5, spaced; petals deeply notched, the notch 1.5-5 mm deep ..... ***P. bifida***
    3 Larger leaves < 2.5 cm long; nodes >6, crowded; petals shallowly notched, the notch 0.5-3 mm deep ..... ***P. subulata***
  2 United portion of the style 1.5-4 mm long, the cleft portion 0.5-2 mm long.

4 Fertile shoots (10-) 15-30 cm tall; upper leaves oblong-lanceolate, up to 12-25 mm long, 1.5-3 mm wide on sterile shoots, 2.5-5 mm wide on fertile shoots; pubescence of the inflorescence mostly with conspicuously glandular tips ..... ***P. nivalis* var. *hentzii***
4 Fertile shoots (3-) 8-12 (-15) cm tall; upper leaves linear-lanceolate, up to 8-12 mm long, 0.5-1.5 mm wide on sterile shoots, 1.5-3 mm wide on fertile shoots; pubescence of the inflorescence mostly with finely glandular tips ..... ***P. nivalis* var. *nivalis***
1 Stems herbaceous, erect or decumbent; leaves (at least the larger) > 25 mm long and/or > 5 mm wide, generally lacking axillary fascicles of leaves.
5 Style short, 1-4 mm long, the united portion 1-1.5 (-2)× as long as the cleft portion; stamens shorter than the corolla tube (thus included).
6 Upper leaves alternate; annual; corolla red, white, or variegated; [alien, mostly naturalized in dry sandy soils of roadsides, fields, and disturbed areas]..... ***P. drummondii***
6 Upper leaves opposite or subopposite; perennial; corolla blue, lavender, or pink; [native, mostly of forests, woodlands, or roadbanks].
7 Sterile shoots rooting at the nodes; leaves broad-elliptic, ca. 2-3× as long as wide; sepals acuminate to very slightly awned, the awn 0-0.5 mm long; corolla tube glabrous..... ***P. divaricata***
7 Sterile shoots not rooting at the nodes; leaves lanceolate to linear, ca. 4-10× as long as wide; sepals awned, the awn 0.5-3.0 mm long; corolla glabrous, pilose, or glandular-pubescent.
8 Cymes open, the lowest branches elongate, > 1 cm long; corolla usually glandular-pubescent or pilose (rarely glabrous); pedicels 1-8 (-12) mm long
9 Leaves largest below the middle of the stem ..... ***P. floridana***
9 Leaves largest above the midpoint of the stem ..... ***P. pilosa***
8 Cymes compact, the lowest branches short, < 0.5 cm long; corolla glabrous; pedicels 1-6 mm long.
10 Leaves and bracts oblong-elliptic to lanceolate, acute to obtuse (rarely acuminate), the larger 20-40 (-50) mm long, 4-8 (-12) mm wide, ca. 5× as long as wide; bracts below the inflorescence hiding the calyces ..... ***P. amoena***
10 Leaves and bracts linear to lanceolate, acuminate, the larger 35-45 mm long, 3-5 mm wide, ca. 10× as long as wide; bracts below the inflorescence not hiding the calyces..... ***P. lighthipei***
4 Style long, (12-) 14-26 mm long, the united portion 3-30× as long as the cleft portion; stamens equaling or exceeding the corolla tube (thus in part exserted).
11 Plants forming colonies by rhizomes, stolons, and/or prostrate sterile shoots with evergreen to semi-evergreen leaves; flowering shoots 1-4 (-5) dm tall.
12 Plants with rhizomes and stolons tipped with clustered, evergreen, linear to lanceolate leaves 3-12 cm long, 5-10 (-12) mm wide..... ***P. buckleyi***
12 Plants with prostrate sterile shoots with scattered, semi-evergreen, spatulate to obovate leaves 1.5-4.5 cm long, 5-16 mm wide ..... ***P. stolonifera***
11 Plants not colony-forming by rhizomes or stolons; flowering shoots (3-) 5-20 dm tall.
13 Leaf margin ciliate-serrulate; lateral veins of the leaves readily apparent, these joining to form a connecting vein parallel to the leaf margin.
14 Bracts of the inflorescence pubescent with glandular hairs; corolla tube glabrous; leaves opposite; nodes usually 8-15; leaves usually 2-3× as long as wide ..... ***P. amplifolia***
14 Bracts of the inflorescence pubescent with non-glandular hairs; corolla tube pubescent (rarely glabrous); leaves subopposite (at least near the inflorescence); nodes usually 15-40; leaves usually 3-4× as long as wide..... ***P. paniculata***
13 Leaf margin smooth or slightly rough; lateral veins of the leaves not readily apparent, not forming a connecting vein parallel to the leaf margin.
15 Flowering shoots arising from decumbent stems; nodes below the inflorescence 3-7
16 Sterile, decumbent stems short; nodes (3-) 4 (-5) ..... ***P. ovata***
16 Sterile, decumbent stems elongate; nodes (5-) 6 (-7)..... ***P. pulchra***
15 Flowering shoots arising from rhizomes; nodes below the inflorescence 7 or more.
17 Cymes several, the lower on rather short and uniform peduncles, thus the inflorescence as a whole subcylindric in outline.
18 Nodes 7-15, well-spaced; upper leaves oblong to ovate, cordate at the base; flowering early summer..... ***P. maculata* var. *maculata***
18 Nodes 16-35, crowded; upper leaves lanceolate to ovate-oblong; truncate to subcordate at the base; flowering late summer.... ***P. maculata* var. *pyramidalis***
17 Cymes solitary or several, if several then the lower on long peduncles, thus the inflorescence as a whole broadly rounded or even flat-topped.
19 Calyx subcylindric, the sepals fairly broad, with a rather weak midrib, the junction-membranes thin, narrow, becoming markedly plicate-keeled ..... ***P. carolina***
19 Calyx subcampanulate, the sepals narrow with a well-developed midrib, the junction-membranes firm, broad and flat (to slightly plicate-keeled)..... ***P. glaberrima***

Phlox amoena Sims, Hairy Phlox, Chalice Phlox. Dry woodlands and forests, roadbanks, sandhills. April-June; June-July. W. NC west to s. KY, south to n. FL and MS. [= C, F, G, S, W; = *P. amoena* ssp. *amoena* – K, Z; < *P. amoena* – RAB, WH (also see *P. lighthipei*)]

Phlox amplifolia Britton, Broadleaf Phlox. Moist forests, particularly over mafic rocks. July-August. W. VA west to s. IN and se. MO, south to w. NC, AL, and n. AR. [= RAB, C, F, G, K, S, W, WV, Z]

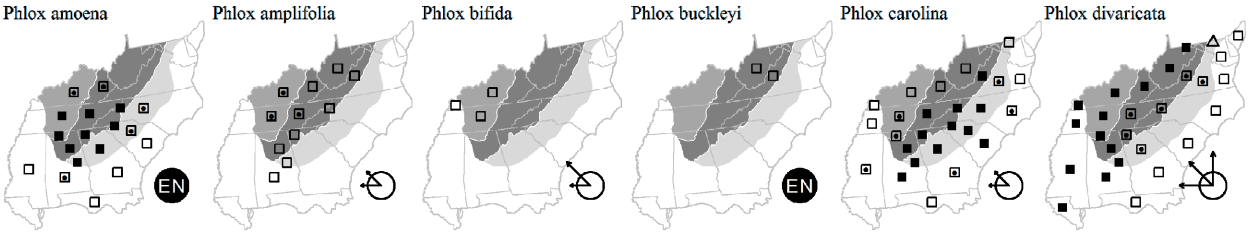
Phlox bifida Beck, Ten-point Phlox. Cliffs, rock outcrops, dry rocky or sandy sites. MI west to MN, south to c. TN (Chester, Wofford, & Kral 1997) and nw. AR. [= *Phlox bifida* Beck ssp. *bifida* – K, Z; > *Phlox bifida* Beck ssp. *stellaria* (A. Gray) Wherry – K, Z; > *Phlox bifida* Beck var. *bifida* – C, F, G; > *P. bifida* var. *cedraria* (Brand) Fernald – C, F, G; > *Phlox bifida* Beck var. *stellaria* (A. Gray) Wherry – G, K, Z]

Phlox buckleyi Wherry, Swordleaf Phlox, Shale-barren Phlox. Shale woodlands and woodland edges, shaley roadbanks. May-June. Endemic to w. VA and e. WV. [= C, F, G, K, W, WV, Z]

Phlox carolina Linnaeus, Carolina Phlox, Thick-leaf Phlox, Giant Phlox. Forests, woodlands, woodland borders, barrens. May-July. VA, WV, IL and MO south to s. GA, s. AL, s. MS, se. LA and e. TX. [= RAB, G, S, W; < *P. glaberrima* – C; > *P. carolina*

ssp. *alta* Wherry – K, Z; > *P. carolina* ssp. *angusta* Wherry – K, Z; > *P. carolina* ssp. *carolina* – K, Z; > *P. carolina* ssp. *turritella* Wherry – K, Z]

Phlox divaricata Linnaeus, Eastern Blue Phlox, Timber Phlox. Moist deciduous forests in circumneutral soils. April-May. VT and QC west to MN, south to e. NC, GA, Panhandle FL, and TX. [= RAB, S, W, WH, WV; > *P. divaricata* var. *divaricata* – C, F, G; > *P. divaricata* var. *laphamii* A.W> Wood – C, F, G; > *P. divaricata* ssp. *divaricata* – K, Z; = *P. divaricata* ssp. *laphamii* (A.W. Wood) Wherry – K, Z]



* ***Phlox drummondii*** Hooker, Annual Phlox, Drummond Phlox. Dry sandy soils of roadsides, fields, disturbed areas; native of TX. April-July. Wherry recognized 3 subspecies in *P. drummondii*, all endemic to TX; it does not seem meaningful to try to distinguish infraspecific taxa in our area, since our plants are the progeny of various cultivars derived from hybrids and selections of the wild taxa. [= RAB, F, G, S, WH; > *P. drummondii* spp. *drummondii* – K, Z]

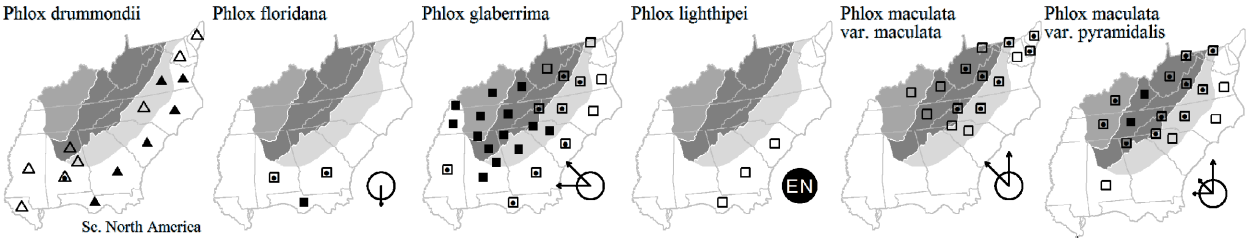
Phlox floridana Bentham. Sandhills. Sw. GA and se. AL south to FL Panhandle and nw. peninsular FL. [= K, S, WH, Z]

Phlox glaberrima Linnaeus, Smooth Phlox. Wet forests and woodlands, especially bottomlands. April-June; June-July. MD, OH, IN, IL, WI, and MO south to Panhandle FL, LA, and OK. [= F, G, S, W; > *P. glaberrima* ssp. *glaberrima* – RAB, K, Z; > *P. glaberrima* ssp. *triflora* (Michaux) Wherry – RAB, K, Z; > *Phlox glaberrima* Linnaeus ssp. *interior* (Wherry) Wherry – K, Z; > *Phlox glaberrima* Linnaeus var. *interior* Wherry – F; > *P. carolina* Linnaeus var. *triflora* (Michaux) Wherry – F; > *Phlox glaberrima* Linnaeus var. *interior* Wherry; < *P. glaberrima* – C, WH]

Phlox lighthipei Small, Lighthipe's Phlox. Dry to moist sandy soils. April-May; June-July. S. SC south to n. FL. [= S; = *P. amoena* ssp. *lighthipei* (Small) Wherry – K, Z; < *P. amoena* – RAB, WH]

Phlox maculata Linnaeus *var.* ***maculata***, Northern Meadow Phlox. Moist forests and openings. June-July. S. QC west to MN, south to c. NC, KY, and IA. [= F, G, WV; = *P. maculata* ssp. *maculata* – K, Z; < *P. maculata* – C, S]

Phlox maculata Linnaeus *var.* ***pyramidalis*** (J.E. Smith) Wherry, Leafy Meadow Phlox. Moist forests and openings. July-September. PA, OH, s. IN, and se. MO, south to NC, n. GA, and TN. [= *P. maculata* ssp. *pyramidalis* (J.E. Smith) Wherry – RAB, K, Z; = *P. maculata* var. *purpurea* Fernald – F, G, WV; < *P. maculata* – C, S]



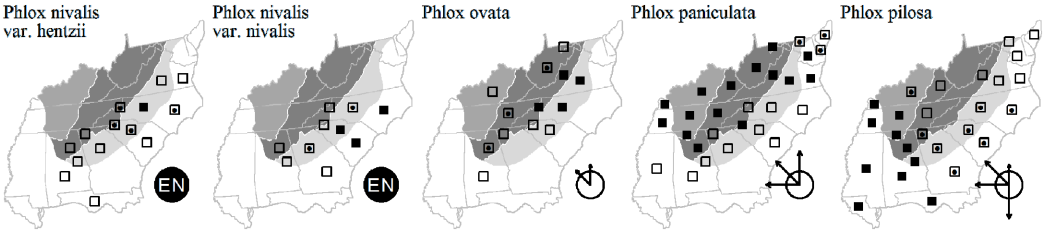
Phlox nivalis Loddiges ex Sweet *var.* ***hentzii*** (Nuttall) Wherry, Trailing Phlox. Rock outcrops, thin soils of rocky woodlands, roadbanks. March-May. Sc. VA west to n. AL, south to c. peninsular FL and s. AL. [= RAB; < *P. nivalis* – C, F, S, W, WH; < *P. hentzii* – G; = *P. nivalis* ssp. *hentzii* (Nuttall) Wherry – K, Z]

Phlox nivalis Loddiges ex Sweet *var.* ***nivalis***, Pineland Phlox. Sandhills, other dry woodlands, roadbanks. March-May. Nc. NC south to Panhandle FL. A third taxon, *P. nivalis* ssp. *texensis* Lundell is endemic in e. TX. [= RAB; < *P. nivalis* – C, F, S, W, WH; < *P. hentzii* – G; = *P. nivalis* ssp. *nivalis* – K, Z]

Phlox ovata Linnaeus, Mountain Phlox, Appalachian Phlox, Allegheny Phlox. Moist forests, woodlands, woodland borders, and barrens. May-June; July. PA to NC and ne. TN in the Appalachians; disjunct in OH and IN. See Locklear (2011) for a discussion of the nomenclatural issue involving *P. ovata* and *P. latifolia*. [= RAB, C, F, G, S, W, WV, Z; = *Phlox latifolia* Michaux – K1]

Phlox paniculata Linnaeus, Garden Phlox. Streambanks, moist forests, woodlands, and woodland borders. July-August; September. S. NY west to IL and MO, south to e. NC, w. SC, n. GA, n. MS, and AR. [= RAB, C, F, G, K, S, W, WV, Z]

Phlox pilosa Linnaeus, Downy Phlox. Dry to mesic woodlands and forests, roadbanks. April-May; May-June. PA west to se. ND, south to c. peninsular FL and TX. [= *P. pilosa* – RAB, S, W, WH; > *P. pilosa* ssp. *pilosa* – K, Z; > *P. pilosa* Linnaeus ssp. *detonsa* (A. Gray) Wherry – K, Z; > *P. pilosa* Linnaeus ssp. *deamii* Levin – K; > *P. pilosa* Linnaeus ssp. *ozarkana* (Wherry) Wherry – K, Z; > *P. pilosa* var. *pilosa* – C, F, G; < *P. pilosa* – RAB, S, W, WH]



Phlox pulchra Wherry, Alabama Phlox. {habitat} Endemic to c. AL. [= K] {add to synonymy}

Phlox stolonifera Sims, Creeping Phlox. Moist forests. April-May; May-June. PA and s. OH south to w. NC, n. GA, and e. TN, essentially a Southern and Central Appalachian endemic. This species is sometimes locally abundant, as in parts of Great Smoky Mountains National Park. [= RAB, C, F, G, K, S, W, WV, Z]

Phlox subulata Linnaeus, Moss Phlox, Mountain-pink. Dry and exposed rock outcrops, rocky flood-scoured riversides, dry woodlands over a wide variety of rocks, shale barrens. April-May. NY and OH south to w. NC and TN; escaped or naturalized more widely from horticultural use. Infraspecific taxa that are sometimes recognized seem poorly correlated with morphology nd geography. [= RAB, S, W; > *P. subulata* var. *australis* – G; > *P. subulata* var. *setacea* (Linnaeus) Brand – C; > *P. subulata* var. *brittonii* – F, WV; > *P. subulata* ssp. *australis* (Wherry) Wherry – K, Z; > *P. subulata* ssp. *brittonii* (Small) Wherry – K, Z; > *P. brittonii* Small – S; > *P. subulata* var. *subulata* – C, F, WV; < *P. subulata* var. *subulata* – C (also see var. *brittonii*); > *P. subulata* var. *ciliata* Wherry – G; > *P. subulata* ssp. *subulata* – K, Z]

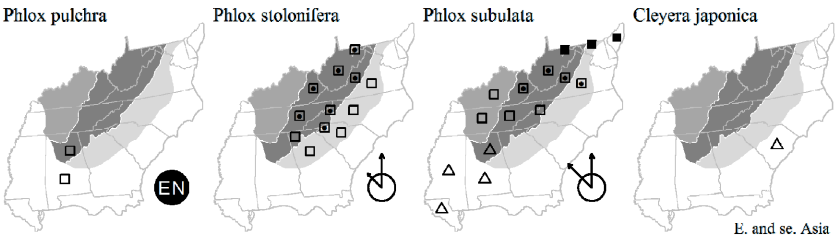
330. PENTAPHYLACACEAE Engler 1897 (Pentaphylax or Sakaki Family) [in ERICALES]

A family of 12 genera and ca. 340 species, of the tropics and subtropics (a few of warm temperate areas), mainly of Asia and America. There is nomenclatural dispute over whether to use the name Pentaphylacaceae (which is conserved) or the older Ternstroemiaceae. References: Weitzman, Dressler, & Stevens in Kubitzki (2004).

Cleyera Thunberg 1783 (Sakaki)

A genus of about 8 species, of e. Asia, se. Asia, and tropical America.

* ***Cleyera japonica*** Thunberg, Sakaki. Moist forests and bluffs; native of e. Asia (Japan, China, Nepal, n. India, Myanmar). Locally and aggressively naturalizing at Kalmia Gardens, Coker College, Hartsville, Darlington County, SC, where perhaps planted as long ago as the 1930s. [= K1; = *Ternstroemia japonica* (Thunberg) Thunberg]



331. SAPOTACEAE A.L. de Jussieu 1789 (Sapodilla Family) [in ERICALES]

A family of about 53-54 genera and 1100-1250 species, trees and shrubs, primarily tropical (rarely temperate), of Old World and New World. References: Elisens, Whetstone, & Wunderlin in FNA 2009); Pennington in Kubitzki (2004); Govaerts, Frodin, & Pennington (2001).

Sideroxylon Linnaeus 1754 (Bumelia, Buckthorn, Bully)

As defined broadly by Pennington (1991), *Sideroxylon* includes about 75 species, widely distributed in the New World and Old World Tropics (our species are the northern tip of a "tropical iceberg"). Pennington found that no consistent set of characters could be used to separate *Bumelia* from other New World genera (such as *Mastichodendron* and *Dipholis*), and that the New World segregate genera were also not separable from several Old World genera. The Linnaean *Sideroxylon* has nomenclatural priority. References: Elisens & Jones in FNA (2009); Clark (1945)=V; Cronquist (1945)=Q; Pennington (1991)=Z; Godfrey (1988)=Y; Govaerts, Frodin & Pennington (2001)=X; Allison (2006)=U. Key adapted from Y.

1 First-year twigs persistently pubescent; leaves pubescent beneath with appressed to tomentose hairs, ranging in color (depending partly on age) from silvery through coppery to dark brown;.
2 Mature leaves densely pubescent beneath, the hairs sericeous, matted and shiny; leaves 2-5 (-7) cm long, 0.5-2 (-3) cm wide .....***S. tenax***

2 Mature leaves pubescent beneath, the hairs woolly-tomentose, neither matted nor shiny; leaves 1-10 cm long, 0.5-4 cm wide.
3 Low shrub, 0.1-0.3 (-1) m tall, clonal from subterranean stems; berries (8-) 10-13 mm long ..... ***S. rufohirtum***
3 Shrub or small tree, to 12 m tall, sometimes multistemmed but not extensively clonal; berries 6-8 mm long.
4 Leaf pubescence persistently tawny or red..... ***S. lanuginosum*** *ssp.* ***lanuginosum***
4 Leaf pubescence slightly tawny when leaves are first emerging, later becoming gray or white ..... ***S. lanuginosum*** *ssp.* ***oblongifolium***
1 First-year twigs pubescent when young, soon becoming glabrous or nearly so; leaves glabrous, glabrate, or sparsely pubescent beneath with appressed blond hairs or cottony white hairs (or densely appressed metallic-silvery pubescent in *S. alachuense*).
5 Low shrub, 0.1-0.5 (-1) m tall, clonal from subterranean stems; leaves 1-4 (-5.2) cm long; [endemic to xeric sands in GA] .... ***S. macrocarpum***
5 Shrub or small tree, to 20 m tall, sometimes multistemmed but not extensively clonal; leaves 1-12 (-15) cm long; [collectively widespread].
6 Lower leaf surface with dense, metallic-silvery, appressed pubescence; stems of shoots of the season pale gray or silvery .... ***S. alachuense***
6 Lower leaf surface glabrous or glabrescent, green; {stems…}.
7 Leaf blade not conspicuously reticulate ..... ***S. celastrinum***
7 Leaf blade conspicuously reticulate (see below).
8 Upper surfaces of the mature leaf blades faintly and coarsely reticulate-veined (at 20× or greater magnification), the veins of the reticulum not at all raised, usually somewhat impressed, and, although pale, not bony-cartilaginous ..... ***S. thornei***
8 Upper surfaces of the mature leaf blades notably finely reticulate-veined (at 20× or greater magnification), the veins of the reticulum usually raised above the enclosed islets, and bony-cartilaginous in contrast to the green islets.
9 Larger leaf blades 8-12 (-15) cm long; large shrub or small tree, the stem usually solitary; berries 10-15 mm long, 10-12 mm in diameter; [of NC, SC, and VA and southward] ..... ***S. lycioides***
9 Larger leaf blades 2-5 (-7) cm long; small to large shrub, usually multi-stemmed; berries 5-8 mm long, ca. 5 mm in diameter; [of SC and southward] ..... ***S. reclinatum*** *ssp.* ***reclinatum***

Sideroxylon alachuense L.C. Anderson, Alachua Bully, Silver Buckthorn. Sandy hammocks, shell middens. S. GA south to c. peninsular FL. [= FNA, K; = *Bumelia anomala* (Sargent) R.B. Clark – V, Y; = *S. alachense* – X, misspelled; = *B. lanuginosa* (Michaux) Persoon var. *anomala* Sargent]

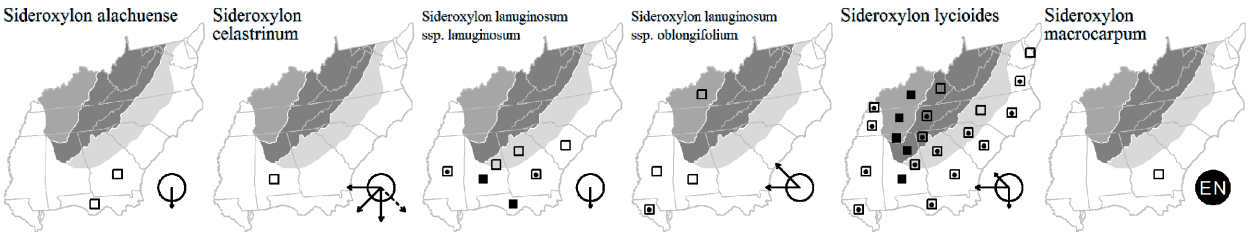
Sideroxylon celastrinum (Kunth) T.D. Pennington, Saffron-plum. Sandy hammocks. Peninsular FL (immediately south of our area), s. AL, s. TX, south through Mexico and Central America to n. South America; West Indies. [= FNA, K2, WH, X; = *Bumelia celastrina* Kunth]

Sideroxylon lanuginosum Michaux *ssp.* ***lanuginosum***, Eastern Gum Bumelia, Eastern Gum Bully. Mesic to floodplain forests. E. GA south to nc. FL, west to LA. Other subspecies are more western. Reported for SC by Kartesz (1999) {investigate}. [= FNA, X; > *S. lanuginosum* ssp. *lanuginosum* – K; > *S. lanuginosum* ssp. *albicans* (Sargent) Kartesz & Gandhi – K; = *Bumelia lanuginosa* ssp. *typica* Q; < *Bumelia lanuginosa* (Michaux) Persoon – S; > *B. lanuginosa* var. *lanuginosa* – V; > *B. rufa* Rafinesque – V; = *B. lanuginosa* ssp. *lanuginosa* – Y; < *S. lanuginosum* – Z]

Sideroxylon lanuginosum Michaux *ssp.* ***oblongifolium*** (Nuttall) T.D. Pennington, Western Gum Bumelia, Western Gum Bully. Hammocks and mesic to dry forests. AL and KY west to KS, OK, and TX. [= FNA, K, X; = *Bumelia lanuginosa* (Michaux) Persoon var. *oblongifolia* (Nuttall) R.B. Clark – C, F, G, V; = *Bumelia lanuginosa* ssp. *oblongifolia* (Nuttall) Cronquist var. *oblongifolia* (Nuttall) R.B. Clark – Q; < *S. lanuginosum* – Z]

Sideroxylon lycioides Linnaeus, Buckthorn Bumelia, Buckthorn Bully. Maritime forests, maritime scrub, river bluffs, swamp margins, usually in circumneutral soil (over shell hash, coquina limestone, marl, or limestone), in the Piedmont and Mountains in rich, mesic forests over mafic or calcareous rocks. June-July; September-October. Se. VA south to Panhandle FL, west to se. TX, north in the interior to s. IN, s. IL, and se. MO, mostly on the Coastal Plain, but extending (in our area in NC and SC) to the upper Piedmont and north in the interior (primarily on limestone) to KY and TN. This species is extremely variable in leaf shape; though described in most works as up to 10-12 cm long and up to 4 cm wide, the leaves can be to 15 cm long and 8 cm wide. The leaf apex can be acuminate, acute, rounded, or notched. [= FNA, K, X, Z; = *Bumelia lycioides* (Linnaeus) Persoon – RAB, C, G, GW, S, Y; > *B. lycioides* var. *lycioides* – F, V; > *B. lycioides* var. *virginiana* Fernald – F, V; > *B. lycioides* var. *ellipsoidalis* R.B. Clark – V; > *B. smallii* R.B. Clark – F]

Sideroxylon macrocarpum (Nuttall) J.R. Allison, Big-fruited Buckthorn, Ohoopee Bumelia, Ohoopee Bully. Longleaf pine sandhills. Endemic to sc. GA (Appling, Candler, Emanuel, Evans, Jeff Davis, Laurens, Long, Montgomery, Pierce, Tattnall, Toombs, Treutlen, and Wheeler counties). [= FNA, U; < *B. reclinata* (Michaux) Ventenat var. *reclinata* – Q, Y; < *B. reclinata* – V; = *Bumelia macrocarpa* Nuttall]



Sideroxylon reclinatum Michaux *ssp.* ***reclinatum***, Smooth Bumelia, Florida Bully. Floodplain forests and river margins. Ssp. *reclinatum* ranges from s. SC and se. GA south to s. peninsular FL. Ssp. *austrofloridense* (Whetstone) Kartesz & Gandhi [= K; *Bumelia reclinata* (Michaux) Ventenat var. *austrofloridensis* Whetstone] occurs in peninsular FL. [= FNA, K, X; > *Bumelia reclinata* – S; > *B. microcarpa* Small – S; < *B. reclinata* (Michaux) Ventenat var. *reclinata* – Q, Y; < *B. reclinata* – V; < *S. reclinatum* – Z]

Sideroxylon rufohirtum Herring & Judd, Red-haired Bully. Hammocks. Endemic to FL: ne. FL south to c. peninsular FL. [= FNA; = *S. reclinatum* Michaux ssp. *rufotomentosum* (Small) Kartesz & Gandhi – K, X; = *Bumelia rufotomentosa* Small – V, S, Y; = *B. reclinata* (Michaux) Ventenat var. *rufotomentosa* (Small) Cronquist – Q]

Sideroxylon tenax Linnaeus, Tough Buckthorn, Tough Bumelia, Tough Bully. Maritime scrub, maritime forests, also inland in hammocks. May-June; September-October. Se. NC south to s. peninsular FL. [= FNA, K, X, Z; = *Bumelia tenax* (Linnaeus) Willdenow – RAB, Q, V, Y; > *B. tenax* – S; > *B. lacuum* Small – S]

Sideroxylon thornei (Cronquist) Pennington, Thorne's Bumelia, Swamp Bumelia. Bottomlands and limesink depressions, particularly over calcareous substrates. May-June; August-early October. Ne. GA south to Panhandle FL, and west to AL. The validity of this species has been supported by Anderson (1996). [= FNA, K, X, Z; = *Bumelia thornei* Cronquist – Y]

332. EBENACEAE Gürcke 1891 (Ebony Family) [in ERICALES]

A family of 2-6 genera and 500-600 species, trees and shrubs, distributed in tropical and subtropical (rarely warm temperate) regions. References: Eckenwalder in FNA (2009); Wallnöfer in Kubitzki (2004).

Diospyros Linnaeus 1753 (Persimmon)

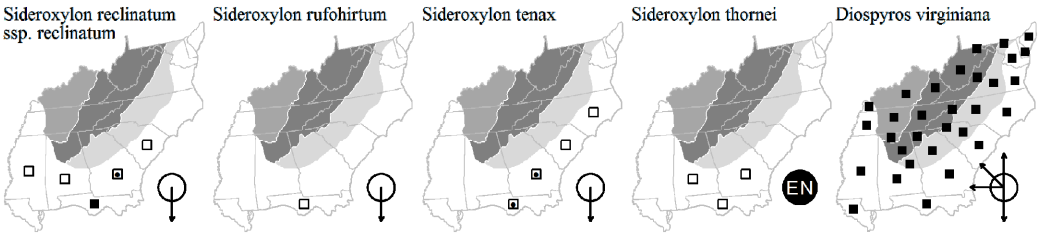
A genus of 500-600 species, trees and shrubs, of tropical and subtropical regions (with very few exceptions). The genus includes a variety of tropical trees called ebony in the wood trade. References: Eckenwalder in FNA (2009); Spongberg (1977)=Z; Wallnöfer in Kubitzki (2004).

Identification notes: Seedlings and fire sprouts are superficially very similar to *Nyssa sylvatica*, but can be separated in the following ways: bundle scar 1 per bud scar, narrowly crescent-shaped (vs. *Nyssa* with 3 distinct, circular, bundle scars arranged in a broad V pattern), leaves never with teeth (vs. *Nyssa* leaves sometimes with a few irregular teeth), leaves glabrate to tomentose with curly hairs (vs. glabrous or with a few straight, forward-pointing hairs), leaves with sessile to short-stipitate glands on upper surface of midrib and outer petiole, later becoming necrotic spots (vs. leaves without glands).

1 Twigs stout, reddish-pubescent; fruits to 10 cm in diameter; [cultivated alien] ..... ***[D. kaki]***
1 Twigs slender, glabrous or with gray pubescence; fruits to 4 cm in diameter; [native] ..... ***D. virginiana***

* *Diospyros kaki* Linnaeus f., Kaki, Kaki-plum, Japanese Persimmon. Rarely grown in our area for its fruits, which are much larger than *D. virginiana* (to 9 cm in diameter). [= FNA, Z] {not mapped; rejected as a component of our flora}

Diospyros virginiana Linnaeus, American Persimmon, Possumwood. Dry woods, sandhills, disturbed places, floodplain and mesic forests, fencerows. May-June; September-December (and persisting). CT, PA, OH, IN, IL, MO, and e. KS south to s. FL and TX. East of the Mississippi River, *D. virginiana* var. *virginiana* has leaves cuneate to rounded at the base, and glabrous or glabrescent; mostly west of the Mississippi River and perhaps eastward along the Coastal Plain, *D. virginiana* var. *pubescens* (Pursh) Dippel has leaves subcordate, and persistently pubescent. Though these differences seem relatively trivial, they are consistent, geographically correlated, and may be worthy of varietal recognition. Persimmons are famous for their sweet and edible fruits, and infamous for the bitter-astringency of the not fully ripe fruit. The species is dioecious, the male trees appear to reach a greater size than the females. The wood is one of the heaviest and hardest in e. North America. [= RAB, FNA, GW, K, W, WH, WV; > *D. virginiana* var. *virginiana* – C, F, G, Z; > *D. virginiana* var. *pubescens* (Pursh) Dippel; > *D. virginiana* – S; > *D. mosieri* Small – S]



333. PRIMULACEAE Ventenat 1799 (Primrose Family) [in ERICALES]

As broadly circumscribed to include Myrsinaceae and Samolaceae, cosmopolitan in distribution. Following the discovery that various herbaceous and largely temperate genera (*Lysimachia*, *Trientalis*, *Anagallis*, *Samolus*, etc.) traditionally placed in Primulaceae actually were more closely related to the largely tropical and woody Myrsinaceae, various authors, including Källersjö, Bergqvist, & Anderberg (2000) and Martins, Oberprieler, & Hellwig (2003) proposed the transfer of *Lysimachia*, *Anagallis*, and *Trientalis* to Myrsinaceae and of *Samolus* to Theophrastaceae. APG III (2009) alternatively merges Samolaceae and Myrsinaceae into Primulaceae, and recognizes variation at the subfamilial and tribal ranks; this approach is followed here. References: Cholewa in FNA (2009); Cholewa & Kelso in FNA (2009); Cholewa, Pipoly, and Ricketson in FNA (2009); Channell & Wood (1959); APG III (2009); Källersjö, Bergqvist, & Anderberg (2000); Martins, Oberprieler & Hellwig (2003);

Anderberg in Kubitzki (2004); Ståhl in Kubitzki (2004), Ståhl & Anderberg in Kubitzki (2004). [including *MYRSINACEAE* and *SAMOLACEAE*]

1 Aquatic; leaves pectinate (deeply pinnatifid into linear segments); [subfamily *Primuloideae*] ..... ***2. Hottonia***
1 Terrestrial (though sometimes in wetlands or submersed for short periods of time); leaves entire or shallowly toothed.
2 Shrub or tree; [of FL, LA, and southward]; [subfamily *Myrsinoideae*].
3 Flowers in axillary cymes of many flowers; leaf margins crenulate ..... ***4. Ardisia***
3 Flowers in fascicles of 5-9, on short stalks directly on the stem; leaf margins entire ..... ***5. Myrsine***
2 Herb; [collectively widespread].
4 Leaves strictly in a basal rosette or basally disposed (with a basal rosette and smaller stem leaves).
5 Inflorescence an umbel; leaves strictly basal; [subfamily *Primuloideae*] ..... ***3. Primula***
5 Inflorescence a raceme or a panicle of racemes; larger leaves basal and smaller leaves on the stem; [subfamily *Theophrastidoideae*, tribe *Samoleae*] ..... ***1. Samolus***
4 Leaves all or chiefly cauline.
6 Leaves alternate (or with some opposite or subopposite); flowers white; [subfamily *Myrsinoideae*].
7 Flowers axillary, nearly sessile; leaves 3-10 mm long ..... ***6. Anagallis***
7 Flowers in a terminal raceme, pedicellate, the flowers closely spaced, touching, the inflorescence thus appearing cylindrical, and generally drooping at the tip (reminiscent of *Saururus cernuus*); leaves longer; [introduced, rarely naturalized in upland situations] ..... ***8. Lysimachia***
6 Leaves opposite or whorled; flowers yellow, white, pink, red, or blue.
8 Leaves in a single terminal whorl; petals 7 ..... ***7. Trientalis***
8 Leaves opposite or whorled (if whorled, with several to many whorls); petals 0 or 5.
9 Leaves > 2 cm long (sometimes less in *L. nummularia*, and then orbicular, about as wide as long); flowers yellow ..... ***8. Lysimachia***
9 Leaves < 2 cm long (and distinctly longer than wide); flowers red, blue, white, or pink.
10 Flowers on long pedicels; corolla present ..... ***6. Anagallis***
10 Flowers nearly sessile; corolla absent ..... ***8. Lysimachia***

1. Samolus Linnaeus 1753 (Water-pimpernel)

A genus of about 10-15 species, herbs and subshrubs, nearly cosmopolitan. References: Cholewa in FNA (2009); Ståhl in Kubitzki (2004).

1 Pedicels ebracteate; corolla 3-7.5 mm long, the flowers 5-7 mm across; leaves all below the inflorescence; calyx lobes equaling or longer than tube; staminodes absent ..... ***S. ebracteatus***
1 Pedicels with a minute bract near the middle; corolla 1.2-3 mm long, the flowers 2-3 mm across; leaves extending into the inflorescence; calyx lobes equaling or shorter than tube; staminodes present ..... ***S. parviflorus***

Samolus ebracteatus Humboldt, Bonpland, & Kunth, Limewater Brookweed. Cp (FL): brackish marshes, swamps over calcareous substrate; rare. Peninsular FL, coastal Panhandle FL, sw. LA, and TX, south into Mexico; West Indies. [= FNA, GW, WH; > *S. ebracteatus* ssp. *ebracteatus* – K; > *S. ebracteatus* ssp. *alyssoides* – K]

Samolus parviflorus Rafinesque, Water-pimpernel, Brookweed. Cp (DE, FL, GA, NC, SC, VA), Pd (GA, NC, SC, VA), Mt (GA, VA, WV): stream banks, brackish marshes, pools in floodplains, interdune ponds; common (uncommon in WV). April-October. NB west to BC, south to Central America; also in c. and s. South America. Sometimes treated as a subspecies of the European *S. valerandi*; the American plant is sufficiently distinct to warrant specific status. *S. parviflorus* has priority over *S. floribundus* by a month. [= RAB, F, FNA, GW, W, WV; = *Samolus floribundus* Kunth – C, G, S; = *S. valerandi* Linnaeus ssp. *parviflorus* (Rafinesque) Hultén – K, WH]

2. Hottonia Linnaeus 1753 (Water-violet)

A genus of 2 species, aquatic herbs, of North America and Eurasia. References: Cholewa in FNA (2009); Anderberg in Kubitzki (2004).

Hottonia inflata Elliott, Featherfoil, Water-violet. Cp (DE, NC, SC, VA), Pd (GA, NC), Mt (WV): slow-moving or stagnant waters of swamps, millponds, beaverponds, sag ponds, oxbows, rivers, probably dispersed by waterfowl, primarily in the Coastal Plain, very rarely in the Piedmont and Mountains; rare. April-July; May-August. ME south to GA, west to TX, inland up the Missisippi Embayment to IL, and at other scattered locations inland (as w. WV, and especially around the Great Lakes). The species shows large population fluctuations, and may be essentially ephemeral at many locations. Townsend (1995) documents its first SC record. [= RAB, C, F, FNA, G, GW, K, S, WV]

3. Primula Linnaeus 1753 (Shooting star)

A genus of about 450 species, primarily of the temperate Northern Hemisphere. Mast et al. (2004) show that *Dodecatheon* is nested within *Primula*, and is closely related to (and derived from) *Primula* subgenus *Auriculastrum*, apparently via a relatively

simple alteration of the corolla for buzz-pollination. References: Reveal in FNA (2009); Mast & Reveal (2007)=Y; Fassett (1944)=Z; Mast et al. (2004).

1 Leaves cordate, subcordate, or abruptly narrowed to the petiole ..... ***P. frenchii***
1 Leaves long-cuneate at the base, gradually narrowed to the petiole ..... ***P. meadia***

Primula frenchii (Vasey) A.R. Mast & Reveal, French's Shooting-star. Ledges, cliffs. April-May. IN, IL, and MO south through KY to AL and AR. [= Y; = *Dodecatheon meadia* Linnaeus var. *frenchii* Vasey – C, F, G, Z; = *D. frenchii* (Vasey) Rydberg – FNA, K]

Primula meadia (Linnaeus) A. R. Mast & Reveal, Eastern Shooting Star. Mt (GA, NC, SC, VA, WV), Pd (GA, NC, SC, VA), Cp (FL, SC): rich forests, woodlands, and rock outcrops (primarily calcareous or mafic), especially with nutrient-rich seepage; uncommon (rare in NC). Late March-early June; late May-June. MD and PA west to s. WI, se. MN, IA, and OK, south to sc. SC, n. GA, n. FL (Gadsden County), AL, and TX. [= Y; = *Dodecatheon meadia* – RAB, FNA, W, WH, WV; > *D. meadia* Linnaeus var. *meadia* – C, F, G, Z; > *Dodecatheon meadia* Linnaeus var. *brachycarpum* (Small) Fassett – C, F, G, Z; > *D. meadia* ssp. *meadia* – K; > *D. meadia* ssp. *brachycarpum* (Small) R. Knuth – K; > *D. brachycarpa* Small – S; > *D. meadia* – S; > *D. hugeri* Small – S; > *D. meadia* var. *genuinum* – Z; > *D. meadia* var. *obesum* Fassett – Z]

4. Ardisia Swartz 1788 (Marlberry)

A genus of 400-500, trees and shrubs, of tropical America, Asia, and Australia. References: Pipoly & Ricketson in FNA (2009); Ståhl & Anderberg in Kubitzki (2004).

* ***Ardisia crenata*** Sims, Coral Ardisia, Coralberry, Spiceberry, Hen's Eyes. Cp (FL, GA): moist suburban forests, floodplains, mesic flatwoods; rare, native of Asia. Naturalized from horticultural use in s. GA (Lowndes and Thomas counties [Carter, Baker, & Morris 2009]), FL Panhandle, and FL peninsula. [= FNA, K, WH]

5. Myrsine Linnaeus 1753 (Colicwood)

A genus of about 300 species (if circumscribed to include *Rapanea*), shrubs and trees, pantropical. References: Pipoly & Ricketson in FNA (2009); Ståhl & Anderberg in Kubitzki (2004).

Myrsine cubana A. de Candolle, Myrsine, Colicwood. Cp (FL): hammocks; rare. Dixie, Levy, and Volusia counties FL, south to s. FL; West Indies and Central America. [= FNA; ? *M. guianensis* (Aublet) Kuntze – GW, misapplied; > *M. floridana* A. de Candolle – K (superfluous name); ? *M. guayanensis* – S, misapplied, orthographic variant; ? *Rapanea punctata* (Lamarck) Lundell – WH]

6. Anagallis Linnaeus 1753 (Pimpernel)

A genus of 20-28 species, herbs, mostly Old World. References: Cholewa in FNA (2009); Ståhl & Anderberg in Kubitzki (2004).

1 Leaves alternate; flowers subsessile, on thick pedicels 0.3-1.0 mm long; leaf blades 3-10 mm long ..... ***A. minima***
1 Leaves opposite (occasionally in whorls of 3); flowers pedicellate, on slender pedicels 10-25 mm long; leaf blades 5-30 mm long.
  2 Petals blue, ca. 2× as long as the sepals ..... ***A. monellii***
  2 Petals red or blue (rarely white), ca. 1× as long as the sepals.
    3 Flowers red (rarely white); pedicels usually longer than the leaves ..... ***A. arvensis*** *ssp.* ***arvensis***
    3 Flowers blue; pedicels usually shorter than the leaves ..... ***A. arvensis*** *ssp.* ***foemina***

* ***Anagallis arvensis*** Linnaeus *ssp.* ***arvensis***, Scarlet Pimpernel, Common Pimpernel. Cp (DE, FL, GA, NC, SC, VA), Pd (DE, GA, NC, VA), Mt (VA, WV): lawns, fields, disturbed areas; common (uncommon in WV, rare in FL), native of Europe. April-November. [= K, S; = *A. arvensis* var. *arvensis* – C, G; < *A. arvensis* – RAB, F, FNA, GW, W, WH]

* ***Anagallis arvensis*** Linnaeus *ssp.* ***foemina*** (P. Miller) Schinz & Thellung, Blue Pimpernel. Cp (DE), Pd (DE): disturbed areas; rare, native of Europe. Also reported as introduced in PA, KY, OH, and other scattered states north and west of our area (Kartesz 1999). [= K; = *Anagallis arvensis* Linnaeus var. *caerulea* (Schreber) Grenier & Godron – C, G; < *A. arvensis* – RAB, F, FNA, GW, W; = *A. arvensis* ssp. *coerulea* Hartman – S]

Anagallis minima (Linnaeus) E.H. Krause, Chaffweed, False-pimpernel. Cp (FL, GA, SC), Mt (GA, SC, WV), Pd (GA, VA): ditches, wet disturbed areas, savannas, pond margins; uncommon (rare in Mountains, rare in VA). March-June. This species occurs in widely scattered areas, nearly cosmopolitan. [= FNA, GW, K, WH; = *Centunculus minimus* Linnaeus – RAB, C, F, G, S, W]

* ***Anagallis monellii*** Linnaeus, Blue Pimpernel. Cp (VA): along intermittent stream in suburban woodlands; rare, probably only a waif, native of sw. Europe. Reported for Fairfax County, VA by Harvill et al. (1992) and Shetler & Orli (2000). [= FNA, K]

7. Trientalis Linnaeus 1753 (Starflower)

A genus of 2-4 species, herbs, north temperate. Probably ultimately to be combined into *Lysimachia*. References: Cholewa in FNA (2009); Ståhl & Anderberg in Kubitzki (2004).

Identification notes: *Trientalis* can be recognized by its terminal whorl of leaves (4-10 cm long), the one to several white flowers borne on terminal, slender pedicels, each flower typically with 7 petals (inconspicuously united at the bases), each petal acuminate. The plant is reminiscent of a white-flowered *Lysimachia* with only one whorl of leaves.

Trientalis borealis Rafinesque, Northern Starflower, Maystar. Mt (GA, NC, VA, WV), Cp (DE): northern hardwood forests, rich slope forests, often in second-growth areas; uncommon (rare in DE, GA, and NC). May-June. This northern species, widespread in the mountains of VA, and known from a few locations in n. GA and ne. TN (Chester, Wofford, & Kral 1997), was first located in NC only in 1988 (Dellinger 1989). "The attractive white corollas, usually with 7 petals united only at the very base, are open in the late spring and they drop intact – like fallen stars" (Voss 1996). [= FNA; = *Trientalis borealis* Rafinesque ssp. *borealis* – K; < *T. borealis* – C, F, G, W, WV]

8. Lysimachia Linnaeus 1753 (Loosestrife)

A genus of about 150 species, herbs (rarely shrubs), cosmopolitan. Hao et al. (2004) showed that the traditional subgeneric classification of *Lysimachia* is highly artificial, and that *Glaux* is embedded within *Lysimachia*. References: Cholewa in FNA (2009); Coffey & Jones (1980)=Z; Hao et al. (2004); Ståhl & Anderberg in Kubitzki (2004). Key partly adapted from Z.

1 Petals lacking ..... ***L. maritima***
1 Petals present.
2 Leaves alternate; flowers white, in a terminal raceme, the tip lax while in flower, becoming erect in fruit.
3 Leaf blades linear-elliptic, lanceolate or narrowly ovate ..... ***L. barystachys***
3 Leaf blades broadly elliptic, broadly lanceolate, or broadly ovate ..... ***L. clethroides***
2 Leaves opposite or whorled; flowers yellow, borne variously.
4 Leaves nearly round; plant trailing, rooting at nodes
5 Flowers 5-7 mm across; sepals about 1× as long as the petals ..... ***L. japonica***
5 Flowers 16-24 mm across; sepals about ½× as long as the petals ..... ***L. nummularia***
4 Leaves linear, lanceolate, elliptic, or ovate; plant erect (or trailing and rooting at the nodes in *L. radicans*, which has lanceolate leaves).
6 Flowers in a terminal raceme or panicle, subtended by bracts much smaller than the stem leaves.
7 Inflorescence a terminal panicle ..... ***L. fraseri***
7 Inflorescence a terminal raceme.
8 Leaves narrowly ovate, broadest near the base, with 3 prominent veins ..... ***L. asperulifolia***
8 Leaves linear to lanceolate, broadest near the middle, with 1 prominent vein.
9 Leaves linear to narrowly lanceolate, (1-) 2-4 (-8) mm wide; sepals stipitate-glandular ..... ***L. loomisii***
9 Leaves lanceolate to elliptic, 7-20 mm wide; sepals glabrous.
10 Flowers in part (the lower) in the axils of well-developed leaves ..... ***L. ×producta***
10 Flowers all in the axils of much reduced linear bracts ..... ***L. terrestris***
6 Flowers axillary, all or most of them subtended by leaves similar in shape to (though often somewhat smaller than) stem leaves not subtending flowers (or with flowers in axillary, peduncled, densely-flowered racemes in *L. thyrsiflora*).
11 Flowers in peduncled axillary racemes in the axils of midstem leaves; petals linear to lanceolate, ca. 5 mm long and ca. 1 mm wide, much surpassed by the stamens; [*Naumbergia*] ..... ***L. thyrsiflora***
11 Flowers solitary, all or most of them subtended by leaves similar in shape to (though often somewhat smaller than) normal stem leaves; petals lanceolate to ovate, as long or longer than the stamens.
12 Stem leaves whorled (in adult plants – juvenile plants with opposite leaves or a mixture of opposite and whorled); leaves "punctate" with sinuous, elongate markings (visible with the naked eye, but more readily observed with 10 × magnification).
13 Petals yellow, marked with black lines; sepals 2.5-5 mm long; stem glabrous or sparsely pubescent; [native] .... ***L. quadrifolia***
13 Petals plain yellow, not marked with black lines; sepals 2.5-4.5 mm (L. vulgaris) **or** 5.5-9 mm long (*L. punctata*]; stem hairy; [alien].
14 Calyx lobes 5-8 mm long, green throughout; corolla lobes 12-16 mm long, glandular-ciliolate ..... ***L. punctata***
14 Calyx lobes 3-5 mm long, with red margins; corolla lobes 8-12 mm long, entire ..... ***L. vulgaris***
12 Stem leaves opposite; leaves not "punctuate;" [*Steironema*].
15 Mid-cauline leaves with petioles ciliate their entire length.
16 Mid-cauline leaves 1-2 mm wide; flowers 7-14 mm across; [of ne. AL] ..... ***L. graminea***
16 Mid-cauline leaves 4-60 mm wide; flowers 11-26 mm across; [collectively widespread].
17 Mid-cauline leaves ovate to lanceolate, 17-60 mm wide; sepals with 3 (or 6) usually reddish-brown veins ..... ***L. ciliata***
17 Mid-cauline leaves lanceolate to linear, 4-23 mm wide; sepals without reddish-brown veins.
18 Cilia of the petiole not extending onto the leaf blade; leaf blade lanceolate to ovate, typically 2-4× as long as wide, rounded to cuneate at the base; sepal venation conspicuous; capsules 4-6.5 mm in diameter ..... ***L. hybrida***
18 Cilia of the petiole extending onto the base of the leaf blade; leaf blade lanceolate to linear, typically about 8-12× as long as wide, cuneate at the base; sepal venation inconspicuous or apparently absent; capsules 2-4.5 mm in diameter ..... ***L. lanceolata***
15 Mid-cauline leaves with petioles pubescent only along basal portion.
19 Rhizomes absent, new shoots arising from crown of rootstock ..... ***L. tonsa***
19 Rhizomes present, new shoots arising from the rhizome.

20 Plant reclining or trailing, rooting at the nodes ..... ***L. radicans***
20 Plant erect, not rooting at the nodes.
21 Leaf blades ovate to lanceolate, typically 2-4× as long as wide, rounded to cuneate at the base, with the midrib not prominent; sepals conspicuously veined, 0.5-4 mm wide ..... ***L. hybrida***
21 Leaf blades linear to narrowly lanceolate, typically 8-14× as long as wide, cuneate to tapering at the base, with a prominent midrib; sepals not conspicuously veined, 1-2 mm wide ..... ***L. quadriflora***

Lysimachia asperulifolia Poiret, Pocosin Loosestrife, "Roughleaf Loosestrife". Cp (NC, SC): low pocosins, high pocosins, streamhead pocosins, savanna-pocosin ecotones, sandhill-pocosin ecotones; rare. May-June; August-October. Endemic to the Coastal Plain of NC and SC. *L. asperulifolia* is a very distinctive species, easily recognized vegetatively by its whorls of sessile, rounded-based, acuminate, bluish-green (to yellowish-green when shaded or otherwise stressed) leaves. The leaves of *L. asperulifolia* are not rough; the common name "roughleaf loosestrife" is a misnomer, based on a mistranslation of the specific epithet, the translator assuming that "*asperulifolia*" meant "rough-leaved." The epithet actually refers to the perceived similarity of the leaves to those of the European *Asperula odorata* (treated in this work as *Galium odoratum*), Sweet Woodruff, a plant with which Poiret would have been very familiar. The leaves of *G. odoratum* are similar to those of *L. asperulifolia* in their whorled disposition. Franklin (2001) studied the biology of this rare species. [= FNA, K; = *L. asperulaefolia* – RAB, GW, S (orthographic variant)]

* ***Lysimachia barystachys*** Bunge, Manchurian Loosestrife. Pd (GA): disturbed areas; rare, native of Manchuria. Reported from a single county in nc. GA (Jones & Coile 1988) {further investigate}. [= FNA, K]

Lysimachia ciliata Linnaeus, Fringed Loosestrife. Pd (DE, GA, NC, SC, VA), Mt (GA, NC, SC, VA, WV), Cp (DE, FL, GA, NC, SC, VA): mesic forests, especially bottomlands and coves dominated by hardwoods; common (uncommon in DE Coastal Plain, rare in FL). June-August; August-October. NL (Newfoundland) west to AK, south to GA, Panhandle FL, AL, MS, AR, KS, NE, CO, NM, UT, ID, and OR. [= RAB, C, F, FNA, GW, K, W, WH, WV, Z; = *Steironema ciliatum* (Linnaeus) Baudo – G, S]

* ***Lysimachia clethroides*** Duby, Gooseneck Loosestrife. Mt (NC, WV): roadsides (cultivated and rarely persistent or escaped); rare, native of Japan. July-August. Collected in the Mountains of NC (Macon County), escaped from cultivation; it is also reported as naturalized in Grundy County, TN (Chester, Wofford, & Kral 1997, Kral 1981). It and *L. barystachys* differ from our other species in their white flowers in a dense terminal spike (with secund tip) and alternate leaves. [= C, FNA, G, K]

Lysimachia fraseri Duby, Fraser's Loosestrife. Mt (GA, NC, SC): hardwood forests, forest edges and roadbanks, thin soils around rock outcrops, usually flowering only when exposed to extra sunlight by a tree-fall light gap or other canopy opening; rare. June-August; September-October. W. NC and e. TN south to n. SC, n. GA, and AL; disjunct in s. IL and nw. TN (Stewart County) (Chester, Wofford, & Kral 1997). This rare species is limited in NC to the mountains south of the Asheville Basin, especially in the escarpment gorges of Macon and Jackson counties. Potentially the largest and coarsest of our *Lysimachia* (up to 2 meters tall), *L. fraseri* usually occurs as much smaller seedlings and non-flowering individuals. When a tree-fall light gap occurs, individuals flower and fruit. Even seedlings can be separated from the more common and widespread *L. quadrifolia* by the following characteristics (all best observed at 10×): leaves with a narrow, translucent red border, upper internodes of the stem glandular-puberulent, and backlighted leaf without sinuous, translucent lineations (*L. quadrifolia*: leaves without red border, upper internodes sparsely pubescent with longer, nonglandular hairs, or rarely a few of the hairs with slightly bulbous tips, and backlighted leaf with numerous sinuous, translucent lineations). [= RAB, FNA, GW, K, S, W]

Lysimachia hybrida Michaux, Lowland Loosestrife. Cp (DE, FL, NC, SC, VA), Mt (NC, VA, WV), Pd (NC, VA): mesic hardwood forests, wet areas; rare. June-August; September-October. ME and s. QC west to AB and WA, south irregularly to ne. FL, Panhandle FL, AR, NE, and AZ. [= C, F, FNA, K, W, WV, Z; = *L. lanceolata* var. *hybrida* (Michaux) A. Gray – RAB, GW, WH; = *Steironema hybridum* (Michaux) Rafinesque ex B.D. Jackson – G, S]

* ***Lysimachia japonica*** Thunberg, Japanese Loosestrife, Ko-Nasubi. Mt (WV): grassy places, roadsides, disturbed areas; rare, native of Japan and China. May-October. Reported for WV (FNA 2009, Harmon, Ford-Werntz, & Grafton 2006) and LA (FNA 2009). [= FNA, K, WV]

Lysimachia lanceolata Walter, Lanceleaf Loosestrife. Mt (GA, NC, SC, VA, WV), Pd (GA, NC, SC, VA), Cp (FL, GA, NC, SC, VA): mesic to relatively dry forests, forest edges, roadbanks, primarily on circumneutral soils; uncommon (rare in FL). June-August; September-October. NJ, PA, OH, MI, and WI south to GA, Panhandle FL, AL, MS, LA, and ne. TX. [= C, F, FNA, K, W, WV, Z; = *L. lanceolata* var. *lanceolata* – RAB, GW, WH; = *Steironema lanceolatum* (Walter) Gray – G, S; = *Steironema heterophyllum* (Michaux) Baudo – S]

Lysimachia loomisii Torrey, Carolina Loosestrife. Cp (GA, NC, SC): moist to wet savannas, pocosin ecotones; uncommon (rare in GA). May-June; August-October. Endemic to the outer and middle Coastal Plain of NC, SC, and e. GA. *L.* ×*radfordii* Ahles, a hybrid of *L. loomisii* × *quadrifolia*, is intermediate between its parents. [= RAB, FNA, GW, K, S]

Lysimachia maritima (Linnaeus) Galasso, Banfi, & Soldano, Sea-milkwort. Cp (MD, NJ, VA?): saline coastal habitats; rare. June-July. The species is interruptedly circumboreal, in North America from QC south to VA on the east coast, and from BC south to OR on the west coast, also inland in w. North America, from SK south to NM. G suggests that *L. maritima* is introduced near its southern limit in the east. [= FNA; = *Glaux maritima* Linnaeus – C, K; > *G. maritima* var. *maritima* – F, G]

* ***Lysimachia nummularia*** Linnaeus, Creeping Charlie, Creeping Jenny, Moneywort. Pd (DE, GA, NC, SC, VA), Mt (NC, SC, VA, WV), Cp (DE, NC, SC, VA): lawns, pastures, seepages, other moist, disturbed places; common (uncommon in GA, NC, SC), native of Europe. May-July; August-September. The leaves have many minute, maroon dots. [= RAB, C, F, FNA, G, GW, K, S, W]

Lysimachia ×producta (A. Gray) Fernald (pro sp.). Mt (NC, VA), Pd (VA), Cp (NC): moist areas; rare. May-July; August-October. This is a fertile hybrid of *L. quadrifolia* and *L. terrestris*, sometimes occurring in the apparent absence of one or both parents. [= RAB, C, FNA, K; = *L. producta* (A. Gray) Fernald – G, S]

* ***Lysimachia punctata*** Linnaeus, Large Loosestrife, Spotted Loosestrife. Mt (NC): disturbed areas; rare, native of Eurasia. June-July; August? First found in NC in 1985 (Weakley *in prep.*). [= C, F, FNA, G, K]

Lysimachia quadriflora Sims, Smooth Loosestrife, Four-flowered Loosestrife. Mt (GA, VA, WV): wet meadows and calcareous fens, stream banks; rare. July-September. MA, s. ON, MI, and ND south to w. VA, WV, nw. GA, AL, and AR; mainly north and west of the Ohio River, very rare and scattered in or east of the Appalachians. Reported for c. NC by Coffey & Jones (1980), the record seems very unlikely and is rejected unless documentation is found. [= C, F, FNA, K, W, WV, Z; = *Steironema quadriflora* (Sims) Hitchcock – G]

Lysimachia quadrifolia Linnaeus, Whorled Loosestrife. Mt (GA, NC, SC, VA, WV), Pd (DE, GA, NC, SC, VA), Cp (DE, NC, SC, VA): a wide variety of forests and openings, including pine savannas of the outer Coastal Plain, ranging from moist to very dry; common (uncommon in Coastal Plain south of VA). May-August; August-October. ME west to WI and MN, south to SC, c. GA, AL, and TN. Although the species normally has whorled leaves, immature and small plants often have opposite leaves only. See *L. fraseri* for discussion of vegetative features useful in distinguishing the two species. *L. ×radfordii* Ahles, a hybrid of *L. loomisii* × *quadrifolia*, is intermediate between its parents. [= RAB, C, F, FNA, G, GW, K, S, W, WV]

Lysimachia radicans Hooker, Trailing Loosestrife. Mt (VA), Cp (VA): moist forests, swamps; rare. June-August. The main distribution of this species is in the Mississippi Embayment, from MO and w. TN south to s. AL, MS, AR, LA, and e. TX; disjunct occurrences in VA and (allegedly) e. NC are curious. The report for NC is from a species list for Nags Head Woods, Dare County; it is unpublished, apparently not documented by an herbarium specimen, and rejected unless documentation is found. [= C, F, FNA, K, W, Z; = *Steironema radicans* (Hooker) A. Gray – G, S]

Lysimachia terrestris (Linnaeus) Britton, Sterns, & Poggenburg, Bog Loosestrife, Bog-candles, Swamp-candles. Mt (GA, NC, SC, VA, WV), Pd (DE, NC, SC, VA), Cp (DE, NC, SC, VA): bogs, wet meadows, and swamp forests; uncommon. May-July; August-October. NL (Newfoundland) west to MN and SK, south to SC, GA, e. TN, and sc. TN. [= RAB, C, FNA, G, GW, K, S, W, WV; > *L. terrestris* var. *terrestris* – F]

Lysimachia thyrsiflora Linnaeus, Tufted Loosestrife. Mt (WV): bogs, swamps, marshes; rare. May-July. Circumboreal, south in North America to NJ, PA, OH, and MO (Kartesz 1999), WV (FNA), and MD (from Big Marsh, Kent County) (Steury, Tyndall, & Cooley (1996), NE, CO, UT, and CA. [= C, F, K; = *Naumburgia thyrsiflora* (Linnaeus) Duby – G]

Lysimachia tonsa (Wood) Wood ex Pax & R. Knuth, Southern Loosestrife, Appalachian Loosestrife. Pd (GA, NC, SC, VA), Mt (GA, VA, WV): upland forests, especially over calcareous or mafic rocks; rare. May-July; August-October. Sc. VA, sw. VA, and KY south to SC, wc. GA, and e. TN. The range is centered on the Southern Appalachians, but the species is essentially absent from the higher mountains – a "doughnut range." [= RAB, C, F, FNA, K, W, WV, Z; *=? Steironema intermedium* Kearney – G; = *Steironema tonsum* (Wood) Bicknell ex Britton – S]

* ***Lysimachia vulgaris*** Linnaeus, Garden Loosestrife. Mt (WV), Pd (VA): disturbed bottomlands, marshes, disturbed areas; rare, native of Europe. Introduced and naturalized south at least to se. and sc. PA (Rhoads & Klein 1993), WV, KY, MD, and NJ (Kartesz 1999) and now reported for n. VA (Steury, Fleming, & Strong 2008). [= C, F, FNA, G, K]

Lysimachia graminea (Greene) Handel-Mazzetti, Grassleaf Yellow-loosestrife. Endemic to ne. AL (Little River Canyon area). [= FNA, K, Z; = *Steironema gramineum* Greene – S]

334. THEACEAE D. Don 1825 (Tea Family) [in ERICALES]

With a more circumscribed definition (excluding Pentaphylacaceae), a family of about 9 genera and 450 species, trees and shrubs, of primarily tropical and subtropical regions of the Old and New Worlds. References: Prince in FNA (2009); Prince & Parks (2001); Stevens, Dressler, & Weitzman in Kubitzki (2004).

1 Leaves deciduous, medium green above, herbaceous in texture.
  2 Leaves broader toward the tip, 2-2.5× as long as wide; [tribe *Gordonieae*] ..... ***Franklinia***
  2 Leaves broadest near or below the middle, 1-1.8× as long as wide); [tribe *Stewartieae*] ..... ***Stewartia***
1 Leaves evergreen, dark green above, coriaceous in texture.
  3 Leaves ovate to elliptic (broadest at or below the middle), 1-3× as long as wide, slightly to strongly acuminate, 5-10 (-15) cm long; [introduced shrub, planted in upland soils]; [tribe *Theeae*] ..... ***Camellia***
  3 Leaves oblanceolate to narrowly elliptic (broadest at or above the middle), 2.5-4× as long as wide, acute to obtuse (rarely slightly acuminate), 8-30 cm long; [small to large tree, native in acidic Coastal Plain wetlands]; [tribe *Gordonieae*] ..... ***Gordonia***

Camellia Linnaeus 1753 (Camellia, Tea)

A genus of about 100-300 species, shrubs and trees, of se. Asia. References: Stevens, Dressler, & Weitzman in Kubitzki (2004).

1 Sepals deciduous; flowers sessile; leaves mostly ovate, acuminate, > 4 cm wide ..... ***C. japonica***
1 Sepals persistent; flowers on pedicels; leaves mostly elliptic, only slightly acuminate, < 4 cm wide ..... ***C. sinensis***

* ***Camellia japonica*** Linnaeus, Camellia. Frequently cultivated, sometimes persistent around old home sites; native of China and Japan. [= K]

* *Camellia sasanqua* Thunberg, Sasanqua Camellia, is reported as introduced in NC, SC, GA, and FL (Kartesz 1999). [= K] {not yet keyed}

* ***Camellia sinensis*** (Linnaeus) Kuntze, Tea. Cultivated in plantations and as a horticultural novelty, rarely escaped; native to China. [= K; = *Thea sinensis* Linnaeus]

Franklinia Bartram ex Marshall 1785 (Franklinia)

A monotypic genus, apparently endemic to e. GA (now presumably extinct in the wild). *Franklinia* is actually most closely related to the Asian genus *Schima* (Prince & Parks 2001); its closest relative in North America is *Gordonia*, from which it differs in its deciduous leaves (vs. evergreen) and globose fruits (vs. pointed). References: Prince in FNA (2009); Bozeman & Rogers (1986); Stevens, Dressler, & Weitzman in Kubitzki (2004).

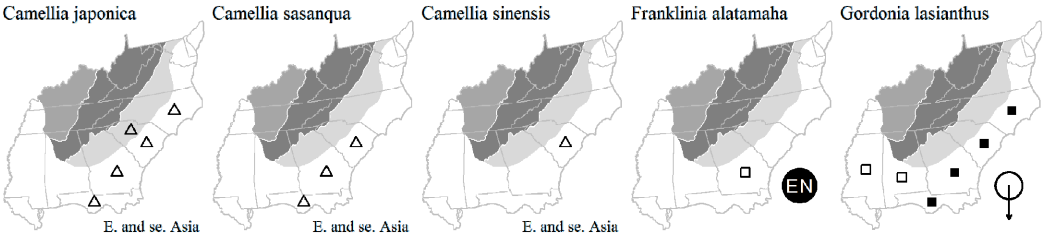
Franklinia alatamaha Bartram ex Marshall, Franklinia. Habitat speculative, probably dry sandy ridges, near the mouth of the Altamaha River; believed to be extinct in the wild. It was native to the Coastal Plain of GA, where it was found by William Bartram near the mouth of the Altamaha River. It has not been seen in the wild since 1803 and is now considered to be extinct in the wild. It is sometimes cultivated in our area. Bozeman & Rogers (1986) discuss the history of this tree. [= FNA, K, S; = *Gordonia alatamaha* (Bartram ex Marshall) Sargent]

Gordonia Ellis 1771 (Loblolly Bay, Gordonia)

As recircumscribed, a genus of 2 species, trees, of se. North America and Central America (*Gordonia brandegeei* H. Keng). The other 20-70 species, trees and shrubs, of se. Asia, previously assigned to *Gordonia* are actually in a different tribe and should be reassigned to *Polyspora* (Yang et al. 2004). References: Prince in FNA (2009); Yang et al. (2004); Stevens, Dressler, & Weitzman in Kubitzki (2004).

Identification notes: *Gordonia* is one of the "bay trees" so typical of acid Coastal Plain wetlands of our area – the other two being Sweet Bay (*Magnolia virginiana* of the Magnoliaceae) and Swamp Red Bay (*Persea palustris* of the Lauraceae). *Gordonia* can be distinguished from the other two species by its smooth leaves, serrate toward the tip, odorless when crushed (vs. pubescent leaves, entire-margined, aromatic when crushed). *Gordonia* is also distinctive in its narrow, conical crown, resembling *Liriodendron* or *Chamaecyparis*, and its medium-gray, deeply furrowed bark. Most individuals of *Gordonia* have at least a few orange-red leaves visible, at any season.

Gordonia lasianthus (Linnaeus) Ellis, Loblolly Bay, Gordonia. Pocosins, bayheads, acidic, organic-rich swamp forests, wet pine savannas, bay forests. July-September; September-October. Ne. NC south to s. peninsular FL, west to s. MS (Sorrie & Leonard 1999), a Southeastern Coastal Plain endemic. Peat-filled Carolina bays and large peat dome pocosins typically have *Gordonia* as an important tree, surpassed in abundance and importance only by *Pinus serotina*. On deep peats, *Gordonia* individuals are stunted and rarely reach sizes larger than pocosin shrubs. [= RAB, FNA, GW, K, S, WH]



Stewartia Linnaeus 1753 (Stewartia, Wild Camellia)

A genus of about 20 species, trees and shrubs, of temperate e. Asia and e. North America. Both our species of *Stewartia* are very attractive shrubs. The other species of the genus are Asian. Li et al. (2002) demonstrate that our 2 species form a clade together, separate from and basal to the Asian species; Prince (2002) shows a different tree topology. References: Prince in FNA (2009); Spongberg (1974)=Z; Li et al. (2002); Prince (2002); Stevens, Dressler, & Weitzman in Kubitzki (2004).

Identification notes: The leaves are borne in horizontal planes, reminiscent of *Cornus florida* and *Cornus alternifolia*. The leaves of both species are obscurely serrate or crenate, and also conspicuously and copiously ciliate-margined.

1 Style 1, with a 5-lobed stigma; seeds 5-7 mm long, shiny, plump, angled; fruit lobes rounded; leaves mostly 4-10 cm long, with 7-8 pairs of lateral veins; petioles narrowly winged (0.1-1 mm wide), not enclosing and concealing the terminal and lateral buds; calyx subtended by 2 persistent bracts, each 2-4 mm long; seeds shiny ..... ***S. malacodendron***

1 Styles 5, separate; seeds 8-10 mm long, dull, flat, thin (to slightly winged); fruit lobes angled; leaves mostly 7-15 cm long, with 5-7 pairs of lateral veins; petioles widely winged (1-2 mm wide), enclosing and concealing the terminal and lateral buds; calyx subtended by 1 persistent bract, 11-14 mm long; seeds dull ..... ***S. ovata***

Stewartia malacodendron Linnaeus, Silky Camellia, Virginia Stewartia. Mesic forests, especially on beech-dominated bluffs or "islands" in Coastal Plain swamps. May-June; September-October. Primarily Coastal Plain, se. VA south to FL, west to se. TX, but extending inland to the Piedmont of GA, NC, and SC and the Mountains of NC. [= RAB, FNA, K, W, WH, Z; = *Stewartia malachodendron* – C, F, G (orthographic variant); = *Stuartia malachodendron* – S (orthographic variant)]

Stewartia ovata (Cavanilles) Weatherby, Mountain Camellia, Mountain Stewartia. Mesic forests, especially acidic bluffs, often in openings in rhododendron thickets ("hells"), in the Coastal Plain of VA restricted to ravines. Late June-July; August-September. Primarily Appalachian: e. KY, sc. VA, e. VA south to c. NC, w. SC, e. and c. TN to n. GA and n. AL, avoiding, however, the higher mountains, and extending into the Coastal Plain in e. VA. The species is most abundant in the Cumberland Plateau of KY and TN. [= RAB, C, F, FNA, G, K, W, Z; = *Malachodendron pentagynum* (L'Héritier) Small – S]

335. SYMPLOCACEAE Desfontaines 1820 (Sweetleaf Family) [in ERICALES]

A family of 1 genus and about 250-300 species, trees and shrubs, of tropical and warm temperate America and Asia. References: Nooteboom in Kubitzki (2004).

Symplocos Jacquin 1760 (Sweetleaf)

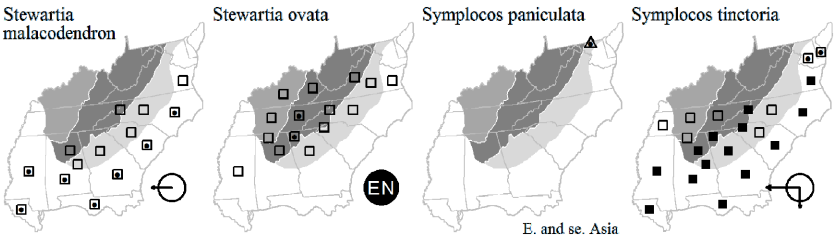
A genus of about 300 species, trees and shrubs, of tropical and warm temperate America and Asia. Wang et al. (2004) found that the affinities of *S. tinctoria* are with South American species of subgenus *Epigenia*, rather than with east Asian species of subgenus *Hopea*, section *Palaeosymplocos*. References: Wang et al. (2004); Nooteboom in Kubitzki (2004).

Identification notes: The foliage of *S. tinctoria* has a sweet taste, and an odor and taste similar to green apples. Sometimes the leaves are glossy and appear subcoriaceous, somewhat resembling *Kalmia latifolia*.

1 Leaf margins sharply and finely glandular-dentate; inflorescence a terminal panicle; drupes blue (white); [alien, rarely cultivated and escaped]; [subgenus *Palura*] ..... ***S. paniculata***
1 Leaf margins entire to coarselt serrate-crenate; inflorescence an axillary fascicle; drupes green; [native, common in parts of our area]; [subgenus *Symplocos*; section *Barberina*] ..... ***S. tinctoria***

* ***Symplocos paniculata*** (Thunberg) Miq., Sapphire-berry, Asiatic Sweetleaf. Suburban woodlands; native of e. Asia. Spreading from plantings at scattered locations in the ne. United States, such as DE and District of Columbia (Whittemore 2003).

Symplocos tinctoria (Linnaeus) L'Heritier, Sweetleaf, Horsesugar. Moist bottomland forests, pocosin edges, mesic forests, ridgetop forests. March-May; August-September. DE south to n. FL and west to e. TX and se. OK. The range in our area is discontinuous and interesting, the species rather abundant in the Coastal Plain throughout our area, and in the Mountains of NC and SC (absent from the VA mountains!), but present in the Piedmont only near its borders with the other provinces and in scattered sites in the central Piedmont. The leaves have a subcoriaceous and rather evergreen appearance, but are (in our area) only semi-evergreen. As the name implies, the leaves are somewhat sweet, but the sweetness seems variable from plant to plant, season to season, and taster to taster. Whether sweet or not, the taste is distinctive and is helpful (once learned) in distinguishing this rather nondescript shrub or small tree. Where protected from fire, *S. tinctoria* can reach considerable size, up to 20 cm in diameter and 10 m tall, with longitudinally striped bark. [= RAB, C, GW, K, S, W, WH; > *S. tinctoria* var. *tinctoria* – F, G; > *S. tinctoria* var. *pygmaea* Fernald – F, G (probably based on fire sprouts); > *S. tinctoria* var. *ashei* Harbison]



336. DIAPENSIACEAE (Link) Lindley 1836 (Diapensia Family) [in ERICALES]

A family of 5-6 genera and about 13-15 species, subshrubs and perennial herbs, largely arctic and north temperate. References: Nesom in FNA (2009); Scott & Day (1983)=X; Scott in Kubitzki (2004).

1 Leaves cauline, generally < 10 mm long and < 3 mm wide; [of Coastal Plain pinelands] ..... ***Pyxidanthera***
1 Leaves basal (or on a short caudex), generally > 50 mm long and > 30 mm wide; [throughout our area, more common in the Piedmont and Mountains].
2 Leaves orbicular, rounded or with a slight point at the apex, finely serrate (4-8 teeth per cm), the teeth not prominently mucronate; flowers in racemes; [widespread] ..... ***Galax***

2 Leaves broadly elliptic, generally emarginate (slightly notched) at the apex, coarsely serrate (1-4 teeth per cm), the teeth prominently mucronate; flowers solitary; [native to humid gorges along the escarpment between the Mountains and Piedmont, sometimes cultivated and becoming established elsewhere].....***Shortia***

Galax Sims 1804 (Galax)

A monotypic genus, a perennial herb, endemic to eastern North America. References: Nesom in FNA (2009); Nesom (1983); Soltis, Bohm, & Nesom (1983); Scott in Kubitzki (2004).

Galax urceolata (Poiret) Brummitt, Galax. Mountain forests, rock outcrops, nearly ubiquitous in the Mountains, more restricted in habitat elsewhere, moist to dry slopes in the Piedmont and Coastal Plain, often associated with *Kalmia latifolia* or *Rhododendron maximum*. May-July; August-October. The genus consists of this single species, with a range centered in the Southern Appalachians, occurring in NC, SC, GA, AL, e. TN, KY, VA, WV, and MD. Diploid and tetraploid races exist, and both are present in our area (Nesom 1983). In NC, diploids are the predominant race in the Mountains, the s. Piedmont, and the s. and c. Coastal Plain; tetraploids predominate along the Blue Ridge Escarpment, the n. Piedmont, and the n. Coastal Plain. In SC, diploids occur in the Coastal Plain and Piedmont, tetraploids in the mountains and escarpment. In GA, the pattern is similar, with diploids extending further into the Piedmont and tetraploids restricted to the Mountains and upper Piedmont. In AL, only diploids are known. In VA, however, tetraploids occupy the Coastal Plain and e. Piedmont, diploids in the upper Piedmont and Mountains. A study of the flavonoids supported the idea that the tetraploid is an autopolyploid derivative of the diploid. Because of the close morphologic similarity, substantially sympatric distributions, and apparent general absence of demonstrable ecologic differentiation between the two races, it seems best not to attempt to taxonomically distinguish them (Nesom 1983; Soltis, Bohm, & Nesom 1983). "Galax-pulling" (the gathering of the often bronze-colored evergreen leaves for the florist trade) is an important folk industry in the mountains. [= FNA, K, W, X; = *G. aphylla* Linnaeus – RAB, C, F, G, S, WV, misapplied]

Pyxidanthera Michaux 1803 (Pyxie-moss, Pyxie)

A genus of 2 species, creeping subshrubs, endemic to se. North America. Superficially, *Pyxidanthera* is reminiscent of the circumboreal, arctic-alpine *Diapensia*. References: Sorrie, Weakley, & Nesom in FNA (2009); Primack & Wyatt (1975)=Z; Godt & Hamrick (1995); Scott in Kubitzki (2004).

1 Leaves (3.3) 4-10 mm long; leaves lanceolate, averaging > 1.0 mm wide (oblanceolate and up to 2.5 mm wide if etiolated under leaf litter); leaves (in fresh material) herbaceous in texture, < 0.1 mm thick; leaves of sterile shoots ciliate along the margins at the base, usually also pubescent on the upper surface near the base, but the pubescence rarely extending > 1/3 of the way from the base to the tip; internodes usually > 1 mm long; [of moist sites in the outer and inner Coastal Plain, including the Sandhills] .....***P. barbulata***

1 Leaves 1-5 mm long (rarely to 7 mm long if etiolated under leaf litter); leaves ovate, averaging < 1.2 mm wide (lanceolate and up to 1.5 mm wide if etiolated under leaf litter); leaves (in fresh material) succulent in texture, up to 0.5 mm thick; leaves of sterile shoots lanose to densely pubescent on the upper surface at the base, the pubescence becoming sparser toward the tip of the leaf, but extending past the midpoint of the leaf and often its full length; internodes usually < 1 mm long; [in extremely xeric sites over coarse deep sand or clay in the Sandhills region of sc. NC and nc. SC].....***P. brevifolia***

Pyxidanthera barbulata Michaux, Common Pyxie-moss, Big Pyxie. Pine savannas, pine flatwoods, pocosin margins, edges of sandhill seepage bogs, primarily in mesic to hydric sites, in wet sands and peaty sands, occasionally extending to submesic sands, but generally with a permanently or seasonally high water table, often with *Sphagnum*. March-April; May-June. NY (Long Island) south to NJ, and from se. VA south to n. SC. In the Sandhills, where its range overlaps *P. brevifolia*, *P. barbulata* is limited to seepage areas or pocosin ecotones, while *P. brevifolia* occurs in xeric situations far upslope. [= F, FNA, G, GW, K, S; = *P. barbulata* var. *barbulata* – RAB; < *P. barbulata* – X, Z]

Pyxidanthera brevifolia B.W. Wells, Sandhills Pyxie-moss, Wells's Pyxie-moss, Little Pyxie. On xeric sandhills, generally over deep sand or sand-clay mixtures near the summits or on the upper slopes of sandhills, restricted to the Sandhills region. December-March; February-May. This species is endemic to a six-county area of the Sandhills of NC and SC. In NC, it is nearly limited to Fort Bragg, and is puzzlingly absent from seemingly suitable habitat on the Sandhills Game Land to the west. The taxonomic status of this entity has been controversial, with different authors considering it a species, a variety, or an ecotype not worthy of taxonomic status. A combination of morphologic, embryologic, phytogeographic, ecological, and phenologic evidence favors the recognition of two taxa in *Pyxidanthera*. Recent surveys of *Pyxidanthera* in the Sandhills of NC have shown that it is ecologically distributed in a strongly bimodal manner. While ecologically intermediate situations predominate in the Sandhills, this habitat is rarely occupied by *Pyxidanthera*. Instead, *Pyxidanthera* is usually found either in very dry (hill-top) or moist (pocosin ecotones) situations. A few morphologically intermediate populations are occasionally found, in ecologically intermediate situations, but the vast majority of populations are readily assigned to one taxon or the other. Godt & Hamrick (1995) showed low levels of allozyme differentiation between the two taxa and supported varietal status. [= FNA, K, S; = *P. barbulata* Michaux var. *brevifolia* (B.W. Wells) Ahles – RAB; < *P. barbulata* – X, Z]

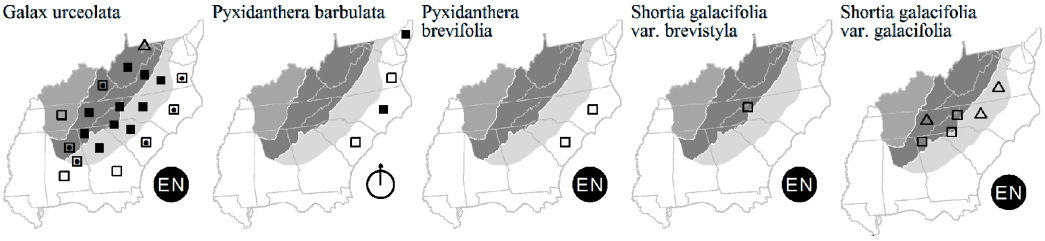
Shortia Torrey & Gray 1842 (Shortia, Oconee Bells)

A genus of 5-6 species, perennial herbs, of e. Asia and the Southern Appalachians. The Asian species are: *S. uniflora* (Maximowicz) Maximowicz of montane Japan (with 3 varieties), *S. rotundifolia* (Maximowicz) Makino of Japan, *S. exappendiculata* Hayata, of montane Taiwan, *S. soldanelloides* (Siebold & Zuccarini) Makino, of montane Japan (with as many as 5 varieties recognized), and *S. sinensis* Hemsley of montane Yunnan Province, China. References: Nesom in FNA (2009); Davies (1952)=Z; Hatley (1977)=Y; Barnes (1990); Scott in Kubitzki (2004).

1 Style 6-10 (-12) mm long; filaments generally 5-7 mm long; corolla lobes 14-17 mm long; [native of McDowell County, NC] ..... ***Sh. galacifolia** var. **brevistyla***
1 Style (10-) 12-18 mm long; filaments generally 6-9 mm long; corolla lobes 16-25 mm long; [native to Transylvania and Jackson counties, NC, Oconee and Pickens counties, SC, and Rabun County, GA; introduced elsewhere] ..... ***Sh. galacifolia** var. **galacifolia***

Shortia galacifolia Torrey & A. Gray *var.* ***brevistyla*** Davies, Northern Shortia. On moist slopes, creekbanks, and rock outcrops in humid escarpment gorges with high rainfall, generally in deep shade under *Rhododendron maximum*, at elevations of 350-550m. March-April; July-August. This variety is known only from McDowell County, NC, where it occurs on several tributaries of the Catawba River and North Fork Catawba River. It has also been reported from the gorge of the Linville River, Burke County, but this locality is questionable and has not been relocated. This area is disjunct about 100 kilometers to the northeast along the Blue Ridge Escarpment from the range of the typic variety. In addition to the characters used in the key, var. *brevistyla* differs in a variety of characters of the flowers and leaves, as discussed in Davies (1952) and Hatley (1977). Whether the recognition of infraspecific taxa is warranted is not clear; Davies argued for and Hatley against. Though the morphological characters are relatively minor and partially overlapping, their correlation with disjunct ranges and their likely influence on pollination and reproduction influence me to provisionally accept varietal status, pending further research. [= FNA, K, Z; < *Shortia galacifolia* – RAB, C, G, W, X, Y; < *Sherwoodia galacifolia* (Torrey & A. Gray) House – S]

Shortia galacifolia Torrey & A. Gray *var.* ***galacifolia***, Southern Shortia, Oconee Bells. On moist slopes, creekbanks, and rock outcrops in humid escarpment gorges with high rainfall, generally in deep shade under *Rhododendron maximum* and *R. minus*, at elevations (in NC) of 350-650m. March-April; July-August. This variety occurs in Transylvania and Jackson counties, NC, Oconee and Pickens counties, SC, and Rabun County, GA, where it occurs in the remarkable escarpment gorges region, at elevations from 200-650m (formerly at lower elevations, now submerged under Lake Jocassee). Most of the population of this species, including the type locality, was destroyed in the early 1960's by the construction of Lake Jocassee (Zahner & Jones 1983). In the gorge tributaries of the Eastatoe, Toxaway, Horsepasture, and Thompson rivers, *Shortia* can sometimes form a dense groundcover covering acres. Various outlying locations, such as in NC (Swain and Macon counties), VA (Amherst County), and TN (Blount, Monroe, and McMinn counties) are not considered native, and are adventive or the result of persistence after cultivation. The species is prized by gardeners, and survives well outside its natural range. [= FNA, K, Z; < *Shortia galacifolia* – RAB, C, G, W, X, Y; < *Sherwoodia galacifolia* (Torrey & A. Gray) House – S]



337. STYRACACEAE Dumortier 1829 (Storax Family) [in ERICALES]

A family of about 11 genera and 160 species, trees and shrubs, of warm temperate and tropical regions of America, Mediterranean Europe, se. Asia, Malesia. References: Fritsch in FNA (2009); Fritsch in Kubitzki (2004).

1 Corolla lobes 4; fruit elongate, winged, 2.5-5 cm long; petioles 15-25 mm long ..... ***Halesia***
1 Corolla lobes 5; fruit globose, not winged, 0.5-0.9 cm in diameter; petioles 2-10 mm long ..... ***Styrax***

Halesia J. Ellis ex Linnaeus 1759 (Silverbell, Snowdrop Tree)

A genus of about 4 species, trees and shrubs, of e. North America and e. Asia. The genus was named to honor Stephen Hales; it therefore seems more appropriate to pronounce the genus with three syllables (the accent on the first) than the commonly heard four, which thoroughly distorts the honoree's name. The number of taxa in our area and their appropriate taxonomic level are in dispute; recent analyses vary from from 2-5, with specific or varietal status. References: Fritsch in FNA (2009); Fritsch & Lucas (2000)=X; Reveal & Seldin (1976)=Y; Sargent (1921); Godfrey (1988)=Z.

1 Petals united only basally, the lobes longer than the tube; fruits broadly 2-winged; leaves broadly obovate to suborbicular, 1-2× as long as wide.
  2 Corolla 10-15 mm long ..... ***H. diptera** var. **diptera***
  2 Corolla 20-30 mm long ..... ***H. diptera** var. **magniflora***

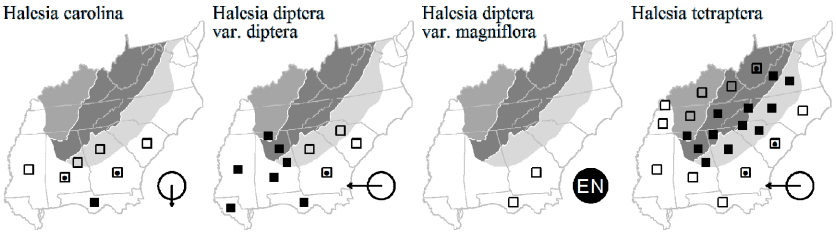
1 Petals united for most of their length, the tube longer than the lobes; fruits narrowly or broadly 4-winged; leaves elliptic-oblong, ca. 2× as long as wide.
  3 Corolla 7-10 (-12) mm long, the style strongly exserted (1/3 to 1/2 the length of the corolla tube beyond its mouth), the anthers at the mouth of the corolla tube or slightly exserted; fruit obovate in outline, broadest toward the tip, strongly narrowed to the base, narrowly winged ..... ***H. carolina***
  3 Corolla (12-) 15-30 mm long, the style included or slightly exserted, the anthers within the mouth of the corolla tube; fruit ellipsoid to slightly obovate in outline, broadest near the middle, broadly winged ..... ***H. tetraptera***

Halesia carolina Linnaeus, Little Silverbell. Sandy alluvial forests. March-April; September-October. S. SC south to Panhandle FL, west to s. MS. [= K, WH, Y, Z; = *H. parviflora* Michaux – RAB, GW, S; < *H. carolina* – FNA, X]

Halesia diptera Ellis *var.* ***diptera***, Common Two-wing Silverbell. Bottomland forests, forested edges of brackish marshes. April-May; August-September. Var. *diptera* ranges from s. SC south to Panhandle FL, west to n. AL, sw. AR, and e. TX. [= Y, Z; < *H. diptera* – RAB, FNA, GW, K, S, WH]

Halesia diptera Ellis *var.* ***magniflora*** Godfrey. Dry to moist hammocks. Endemic to sw. GA and Panhandle FL. Fritsch in FNA (2009) considers the variation clinal, the larger-flowered plants in the eastern part of the range of *H. diptera* s.l., and not worthy of taxonomic status. [= Y, Z; < *H. diptera* – FNA, GW, K, S, WH]

Halesia tetraptera Ellis, Common Silverbell, Mountain Silverbell. Moist slopes, coves, creek-banks, bottomlands. March-May; August-September. W. VA, s. WV, s. OH and s IL, south to FL and e. TX (and cultivated elsewhere). Two varieties or species have sometimes been recognized (see synonymy): "*monticola*," a large tree, restricted to the Southern Appalachians (and especially the Great Smoky Mountains), the corolla (18-) 20-30 mm long, the style included, the anthers well inside the mouth of the corolla tube, and "*tetraptera*," a smaller tree more widely distributed, the corolla (12-) 15-20 mm long, the style slightly exserted, the anthers just within the mouth of the corolla tube. Most studies have judged them too intergradient to be practically delimited. [= C; = *H. carolina* – RAB, F, G, W, WV; < *H. carolina* – FNA, X; > ***Halesia tetraptera*** Ellis *var.* ***tetraptera*** – K, Y; > ***Halesia tetraptera*** Ellis *var.* ***monticola*** (Rehder) Reveal & Seldin – K, Y; > *H. carolina* Linnaeus – S; > *H. monticola* (Rehder) Sargent – S]



Styrax Linnaeus 1753 (Snowbell, Storax)

A genus of about 120-130 species, trees and shrubs, of s. Europe, Malesia, se. Asia, se. North America, and tropical America. References: Gonsoulin (1974)=Z. Nicolson & Steyskal (1976) discuss at length the grammatical gender of the genus, and conclude that it should be treated as masculine.

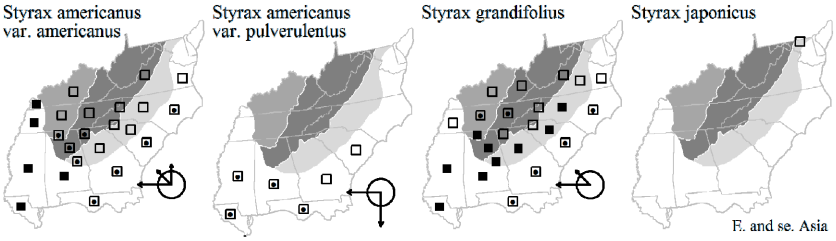
1 Pedicels 15-50 mm long ..... ***S. japonicus***
1 Pedicels 4-10 (-14) mm long
  2 Leaves generally broadly obovate, sometimes broadly ovate, 5-14 cm long, 4-10 cm wide, the apices acute to short-acuminate, densely and finely pubescent beneath, giving the underside of the leaf a pale color; inflorescence usually of 5-20 flowers ..... ***S. grandifolius***
  2 Leaves narrowly elliptic to ovate or obovate, usually 2-8 cm long, 1-4 cm wide, the apices short- to long-acuminate, glabrous or sparsely pubescent beneath (to densely pubescent and then giving the underside of the leaf a rusty color in var. *pulverulentus*); inflorescence usually of 1-7 flowers.
    3 Leaves oblong-elliptic, glabrous or sparsely pubescent on the undersurfaces and petioles, the margins usually distantly toothed toward the apices; pedicels 10-14 mm long; calyces essentially glabrous; new growth glabrous to sparsely pubescent ..... ***S. americanus*** *var.* ***americanus***
    3 Leaves elliptic to ovate to oblanceolate or obovate, sparsely to densely scurfy-hairy on the undersurfaces and petioles, margins entire to serrate; pedicels 4-6 mm long; calyces and pedicels densely scurfy-hairy; new growth densely matted pubescent ..... ***S. americanus*** *var.* ***pulverulentus***

Styrax americanus Lamarck *var.* ***americanus***, American Snowbell, American Storax. Swamp forests, pocosin edges, other moist to wet habitats. April-June; July-September. Var. *americanus* ranges from ne. WV, OH, s. IN, s. IL, s. MO, south to s. FL and e. TX. See discussion below on var. *pulverulentus* and the presence in our area of transitional plants. [= C; < *S. americana* – RAB, G, GW, W; < *S. americanus* – FNA, K, WH; = *S. americana* var. *americana* – F, Z; = *S. americana* – S]

Styrax americanus Lamarck *var.* ***pulverulentus*** (Michaux) Perkins ex Rehder, Downy American Snowbell. Wet pine flatwoods. April-May; July-September. "Good" var. *pulverulentus* ranges from SC south to s. FL and west to e. TX and se. MO; some plants in NC and SC are transitional between the two varieties and will not be easily assigned. [= C, Z; < *S. americana* – RAB, G, GW, W; < *S. americanus* – FNA, K, WH; = *S. pulverulenta* Michaux – S; = *S. americana* var. *americana* - Z]

Styrax grandifolius Aiton, Bigleaf Snowbell, Bigleaf Storax. Upland forests, bluffs. April-May; August-September. Se. VA south to ne. FL and. Panhandle FL, west to e. TX, north to se. MO. [= C, FNA, K, WH; = *S. grandifolia* – RAB, F, G, S, W, Z]

Styrax japonicus Siebold & Zuccarini, Japanese Snowbell. Suburban woodlands; native of e. Asia. [= FNA, K]



338. SARRACENIACEAE Dumortier 1829 (Pitcherplant Family) [in ERICALES]

A family of 3 genera and about 22 species, perennial insectivorous herbs, of e. North America (*Sarracenia*), w. North America (*Darlingtonia*), and ne. South America (*Heliamphora*). References: Mellichamp in FNA (2009); Neyland & Merchant (2006); Kubitzki in Kubitzki (2004).

Sarracenia Linnaeus 1753 (Pitcherplant)

A genus of about 11 species, perennial insectivorous herbs, of e. North America. References: Mellichamp & Case in FNA (2009); McDaniel (1971)=U; Wood (1960)=Z; Schnell & Determann (1997)=Y; Schnell (2002b)=X; Bell (1949)=Q; Case & Case (1976)=V; McPherson (2007); Neyland & Merchant (2006); Schnell (1979, 1981, 1993, 1998, 2002a); Bell (1952); Bell & Case (1956); Reveal (1993); Cheek (1994, 2001); Godt & Hamrick (1999); Naczi et al. (1999); Romanowski (2002); Catalani (2004); Mellichamp (2008).

Identification notes: Hybrids between the various species of pitcher-plants are relatively frequent; see Bell (1952), Bell & Case (1956), Mellichamp (2008), and Mellichamp in FNA (2009) for further discussion. They are usually rather easy to determine, since they show intermediacy in characters, and usually are found in close proximity to both parents.

1 Pitchers mostly decumbent; lateral wing of the pitcher very prominent; petals maroon to pink; [section *Sarracenia*].
  2 Pitchers prominently marked with white on the hood; hood of the pitcher globose; orifice formed by the fusion of the hood margins ..... ***S. psittacina***
  2 Pitchers not marked with white on the hood; hood of the pitcher expanded and erect; orifice not involving the hood margins.
    3 Petals pale pink; lip of pitcher 2.6-7.5 mm thick at thickest point; scape 16.3-35.1 cm high; style arm 2.6-4.1 cm long; [of the Gulf Coastal Plain, from sw. GA westward] ..... ***S. rosea***
    3 Petals red to deep maroon; lip of pitcher 0.7-3.1 mm thick at thickest point; scape 22-79 cm high; style arm 1.7-2.9 (-3.8) cm long; [of e. GA northward]
      4 Pitchers > 3× as long as broad; pitchers glabrous on the outer surface; petals dark maroon (occasionally red); rhizomes generally vertical, and with relatively many pitchers per crown (often 6-10); [of e. VA northward] ..... ***S. purpurea* var. *purpurea***
      4 Pitchers < 3× as long as broad; pitchers bristly-pubescent on the outer surface; petals bright red; rhizomes generally horizontal, and with relatively few pitchers per crown (often 4-5); [of the Coastal Plain of se. VA southward, and in the Mountains and Piedmont of NC and SC].
        5 Hood lobes closely incurved, touching each other or nearly so, obscuring the hood opening; hairs lining the hood averaging 0.8-1.0 mm long; [of the Mountains of sw. NC, nw. SC, and ne. GA] ..... ***S. purpurea* var. *montana***
        5 Hood lobes not closely incurved and touching; hairs lining the inner surface of the hood (1.0-) 1.5-3.0 mm long; [of the Atlantic Coastal Plain and rarely also the adjacent Piedmont of VA, NC, and SC south to e. GA] ..... ***S. purpurea* var. *venosa***
1 Pitchers erect; lateral wing of the pitcher generally not prominent; petals maroon, red, or yellow; [section *Erectae*].
  6 Pitchers with white (or whitish and translucent) patches toward the summit of the pitcher and behind the orifice and/or on the hood.
    7 Areas of white tissue all around the summit of the pitcher and throughout the hood, the areas of bright white tissue surrounded by a conspicuous network of reddish venation; hood erect or ascending; petals maroon ..... ***S. leucophylla***
    7 Areas of whitish, translucent tissue toward the summit of the pitcher and on the lower portion of the hood, behind the orifice, the areas of translucent white tissue not enclosed within a conspicuous network of reddish venation; hood arching horizontally over the orifice; petals pale lemon yellow
      8 Pitchers and scapes < 35 cm tall; unwinged petiolar base of pitchers (3-) avg. 6 (-11) cm long, abruptly widened into the pitcher; [of pine savannas]; [widespread from se. NC southward] ..... ***S. minor* var. *minor***
      8 Pitchers and scapes 40-120 cm tall; unwinged petiolar base of pitchers (12-) avg. 17 (-21) cm long, gradually widened into the pitcher; [of floating peat mats and other very wet sites]; [endemic to the Okeefenokee Swamp and vicinity, se. GA] ..... ***S. minor* var. *okeefenokeensis***
  6 Pitchers without white or translucent patches toward the summit of the pitcher.
    9 Petals yellow; pitcher hood 4-10 (-14) cm wide.
      10 Phyllodia (nonpitcher leaves) many per plant and forming a rosette, 5-18 cm long, strongly curved, usually curving 45-90 degrees; scapes taller than the pitchers; [inland, from sw. NC and e. TN south and west to n. and wc. GA and c. AL] ..... ***S. oreophila***
      10 Phyllodia (nonpitcher leaves) rare, only a few per plant (if present at all), 12-30 cm long, straight to slightly curved; scapes shorter than the pitchers; [of the Coastal Plain and rarely Piedmont, from se. VA southward to n. FL and west to e. TX].
        11 Narrowed base of the hood not purple-spotted, its sides revolute but not rolled backwards and nearly touching; blade of the hood ovate, slightly cordate basally; [of the Coastal Plain, from s. AL west to e. TX] ..... ***S. alata***
        11 Narrowed base of the hood usually purple-spotted, its sides strongly rolled backwards (away from the orifice) such that they nearly touch; blade of the hood broadly reniform to orbicular-reniform, broadly cordate basally; [of the Coastal Plain and rarely Piedmont, from se. VA southward to n. FL and west to se. MS] ..... ***S. flava***

9 Petals maroon; pitcher hood < 4 cm wide (except *S. alabamensis* ssp. *alabamensis*, which can be up to 8.8 cm wide).
12 Orifice wing loosely rolled, with a pronounced "spout" over the wing; summer pitchers ca. 10× as long as the width of the pitcher mouth; orifice yellow-green; [of the Coastal Plain of c. and s. AL and s. MS]
13 Pitcher background color yellow, the upper pitcher weakly or not veined on the outer surface; [of c. AL (Autauga, Chilton, and Elmore counties] ..... ***S. alabamensis*** *ssp.* ***alabamensis***
13 Pitchers background color tan, the upper pitcher strongly reticulately veined on the outer surface; [of s. AL, s. MS, and w. FL] ..... ***S. alabamensis*** *ssp.* ***wherryi***
12 Orifice rim tightly rolled, with a very slight "spout" over the wing; summer pitchers narrow and elongate, ca. 20× as long as the width of the pitcher mouth; [of the Coastal Plain of NC, SC, GA, and Panhandle FL, and the Mountains of sw. NC and nw. SC].
14 Pitchers (25-) avg. 40-50 (-75) cm tall; scapes about the same height as the pitchers; hood ascending, leaving the orifice exposed, 1.5-6.5 cm long, 2.0-5.4 cm wide; orifice 2.8-4.2 cm wide; [of the Mountains of NC and SC] ..... ***S. jonesii***
14 Pitchers (7-) avg. 15-60 cm tall (-55) cm tall; scapes 1.5-2× the height of the leaves (pitchers); hood horizontal, held closely over the orifice, 0.7-4.5 cm long, 0.7-3.9 cm wide; orifice 1.5-3.5 cm wide; [of the Coastal Plain of NC, SC, and GA].
15 Pitchers (7-) 15-43 cm tall; orifice 1.5-2.3 cm wide; [se. and sc. NC south through SC to sc. GA] ..... ***S. rubra*** *ssp.* ***rubra***
15 Pitchers 47-61 cm tall; orifice 2.4-3.5 cm wide; [sw. GA west to FL Panhandle] ..... ***S. rubra*** *ssp.* ***gulfensis***

Sarracenia alabamensis F.W. and R.B. Case *ssp.* ***alabamensis***, Alabama Pitcherplant, Alabama Canebrake Pitcherplant. Seepage bogs. Endemic to c. AL (Autauga, Chilton, and Elmore counties). See Case (2005). [= FNA, V; = *S. rubra* Walter ssp. *alabamensis* (F.W. & R.B. Case) Schnell – K, X; < *S. rubra* – GW, S, U, Z]

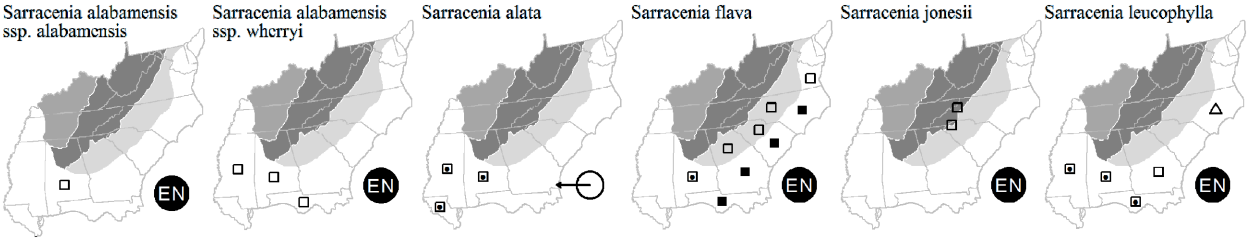
Sarracenia alabamensis F.W. & R.B. Case *ssp.* ***wherryi*** F.W. & R.B. Case, Wherry's Pitcherplant. Seepage bogs and savannas. FL Panhandle, s. AL, s. MS. April-May. See Case (2005). [= FNA, V; = *S. rubra* Walter ssp. *wherryi* (F.W. & R.B. Case) Schnell – K, WH, X; < *S. rubra* – GW, S, U, Z]

Sarracenia alata Wood, Pale Pitcherplant. Savannas, seepage bogs. S. AL west to e. TX. [= FNA, GW, K, U, X, Z; = *S. sledgei* Macfarlane – Q, S]

Sarracenia flava Linnaeus, Yellow Pitcherplant, Trumpets. Savannas, seepage bogs, pocosins. March-April; May-June. Se. VA south to n. FL and west to s. AL and se. MS. In the centers of peat domes and large peat-filled Carolina bays, *S. flava* is sometimes very abundant, occasionally the dominant plant over areas exceeding several square kilometers. [= RAB, C, F, FNA, G, GW, K, Q, U, W, Z; < *S. flava* – S (also see *S. oreophila*); > *S. flava* var. *flava* – X; > *S. flava* var. *atropurpurea* (Bull) C.R. Bell – X; > *S. flava* var. *maxima* Bull ex Masters – X; > *S. flava* var. *ornata* Bull ex Masters – X; > *S. flava* var. *cuprea* Schnell – X; > *S. flava* var. *rugelii* (Shuttleworth ex de Candolle) Masters – X; > *S. flava* var. *rubricorpora* Schnell – X]

Sarracenia jonesii Wherry, Mountain Sweet Pitcherplant. Bogs, cataract seeps. May; July. Endemic to a small area in sw. NC and nw. SC. There has been a great deal of disagreement over the taxonomic treatment of this taxon, a montane sibling of *S. rubra*. See Wherry (1929), Bell (1949), McDaniel (1971), Wherry (1972), Case and Case (1976), Schnell (1977), Massey et al. (1983), and McDaniel (1986) for further discussion. [= FNA, V, W; < *S. rubra* – RAB, GW, Q, U, Z; = *S. rubra* ssp. *jonesii* (Wherry) Wherry – K, X]

Sarracenia leucophylla Rafinesque, Whitetop Pitcherplant, Crimson Pitcherplant. Wet pine savannas. Sw. GA, w. FL, s. AL, and se. MS, a Gulf Coastal Plain endemic; introduced in eastern NC. The NC population (on Croatan National Forest, Carteret Co.) was apparently introduced in the 1980s; it is not known whether this species will spread in NC, but it is persisting and has been independently "discovered" several times. [= FNA, GW, K, U, X, Z; = *S. drummondii* Croom – Q, S]

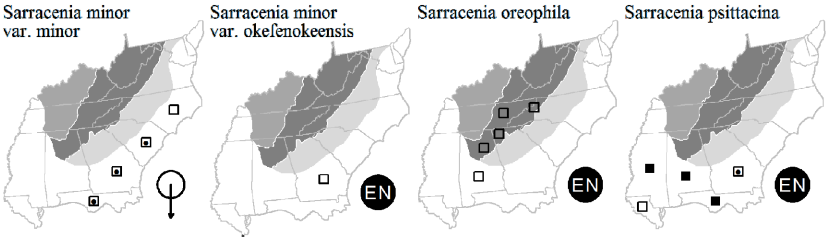


Sarracenia minor Walter *var.* ***minor***, Hooded Pitcherplant. Wet savannas. April-May; June-July. Se. NC south through SC and GA to c. peninsular and e. Panhandle FL. [< *S. minor* – FNA, GW, K, Q, RAB, S, U, X, Z]

Sarracenia minor Walter *var.* ***okefenokeensis*** Schnell, Okeefenokee Hooded Pitcherplant. On floating vegetation mats, ditches, and other very wet sites. Endemic to Okeefenokee Swamp, se. GA. See Schnell (2002a) for additional information. [< *S. minor* – FNA, GW, K, Q, S, U, X, Z]

Sarracenia oreophila (Kearney) Wherry, Green Pitcherplant. Seepage bogs. April-May; June-July. A montane-piedmontane sibling of *S. flava*, known from sw. NC, se. TN (where presumed extirpated from the state), n. GA, and c. and ne. AL (Govus 1987, Wherry 1933, Schnell 1980b, Dennis 1980, Catalani 2004). [= FNA, GW, K, Q, U, W, X, Z; < *S. flava* – S]

Sarracenia psittacina Michaux, Parrot Pitcherplant. Savannas. This distinctive species is distributed primarily in the East Gulf Coastal Plain, but ranges east to the Atlantic Coastal Plain of e. GA (Bullock County), in close proximity to the SC border. [= FNA, GW, K, Q, S, U, X, Z]



Sarracenia purpurea Linnaeus *var.* ***montana*** Schnell & Determann, Southern Appalachian Purple Pitcherplant. Mountain bogs, seepage bogs. May; July. Var. *montana* is restricted to a few dozen populations in sw. NC (south of Asheville), nw. SC, and ne. GA (Rabun County). These montane populations (in sw. NC, nw. SC, and ne. GA) show some consistent differences and appear to warrant taxonomic distinction (Schnell & Determann 1997); further study is warranted. For those tolerant of quadrinomial taxonomy, plants in our area can be called *S. purpurea* ssp. *venosa* (Rafinesque) Fernald var. *montana* Schnell & Determann. Allozyme studies by Godt and Hamrick (1999) show striking genetic differences between var. *montana*, var. *purpurea*, var. *venosa* and the Gulf Coast var. *burkii*, supporting their taxonomic recognition. In fact, the genetic differentiation is greater than that between taxa in the *S. rubra* complex. [< *S. purpurea* – RAB, GW, Q, S, W, Z; < *S. purpurea* var. *purpurea* – Reveal (1993); < *S. purpurea* ssp. *purpurea* – FNA; = *S. purpurea* ssp. *venosa* (Rafinesque) Fernald var. *montana* Schnell & Determann – K, Y]

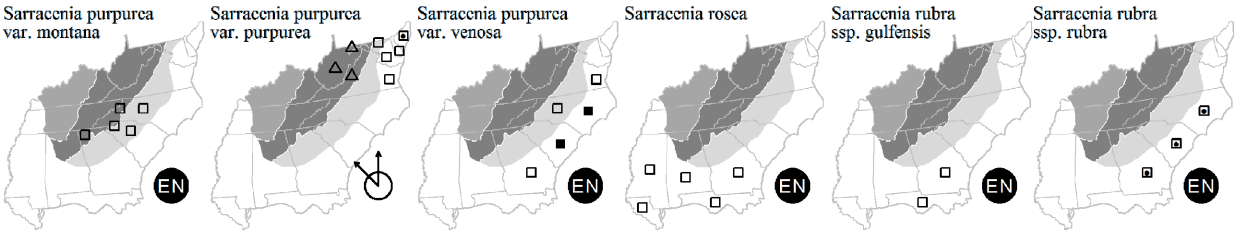
Sarracenia purpurea Linnaeus *var.* ***purpurea***, Northern Purple Pitcherplant. Bogs. April-May; June-July. The species as a whole is widespread in e. North America, the only *Sarracenia* to extend north of se. VA. Var. *purpurea* ranges from NL (Labrador) to NT and BC, south to NJ, DE, e. MD, w. MD (where not native), ne. VA, e. WV (where not native), OH, IN, IL, MN, and WA. A nomenclatural battle about the application of the typic variety has been resolved, with var. *purpurea* applying to the northern variety (Reveal 1993, Cheek 1994, Kartesz & Gandhi 1995, Cheek 2001). [= C, F, G, Z; < *S. purpurea* – RAB, GW, Q, S, U, W, WV; = *S. purpurea* ssp. *gibbosa* (Rafinesque) Wherry – K; = *S. purpurea* var. *terrae-novae* de la Pylaie – Reveal (1993); < *S. purpurea* ssp. *purpurea* – FNA; = *S. purpurea* ssp. *purpurea* – X]

Sarracenia purpurea Linnaeus *var.* ***venosa*** (Rafinesque) Fernald, Southern Purple Pitcherplant. Wet savannas, sandhill seepage bogs, hillside seepage bogs. April-May; June-July. Var. *venosa* is restricted to the Atlantic Coastal Plain of the southeastern United States, ranging from se. VA south to se. SC and e. GA; perhaps disjunct in e. LA. See MacRoberts & MacRoberts (2004) for a detailed discussion about old LA collections of *S. purpurea* or *S. rosea*. For those tolerant of quadrinomial taxonomy, plants in our area may be considered *S. purpurea* ssp. *venosa* (Rafinesque) Fernald var. *venosa*. It is notable, though, that the findings of Godt & Hamrick (1999) and Ellison et al. (2004) do not support the greater relationship of the southern taxa to one another and their divergence from the northern taxon, and thus do not support the quadrinomial taxonomy. [= C, F, G, Z; < *S. purpurea* – RAB, GW, Q, S, U, W; = *S. purpurea* ssp. *venosa* (Rafinesque) Fernald – FNA; = *S. purpurea* Linnaeus ssp. *purpurea* var. *purpurea* – K; = *S. purpurea* var. *purpurea* – Reveal (1993); = *S. purpurea* ssp. *venosa* (Rafinesque) Fernald var. *venosa* – X, Y]

Sarracenia rosea Naczi, F.W. Case, & R.B. Case, Rose Pitcherplant. Wet pine savannas and seepage bogs. Sw. GA and Panhandle FL west to s. MS and (?) e. LA. Schnell (1993) distinguished the distinctive East Gulf Coastal Plain population (with short peduncles, white stigmas, and pale pink petals) as *S. purpurea* ssp. *venosa* var. *burkii* Schnell; Naczi et al. (1999) elevated this to species rank, as *S. rosea*. See Naczi et al. (1999) and Schnell (1993) for more detailed information and color photographs. Naczi et al.'s (1999) treatment of this taxon at specific rank is supported by the greater genetic distance found by Godt and Hamrick (1999) and morphologic and genetic analyses (Ellison et al. 2004). See MacRoberts & MacRoberts (2004) for a detailed discussion about old LA collections of *S. purpurea* or *S. rosea*. [= FNA, WH; < *S. purpurea* – GW, Q, S, U, Z; = *S. purpurea* Linnaeus ssp. *purpurea* var. *burkii* Schnell – K; < *S. purpurea* var. *purpurea* – Reveal (1993); = *S. purpurea* ssp. *venosa* (Rafinesque) Fernald var. *burkii* Schnell – X, Y]

Sarracenia rubra Walter *ssp.* ***gulfensis*** Schnell, Gulf Pitcherplant. Seepage bogs and savannas. April-May. Sw. GA to Panhandle FL. Schnell (2002b) considers the populations of the "*rubra* complex" in Taylor County, GA (the western Coastal Plain of GA, near the AL line) to be best assigned to "*gulfensis*." [= FNA, K, WH, X; < *S. rubra* – GW, S, U, V, Z]

Sarracenia rubra Walter *ssp.* ***rubra***, Sweet Pitcherplant, Redflower Pitcherplant. Sandhill seepage bogs, pocosins, wet savannas. April-May; June-July. Se. and sc. NC south to sc. GA. The *S. rubra* complex consists of five geographically isolated entities, variously treated as species, subspecies, or geographic races (see *S. jonesii* for some of the pertinent references). [= FNA, K, X; < *S. rubra* – RAB, GW, Q, S, U, V, Z]



340. ACTINIDIACEAE Hutchinson 1926 (Kiwi-fruit Family) [in ERICALES]

A family of 3 genera and 340-360 species, trees, shrubs, and lianas, of tropical and warm temperate Asia. References: Dressler & Bayer in Kubitzki (2004).

Actinidia Lindley (Kiwi-fruit)

A genus of 40-60 species, lianas, of e. and se. Asia. In addition to *A. chinensis*, various other species in the genus *Actinidia* are in limited or novelty cultivation in our area; some show potential to escape and naturalize. References: Dressler & Bayer in Kubitzki (2004).

* ***Actinidia chinensis*** Planchon, Kiwi-fruit, Chinese Gooseberry. Pd (NC, VA), Mt (VA): suburban woodlands; rare, native of e. Asia. Also naturalized in nc. TN.

341. CLETHRACEAE Klotzsch 1851 (Clethra Family) [in ERICALES]

A monogeneric family of 65-95 species, shrubs and trees, primarily of tropical America and Asia. Sometimes combined into the Cyrillaceae. References: Tucker & Jones in FNA (2009); Sleumer (1967b); Anderberg & Zhang (2002); Schneider & Bayer in Kubitzki (2004).

Clethra Linnaeus (Sweet Pepperbush, White-alder, Clethra)

A genus of 65-95 species, shrubs and trees, primarily of tropical America and Asia. References: Tucker & Jones in FNA (2009); Sleumer (1967b)=Z ; Schneider & Bayer in Kubitzki (2004). Key based on FNA.

1 Leaves oblong or elliptic, averaging 11-13 cm long and 5-7 cm wide; distance up leaf margin from the leaf base to the first tooth avg. 2.4 cm; leaf margins leaf apex acuminate; inflorescence bracts exceeding the flowers; [of the Mountains]..... ***C. acuminata***
1 Leaves obovate or oblong, averaging 5-9 cm long and 2-4 cm wide cm wide; distance up leaf margin from the leaf base to the first tooth avg. 3.4 cm; leaf apex obtuse to acute; inflorescence bracts shorter than the flowers; [of the Coastal Plain and rarely lower Piedmont].
  2 Lower leaf surface sparsely hairy; petioles 2.5-3.5 (-6) cm long; styles 6-7 mm long, hairy at the base with straight hairs; filaments 0.2-0.3 (-0.4) mm in diameter ..... ***C. alnifolia***
  2 Lower leaf surface wooly-tomentose; petioles 0.5-1 (-1.5) cm long; styles 3.5-5 mm long, downy throughout; filaments 0.4-0.5 (-0.7) mm in diameter..... ***C. tomentosa***

Clethra acuminata Michaux, Mountain Sweet-pepperbush, Mountain White-alder. Moist forests, heath balds, margins of rock outcrops at high elevations. July-August; September-October. Endemic to the Southern and Central Appalachians, *C. acuminata* ranges from sw. PA south through e. WV, w. VA, e. TN, w. NC to nw. SC and ne. GA. [= RAB, C, F, FNA, G, K, S, W, Z]

Clethra alnifolia Linnaeus, Coastal Sweet-pepperbush, Coastal White-alder. Pocosins, blackwater swamp forests, nonriverine swamp forests. June-July; September-October. Primarily a southeastern Coastal Plain species, *C. alnifolia* ranges from NS and ME south to FL, west to TX; disjunct in sc. TN (Coffee County) (Chester, Wofford, & Kral 1997). [= FNA, S; < *C. alnifolia* – C, F, G, GW, K, WH; = *C. alnifolia* var. *alnifolia* – RAB, Z; = *C. alnifolia* var. *pubescens* Aiton – Z]

Clethra tomentosa Lamarck, Downy Sweet-pepperbush, Downy White-alder. Pocosins, swamps, streambanks. E. SC south to FL, and west to e. LA (east of the Mississippi River). If recognized at varietal rank, the correct name is var. *pubescens* Aiton, which predates var. *tomentosa* (Lamarck) Michaux (Sleumer 1967b, Wilbur 1970b). [= FNA, S; < *C. alnifolia* – GW, K, WH; = *C. alnifolia* var. *tomentosa* (Lamarck) Michaux – RAB; = *C. alnifolia* var. *pubescens* Aiton – Z]

342. CYRILLACEAE Endlicher 1841 (Ti-ti Family) [in ERICALES]

A family of 2 genera and 3 or more species, ranging from se. North America to the West Indies and n. South America (following the removal of *Purdiaea* to the Clethraceae (Anderberg & Zhang 2002). References: Lemke in FNA (2009); Godfrey (1988); Anderberg & Zhang (2002); Thomas (1960)=Y; Kubitzki in Kubitzki (2004). Key adapted from Godfrey (1988).

1 Lateral veins of the leaf blades scarcely or not at all apparent on either surface; flowers in terminal and axillary racemes, the racemes solitary or several at a node, not markedly radiating; fruit 5-7 mm long, 2-5 winged..... ***Cliftonia***
1 Lateral veins of the leaf blades readily apparent on both surfaces, the main laterals neatly pinnate, the smaller veins forming a fine reticulum; flowers in lateral racemes, the racemes clustered together at the summit of the previous year's growth and radiating outward or reflexed; fruit 2-2.5 mm long, not winged ..... ***Cyrilla***

Cliftonia Banks ex C.F. Gaertner 1807 (Black Ti-ti, Buckwheat-tree)

A monotypic genus, shrub or small tree, of se. North America. References: Lemke in FNA (2009); Thomas (1960)=Y; Kubitzki in Kubitzki (2004).

Cliftonia monophylla (Lamarck) Britton ex Sargent, Black Ti-ti, Buckwheat-tree. Acid bogs, bayheads, swamps, and streambanks. Se. SC south to n. FL, west to se. LA. [= FNA, GW, K, S, WH, Y]

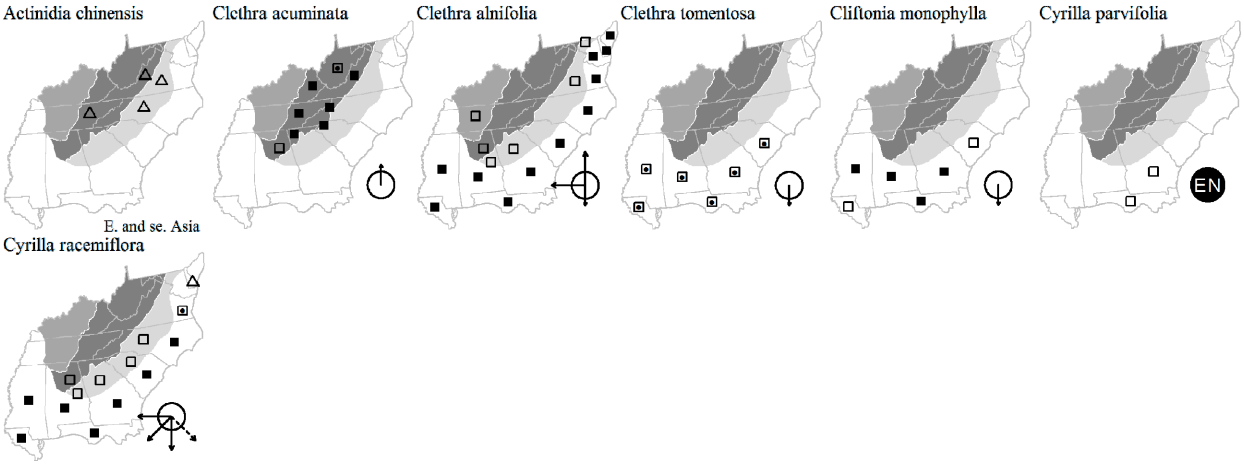
Cyrilla Garden ex Linnaeus 1767 (Ti-ti)

A genus of 1-3 (or more) species, trees and shrubs, of tropical and subtropical North America, West Indies, and n. South America. References: Lemke in FNA (2009); Kurz & Godfrey (1962)=Z; Thomas (1960)=Y; Kubitzki in Kubitzki (2004).

1 Leaves mostly 1-4 cm long, mostly 0.5-1 cm wide; inflorescences mostly 4-9 cm long; petals < 3 mm long; [mostly of flatwoods ponds, in s. GA southward) ..... ***C. parvifolia***
1 Leaves mostly 5-10 cm long, mostly 1-2 cm wide; inflorescences mostly 10-18 cm long; petals > 3 mm long; [of various wetland habitats, throughout our area and widely distributed beyond] ..... ***C. racemiflora***

Cyrilla parvifolia Rafinesque, Littleleaf Ti-ti. Flatwood pond margins and along drains through savannas. S. GA south into Panhandle FL. Its taxonomy is problematic; while very distinctive in some places (such as Apalachicola National Forest, FL), apparent intermediates are seen elsewhere. [= K, S, Z; < *C. racemiflora* – FNA, GW, Y]

Cyrilla racemiflora Linnaeus, Ti-ti. Pocosins, swamps, lake and flatwood pond margins, streambanks, pine flatwoods. May-July; September-October. E. VA (Accomack County) south to FL, west to TX, and south into the West Indies, Belize, Mexico, and n. South America (Thomas 1960). The leaves are quite variable in shape and size; the venation and glossy smoothness, however, are distinctive once learned. Under various ecological conditions, titi can be anything from a small shrub to a medium tree (or large tree in the West Indies). [= RAB, C, G, K, S, Z; < *C. racemiflora* – FNA, GW, Y; > *C. racemiflora* var. *racemiflora* – F; > *C. racemiflora* var. *subglobosa* Fernald – F]



344. ERICACEAE A.L. de Jussieu 1789 (Heath Family) [in ERICALES]

A family of about 107-124 genera and 3400-4100 species, primarily shrubs, small trees, and subshrubs, nearly cosmopolitan. The Ericaceae is very important in our area, with a great diversity of genera and species, many of them rather narrowly endemic. Our area is one of the north temperate centers of diversity for the Ericaceae. Along with *Quercus* and *Pinus*, various members of this family are dominant in much of our landscape. References: Tucker in FNA (2009); Gillespie & Kron (2010); Kron et al. (2002); Wood (1961); Judd & Kron (1993); Kron & Chase (1993); Luteyn et al. (1996)=L; Dorr & Barrie (1993); Cullings & Hileman (1997); Stevens et al. in Kubitzki (2004).

Main Key, for use with flowering or fruiting material

1 Plant an herb, subshrub, or sprawling shrub, not clonal by underground rhizomes (except *Gaultheria procumbens* and *Epigaea repens*), rarely > 3 dm tall; plants mycotrophic or hemi-mycotrophic (except *Epigaea, Gaultheria,* and *Arctostaphylos*).
2 Plants without chlorophyll (fully mycotrophic); stems fleshy; leaves represented by bract-like scales, white or variously colored, but not green; pollen grains single; [subfamily *Monotropoideae*; tribe *Monotropeae*].
3 Petals united; fruit nodding, a berry; flower and fruit several per stem ..... ***6. Monotropsis***
3 Petals separate; fruit erect, a capsule; flower and fruit 1-several per stem.
4 Flowers few to many, racemose; stem pubescent, at least in the inflorescence; plant yellow, orange, or red when fresh, aging or drying dark brown ..... ***5. Hypopitys***
4 Flower solitary; stem glabrous; plant white (rarely pink) when fresh, aging or drying black ..... ***4. Monotropa***

2 Plants with chlorophyll (hemi-mycotrophic or autotrophic); stems woody; leaves present and well-developed, green; pollen grains in tetrads (single in *Orthilia*).
5 Herb with a rosette of ascending basal leaves; flowers scapose; [subfamily *Monotropoideae*; tribe *Pyroleae*].
6 Style and filaments straight; filaments straight, the anthers closely surrounding the style; inflorescence distinctly secund (1-sided) ..... ***3. Orthilia***
6 Style and filaments strongly declined; filaments curved, the anthers not closely surrounding the style; inflorescence slightly or not at all secund (1-sided)..... ***1. Pyrola***
5 Subshrub or sprawling shrub with cauline leaves; flowers axillary (except scapose in *Chimaphila*).
7 Plant erect, the leaves clustered near the apex of the single stem.
8 Leaves lanceolate or oblanceolate, normally 2-4× as long as wide (sometimes proportionately less narrow in stunted individuals; fruit a capsule, borne 1-several on an erect scape above the leaves [subfamily *Monotropoideae*; tribe *Pyroleae*]..... ***2. Chimaphila***
8 Leaves obovate, 1-2× as long as wide; fruit a red berry, borne on nodding axillary pedicels beneath the leaves; [subfamily *Vaccinioideae*; tribe *Gaultherieae*]..... ***27. Gaultheria***
7 Plant creeping or sprawling, leaves scattered along the stems.
9 Flowers solitary and axillary; fruit a white berry; [subfamily *Vaccinioideae*; tribe *Gaultherieae*] ..... ***27. Gaultheria***
9 Flowers in axillary or terminal spikes or racemes; fruit a fleshy loculicidal capsule or red drupe.
10 Leaves glabrous, 1-3 cm long, tapered to the base; corolla urceolate; calyx not subtended by large bracts; [subfamily *Arbutoideae*] ..... ***7. Arctostaphylos***
10 Leaves pilose (glabrate in age), 2-10 cm long, rounded or subcordate at the base; corolla salverform, the lobes spreading; calyx subtended by 2 large bracts; [subfamily *Ericoideae*; tribe *Phyllodoceae*] ..... ***12. Epigaea***

1 Plant a shrub, > 3 dm tall, or 1-3 dm tall and definitely and obviously clonal by underground rhizomes; plants not mycotrophic or hemi-mycotrophic.
11 Leaves ca. 1 mm wide, 3-12 mm long, appearing opposite, alternate, or whorled (the internodes very short, thus the leaves generally appearing whorled); petals absent; fruit a subglobose, 2-stoned drupe, 1-3 mm in diameter; branches often appearing in whorls of 3-7; [subfamily *Ericoideae*; tribe *Empetreae*]
12 Leaves 5-15 mm long; shrubs 5-25 dm tall; drupes red, 1.5-3 mm in diameter; [of SC southwards]..... ***15. Ceratiola***
12 Leaves 3-6 mm long; shrubs 1.5-6 dm tall; drupes gray, 1-1.5 mm in diameter; [of NJ northwards] ..... ***14. Corema***
11 Leaves **either** > 2 mm wide **or** < 5 mm long, mostly alternate or whorled; petals present; fruit not as above, mostly either a capsule or 10- or many-seeded berry; branches appearing alternate or whorled; [subfamily *Vaccinioideae*; tribe *Vaccinieae*].
13 Ovary inferior; fruit indehiscent, a fleshy berry.
14 Ovary 10 locular; seeds 10; leaves glandular-punctate, at least on the lower surface (except *G. brachycera*) ..... ***29. Gaylussacia***
14 Ovary 4-5 locular; seeds numerous; leaves not glandular-punctate ..... ***28. Vaccinium***
13 Ovary superior; fruit dehiscent, a dry capsule.
15 Petals separate; fruit 2-7-locular; **either** a shrub to 1 m tall with ovate to oblong, evergreen leaves, 0.6-1.2 cm long, **or** a shrub to small tree 2-6 (-9) m tall with elliptic, deciduous leaves, 4-12 cm long, **or** a shrub 1-2.5 m tall, with elliptic to ovate, evergreen leaves 2-4 cm long; [subfamily *Ericoideae*; tribe *Phyllodoceae*].
16 Fruit 2-3 (5)-locular; shrub to 1 m tall; leaves, 0.4-1.2 cm long; petals 2-4 mm long..... ***13. Kalmia buxifolia***
16 Fruit 4-7-locular; shrub to small tree 1-6 (-9) m tall; leaves 2-12 cm long; petals 12-30 mm long.
17 Fruit 7-locular; leaves evergreen 2-4 cm long; petals 20-30 mm long; shrub 1-2.5 m tall ..... ***8. Bejaria***
17 Fruit 4-5-locular; leaves deciduous, 4-12 cm long; petals 12-14 mm long; shrub to small tree 2-6 (-9) m tall ..... ***11. Elliottia***
15 Petals fused for part or all their lengths; fruit (4-) 5-locular; shrub or tree with leaves of various shape, evergreen or deciduous, these **either** < 6 mm long, linear and whorled, **or** > 12 mm long.
18 Leaves whorled, < 5 mm long, linear; [subfamily *Ericoideae*, tribe *Ericeae*]
19 Leaves opposite, sessile, clasping at the base ..... ***16. Calluna***
19 Leaves whorled (in 4s), petiolate..... ***17. Erica***
18 Leaves alternate or whorled, > 20 mm long.
20 Flowers 4-merous; fruits 4-locular; leaves with a series of fascicles of trichomes on the midrib below; [subfamily *Ericoideae*; tribe *Rhodoreae*] ..... ***9. Menziesia***
20 Flowers 5-merous; fruits 5-locular; leaves not as above.
21 Leaves coriaceous, evergreen, shiny and dark green above.
22 Leaves sharply and distinctly serrate.
23 Pedicels slender, 7-10 mm long; filaments strongly curved just below the anthers; pith transversely diaphragmed; [subfamily *Vaccinioideae*; tribe *Lyonieae*]..... ***20. Agarista***
23 Pedicels stout, 2-6 mm long; filaments straight; pith solid; [subfamily *Vaccinioideae*; tribe *Gaultherieae*] ..... ***25. Leucothoe***
22 Leaves entire, or obscurely and finely crenulate-serrulate.
24 Capsules elongate, > 2× as long as broad, 8-18 mm long; [subfamily *Ericoideae*; tribe *Rhodoreae*] ..... ***10. Rhododendron***
24 Capsules ovoid to globose or subglobose, about as long as broad, 5-8 mm long.
25 Leaves with a prominent vein running parallel to (and about 1 mm in from) the margin; [subfamily *Vaccinioideae*; tribe *Lyonieae*]..... ***21. Lyonia***
25 Leaves without a prominent marginal vein.
26 Corolla saucer-shaped, 10-30 mm across; leaves entire; [subfamily *Ericoideae*; tribe *Phyllodoceae*] .... ***13. Kalmia***
26 Corolla narrowly urceolate, 4-6 mm across; leaves finely crenulate-serrulate; [subfamily *Vaccinioideae*; tribe *Lyonieae*]..... ***19. Pieris***
21 Leaves membranaceous or subcoriaceous, deciduous or evergreen, if subcoriaceous and evergreen, then not shiny and dark green above.
27 Capsules elongate, > 2× as long as broad, 7-23 mm long; [subfamily *Ericoideae*; tribe *Rhodoreae*]..... ***10. Rhododendron***
27 Capsules ovoid to globose or subglobose, about as long as broad, or broader than long, 2-7 mm long.
28 Leaves (at least the larger) > 2.5 cm wide.
29 Pedicels with 2 bracteoles.

30 Capsule broader than long; shrub; bracteoles just below the calyx; [subfamily *Vaccinioideae*; tribe *Gaultherieae*] ..... ***26. Eubotrys***
30 Capsule longer than broad; tree; bracteoles generally near the middle of the pedicel; [subfamily *Vaccinioideae*; tribe *Oxydendreae*] ..... ***18. Oxydendrum***
29 Pedicels without bracteoles.
31 Leaves entire to minutely serrulate; capsule sutures pale and thickened; [subfamily *Vaccinioideae*; tribe *Lyonieae*] ..... ***21. Lyonia***
31 Leaves crenate; capsule sutures not thickened and pale; [subfamily *Vaccinioideae*; tribe *Andromedeae*] ..... ***23. Zenobia***
28 Leaves < 2.5 cm wide.
32 Leaves linear to narrowly lanceolate, 8× or more as long as wide. strongly revolute, strongly whitened beneath; [subfamily *Vaccinioideae*; tribe *Andromedeae*] ..... ***22. Andromeda***
32 Leaves broader, not revolute or slightly so, not strongly whitened below.
33 Leaves whorled or alternate; corolla saucer-shaped, 10-20 mm across; [subfamily *Ericoideae*; tribe *Phyllodoceae*] ..... ***13. Kalmia***
33 Leaves alternate; corolla narrowly urceolate, 2-8 mm across.
34 Pedicels with 2 bracteoles near the summit; [subfamily *Vaccinioideae*; tribe *Gaultherieae*] ..... ***24. Chamaedaphne***
34 Pedicels with 2 bracteoles near the base; [subfamily *Vaccinioideae*; tribe *Lyonieae*] ..... ***21. Lyonia***

Alternate Key to Ericaceae (including some relatives), emphasizing vegetative characters

[This key includes some related shrubs, of the Diapensiaceae, Clethraceae, and Cyrillaceae]

1 Leaves and stems lacking chlorophyll (either white or variously tinted with colors such as pink, tan, red, or violet) ..... **Key A**
1 Leaves and stems with chlorophyll (green, though some parts may have the green pigment obscured with purple or other colors).
2 Leaves membranaceous or subcoriaceous, deciduous or tardily deciduous, usually not particularly glossy (except in new foliage of some species) ..... **Key B**
2 Leaves coriaceous, more or less stiff, evergreen, usually glossy and often dark green.
3 Subshrub or sprawling shrub, 0-1 (-2) dm tall, not clonal by underground rhizomes (except *Gaultheria procumbens*), though often clonal by creeping stems, or sprawling and patch-forming (many of these species are only ambiguously shrublike and are considered herbs by the casual observer) ..... **Key C**
3 Shrub, > 3 dm tall, or 1-3 dm tall and definitely and obviously clonal by underground rhizomes ..... **Key D**

Key A – Achlorophyllose plants

1 Flower solitary; stem glabrous; plant white (rarely pink) when fresh, aging or drying black ..... ***Monotropa uniflora***
1 Flowers few to many, racemose; stem glabrous (*Monotropsis*) or pubescent, at least in the inflorescence (*Hypopitys*); plant yellow, orange, or red when fresh, aging or drying dark brown.
2 Plant yellow, orange, or red when fresh, aging or drying dark brown; stem pubescent, at least in the inflorescence; petals separate to base... ..... ***Hypopitys monotropa***
2 Plant lavender when fresh; stem glabrous; petals fused into an urceolate corolla..... ***Monotropsis***

Key B – Deciduous ericaceous shrubs and trees

Gaylussacia spp., Vaccinium spp., Elliottia racemosa, Menziesia pilosa, Rhododendron spp., Kalmia cuneata, Chamaedaphne calyculata, Lyonia mariana, Lyonia ligustrina var. ligustrina, Lyonia ligustrina var. foliosiflora, Eubotrys racemosa, Eubotrys recurva, Oxydendrum arboreum, Zenobia pulverulenta, Clethra acuminata, Clethra alnifolia, Cyrilla racemiflora

Key C – Evergreen subshrubs and sprawling shrubs

1 Plant erect, the leaves few (< 10), clustered near the apex of the single stem.
2 Leaves obovate, 1-2× as long as wide; fruit a red berry, borne on nodding axillary pedicels beneath the leaves..... ***Gaultheria procumbens***
2 Leaves lanceolate or oblanceolate, normally 2-4× as long as wide (sometimes proportionately less narrow in stunted individuals; fruit a capsule, borne 1-several on an erect scape above the leaves.
3 Leaves lanceolate (broadest below the middle), base rounded, striped with white or paler green along the major veins..... ..... ***Chimaphila maculata***
3 Leaves oblanceolate (broadest above the middle), base cuneate, solid dark green throughout .... ***Chimaphila umbellata*** *ssp.* ***cisatlantica***
1 Plant creeping or sprawling, leaves scattered along the stems, or tufted at the base.
4 Leaves 2-15 cm wide; leaves (2-) 3.5-15 cm long, rounded or subcordate at the base.
5 Leaves dull green, with a pebbled texture, pilose (glabrate in age) ..... ***Epigaea repens***
5 Leaves bright shiny green (or prrple), with a smooth texture, glabrous.
6 Leaves orbicular, rounded or with a slight point at the apex, finely serrate (4-8 teeth per cm), the teeth not prominently mucronate; flowers in racemes; [widespread in distribution] ..... ***Galax urceolata [DIAPENSIACEAE]***

6 Leaves broadly elliptic, generally emarginate (slightly notched) at the apex, coarsely serrate (1-4 teeth per cm), the teeth prominently mucronate; flowers solitary; [native to humid gorges along the escarpment between the Mountains and Piedmont, sometimes cultivated and becoming established elsewhere]..... ***Shortia galacifolia [DIAPENSIACEAE]***

4 Leaves 0-1.5 cm wide; leaves 0.5-3 cm long, cuneate at the base (at least widely so), glabrous (or bristly beneath in *Gaultheria hispidula*).

7 Leaves linear, < 2 mm wide.

8 Leaves (3.3) 4-10 mm long; leaves lanceolate, averaging > 1.0 mm wide (oblanceolate and up to 2.5 mm wide if etiolated under leaf litter); leaves (in fresh material) herbaceous in texture, < 0.1 mm thick; leaves of sterile shoots ciliate along the margins at the base, usually also pubescent on the upper surface near the base, but the pubescence rarely extending > 1/3 of the way from the base to the tip; internodes usually > 1 mm long..... ***Pyxidanthera barbulata [DIAPENSIACEAE]***

8 Leaves 1-5 mm long (rarely to 7 mm long if etiolated under leaf litter); leaves ovate, averaging < 1.2 mm wide (lanceolate and up to 1.5 mm wide if etiolated under leaf litter); leaves (in fresh material) succulent in texture, up to 0.5 mm thick; leaves of sterile shoots lanose to densely pubescent on the upper surface at the base, the pubescence becoming sparser toward the tip of the leaf, but extending past the midpoint of the leaf and often its full length; internodes usually < 1 mm long..... ***Pyxidanthera brevifolia [DIAPENSIACEAE]***

7 Leaves broader, > 2 mm wide.

9 Leaves serrate or serrulate (sometimes inconspicuously so); [of pinelands of the Coastal Plain and (very rarely) lower Piedmont of se. VA southward].

10 Leaves (2-) 3-18 (-25) mm long, generally elliptic (less commonly ovate or obovate); angle of leaf base typically > 90 degrees; margins finely glandular mucronulate-crenulate, the teeth tightly appressed and therefore often obscure, the margin superficially entire; stems mostly prostrate (ascending in areas that have been long fire-suppressed); [widespread in NC and SC, rare in se. VA and e. GA]..... ***Vaccinium crassifolium***

10 Leaves (4-) 7-35 (-63) mm long, elliptic to obovate (less commonly elliptic-ovate); angle of leaf base typically < 90 degrees; margins glandular mucronulate-serrulate to serrulate-crenulate, the teeth apparent, especially toward the apex; stems often ascending to upright; [of Lexington County, SC]..... ***Vaccinium sempervirens***

9 Leaves entire; [of the Mountains of VA northward, except *Vaccinium macrocarpon* of bogs, as far south as se. sc. and sw. NC].

11 Leaves 10-30 mm long; leaves oblanceolate to obovate, the widest point past the middle; primary stems 1-3 mm in diameter; [of relatively dry, rocky habitats]..... ***Arctostaphylos uva-ursi***

11 Leaves (3-) 5-10 (-18) mm long; leaves ovate or elliptic, the widest point belowor at the middle; primary stems delicate; [of moist to distinctly boggy habitats].

12 Leaf undersurface green, sparsely bristly; [of moist habitats]..... ***Gaultheria hispidula***

12 Leaf undersurface whitened, glabrous; [of saturated wetlands].

13 Leaves elliptic, broadest near middle, (5-) 7-10 (-18) mm long, (2-) 3-4 (-5) mm wide; leaves blunt-rounded and non-involute; pedicels with 2 green, leaf-like bracts 1-2 mm wide; berry 8-15 mm in diameter..... ***Vaccinium macrocarpon***

13 Leaves ovate, broadest toward base, (3-) 5-6 (-9) mm long, (1-) 2-3 (-5) mm wide; leaves involute at least along the margins, thus making the leaf tip acute; pedicels with (0-) 2 (-5) reddish, scale-like bracts < 1 mm wide; berry 6-12 mm in diameter ..... ***[Vaccinium oxycoccos]***

Key D – Evergreen ericaeous shrubs (either tall or obviously clonal) and trees

1 Leaves linear, needle-like, **either** appearing whorled (at least in part, sometimes also with nodes appearing opposite or alternate) **or** opposite (*Calluna*).

2 Leaves opposite, sessile and clasping; [exotic, rarely naturalized]..... ***Calluna vulgaris***

2 Leaves whorled (at least in part), petiolate; [**either** native **or** exotic and rarely naturalized].

3 Leaves densely puberulent and ciliate with gland-tipped hairs; leaves 1.5-5 mm long; [exotic, rarely naturalized]..... ***Erica tetralix***

3 Leaves glabrous; leaves 3-15 mm long; [native].

4 Leaves 5-15 mm long; shrubs 5-25 dm tall; drupes red, 1.5-2 mm in diameter; [of SC southwards]..... ***Ceratiola ericoides***

4 Leaves 3-6 mm long; shrubs 1.5-6 dm tall; drupes gray, 1-1.5 mm in diameter; [of NJ northwards]..... ***Corema conradii***

1 Leaves broader, alternate (or whorled or opposite in *Kalmia*).

5 Leaves (all of them) < 2 cm long.

6 [**Either** of the Mountains, the Piedmont, **or** the Coastal Plain of ne. SC and se. NC].

7 Leaves alternate, glabrous, finely serrulate..... ***Gaylussacia brachycera***

7 Leaves alternate or opposite, stipitate-glandular or glabrous, entire, or with a few obscure teeth..... ***Kalmia buxifolia***

6 [Of the Coastal Plain, from se. SC southward].

8 Twigs densely hispid; leaves hispid on both surfaces..... ***Kalmia hirsuta***

8 Twigs glabrous to puberulent; leaves glabrous or with scattered inconspicuous hairs.

9 Plant glaucous and bluish-green throughout; leaf undersurface lacking scattered glandular hairs; [of s. GA south to s. peninsular FL, west to e. TX]..... ***Vaccinium darrowii***

9 Plant dark green throughout, generally exceeding 20 mm in length; leaf undersurface with scattered glandular hairs, these sometimes very few by late in the season (best seen in the field by folding a leaf, holding the fold up to the light, and using a 10× lens); [of se. SC southward to n. FL, west to s. AL]..... ***Vaccinium myrsinites***

5 Leaves (at least the larger) > 3 cm long.

10 Leaves toothed, at least toward the tip of the leaf (note that fine serrations or crenations can be obscured by revolute margins).

11 Leaves elliptic to oblanceolate, widest near or above the middle, obtuse, acute, or short-acuminate, 1.5-7 cm long, 0.5-2.5 cm wide; leaf serrations fine and obscure; leaf surfaces with small stipitate glands (*Pieris*) or lepidote with scales (*Chamaedaphne*).

12 Leaves lepidote with scales; leaves oblanceolate, widest above the middle..... ***Chamaedaphne calyculata***

12 Leaves with small stipitate glands, otherwise appearing glabrous; leaves elliptic, widest near the middle.

13 Inflorescence a many-flowered panicle of racemes, borne terminally; seeds 2.5-3 mm long; [of slopes and ridges of the Mountains and upper Piedmont]..... ***Pieris floribunda***

13 Inflorescence a 3-9 flowered raceme, borne in the axils of upper leaves; seeds ca. 1 mm long; [of wetlands of the Coastal Plain, often associated with *Taxodium ascendens*]..... ***Pieris phillyreifolia***

11 Leaves lanceolate or ovate, widest below the middle, short-acuminate to acuminate, 4-15 cm long, 1-5 cm wide; leaf serrations generally obvious (at least toward the acuminate leaf tip); leaf surfaces glabrous, or with non-stipitate hairs on the lower surface.
14 Pith transversely diaphragmed; [pedicels slender, 7-10 mm long]; [filaments strongly curved just below the anthers] ..... ***Agarista populifolia***
14 Pith solid; [pedicels stout, 2-6 mm long]; [filaments straight].
15 Leaves with an acute or short-acuminate apex; racemes 2-4 (5) cm long; sepals ovate, with an obtuse or rounded apex; longest petioles 3-8 mm long ..... ***Leucothoe axillaris***
15 Leaves with a long-acuminate apex; racemes 4-10 cm long; sepals lanceolate-ovate, with an acute (or subacute) apex; longest petioles 8-15 mm long ..... ***Leucothoe fontanesiana***
10 Leaves entire.
16 Leaves whitened beneath by a dense mat of white hairs; leaves linear and strongly revolute ..... ***Andromeda***
16 Leaves green or brown beneath, glabrous, glabrescent, or lepidote with scales.
17 Leaves densely lepidote on the under surface with brown scales.
18 Leaves planar, not revolute; petioles 7-20 mm long; twigs more-or-less terete in cross-section; [of the Mountains, Piedmont, and upper Coastal Plain].
19 Corolla mostly 15-20 mm long, the corolla tube (9-13 mm long) shorter than to as long as the corolla lobes (12-18 mm long); plant flowering early relative to R. minus, despite occurring at higher elevations and more northern latitudes; seeds ovoid, < 1.0 mm long, < 2.5× as long as wide (reminiscent of tiny watermelon seeds), coarsely textured, unornamented at the ends; calyx lobes deltoid; [of mountain ridges, heath balds, and rocky summits, mostly either away from the Blue Ridge Escarpment or north of the Asheville Basin] ..... ***Rhododendron carolinianum***
19 Corolla mostly 25-37 mm long, the corolla tube (13-22 mm long) longer than the corolla lobes (8-12 mm long); plant flowering late relative to R. carolinianum; seeds usually > 1.0 mm long, usually > 3× as long as wide, ornamented at one or both ends; calyx lobes ovate; [of the Coastal Plain, Piedmont, and Mountains, in the Mountains mostly of the Blue Ridge Escarpment of sw. NC and nw. SC, ranging in elevation up to the higher granitic domes in Macon and Jackson counties, NC].
20 Leaf apices mostly obtuse to rounded; petioles 2-6 (-7) mm long; branches erect and rigid; seeds moderately to elaborately ornamented with flared protrusions at both ends; [of n. FL] ..... ***Rhododendron chapmanii***
20 Leaf apices mostly acute to acuminate; petioles (5-) 6-20 mm long; branches spreading, not notably erect and rigid; seeds somewhat ornamented at one end; [of c. GA northward] ..... ***Rhododendron minus***
18 Leaves slightly to strongly revolute (or nearly planar in *Lyonia fruticosa*); petioles 1-7 mm long; twigs angled in cross-section; [of the lower Coastal Plain, from se. SC southward].
21 Ultimate branches not rigidly ascending, flowers nearly always restricted to branches of the previous year, the leaves not conspicuously reduced toward the branch tips; leaves with distal margin usually revolute, sometimes strongly so; major veins usually depressed; lower leaf surface with some scales often large and with irregular margins, others smaller and more nearly entire, at least the smaller scales more-or-less persistent; [shrub or small tree to 6 (-10) m tall] ..... ***Lyonia ferruginea***
21 Ultimate branches rigidly ascending, flowers frequent on branches of the current year (though also on older growth), the leaves conspicuously reduced toward the branch tips; leaves with distal margin at most slightly revolute; major veins not depressed; lower leaf surface with scales usually all large and with irregular margins, the scales often deciduous; [shrub to 1.5 (-3) m tall] ..... ***Lyonia fruticosa***
17 Leaves not lepidote beneath (*Lyonia lucida* with scattered minute scales on young leaves).
22 Leaves whorled or rarely opposite.
23 Calyx lobes glandular-canescent and with marginal stipitate glands; leaves glabrous beneath; bracts and bracteoles densely glandular; stomates 18 µ long and 13 µ wide, 15-24 per 0.2 square millimeter; shrub to 1 (-1.2) m tall; [of ne. NC northward] ..... ***Kalmia angustifolia***
23 Calyx lobes canescent but lacking glands; leaves short puberulent beneath; bracts and bracteoles nearly glandless; stomates 13 µ long and 9 µ wide, 35-51 per 0.2 square millimeter; shrub to 2 m tall (though often much shorter); [of se. and sw. VA southward] ..... ***Kalmia carolina***
22 Leaves alternate.
24 Leaf blades (8-) 10-30 cm long, 3-9 cm wide, rounded to obtuse at the tip.
25 Leaves rounded at base (rarely broadly cuneate or slightly cordate), obtuse at apex; leaf generally 1.5-2.5× as long as wide; [corolla usually deep pink to purple]; [sepals 0.5-1 mm long] ..... ***Rhododendron catawbiense***
25 Leaves cuneate at base, acute at apex; leaf generally 3-5× as long as wide; [corolla usually white to pale pink]; [sepals 4-6 mm long] ..... ***Rhododendron maximum***
24 Leaf blades 2-10 (-12) cm long, 1-5 cm wide, acute, short-acuminate (or obtuse or rounded in *Cyrilla*) at the tip.
26 Leaf with a prominent vein running the length of the margin, about 1 mm in; [shrub to 4 m tall] ..... ***Lyonia lucida***
26 Leaf venation not as above; [shrub to small tree] ..... ***Kalmia latifolia, Cyrilla racemiflora, Cliftonia racemosa, Bejaria racemosa***

1. Pyrola Linnaeus 1753 (Shinleaf, Pyrola)

A genus of 30-35 species, subshrubs, circumboreal and also in Sumatra and Guatemala. The inclusion of this group of species in the Ericaceae or its recognition as a separate family has been controversial. Recent studies (Judd & Kron 1993, Kron & Chase 1993) suggest that it is best resubmerged in the Ericaceae. References: Freeman in FNA (2009); Liu et al. (2010); Stevens et al. in Kubitzki (2004).

1 Calyx lobes distinctly longer than broad, 3-4 mm long; leaves coriaceous, more or less glossy; [section *Pyrola*; series *Pyrola*] ..... ***P. americana***
1 Calyx lobes about as broad as long, 1.5-2 mm long; leaves not coriaceous, dull.

2 Leaves mostly 1-3 cm long, the blade mostly < 2.5 cm wide; calyx lobes broadly ovate, the apex subacute to obtuse; [section *Ampliosepala*; series *Chloranthae*] ..... ***P. chlorantha***
2 Leaves mostly 3-9 cm long, the blade mostly > 2.5 cm wide; calyx lobes triangular, the apex acute to acuminate; [section *Pyrola*; series *Ellipticae*] ..... ***P. elliptica***

Pyrola americana Sweet, Rounded Shinleaf. Xeric to mesic woodlands and forests. May-August; July-October. NL (Newfoundland) west to MB, south to NC, ne. TN, KY, IN, MN, and SD. [= FNA, K, S, W; = *P. rotundifolia* Linnaeus var. *americana* (Sweet) Fernald – RAB, C, F, G, L, WV]

Pyrola chlorantha Swartz. Dry forests. June-August; August-October. Circumboreal, in North America south to VA, WV, IN, NE, NM, AZ, and CA. [= C, FNA, K, L, W; > *P. virens* var. *virens* – F, G; > *P. virens* var. *convoluta* (Bart.) Fernald – F, G, WV]

Pyrola elliptica Nuttall, Elliptic Shinleaf. Moist to dry forests, including rich northern hardwood forests. June-August; July-October. NS, NL (Newfoundland), and QC west to BC, south to DE, nw. NC, WV, OH, IN, IL, IA, NE, NM, and AZ. Known in NC only from Ashe County, in Long Hope Valley (McDowell 1984) and on Phoenix Mountain. [= C, F, FNA, G, K, L, S, W, WV]

2. Chimaphila Pursh 1814 (Pipsissewa)

A genus of 4-5 species, subshrubs, of temperate and tropical America, and Eurasia. References: Freeman in FNA (2009); Stevens et al. in Kubitzki (2004).

1 Leaves lanceolate (broadest below the middle), base rounded, striped with white or paler green along the major veins ..... ***C. maculata***
1 Leaves oblanceolate (broadest above the middle), base cuneate, solid dark green throughout ..... ***C. umbellata*** *ssp.* ***cisatlantica***

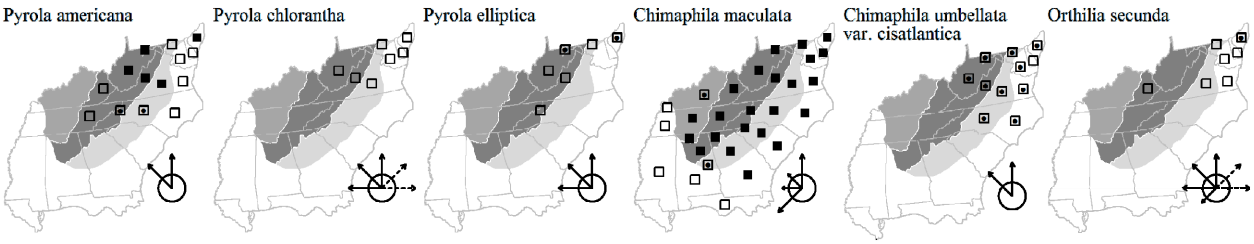
Chimaphila maculata (Linnaeus) Pursh, Pipsissewa, Striped Wintergreen. Forests and woodlands, mostly rather xeric and acid. May-June; July-October. ME west to MI, south to GA, FL Panhandle, and AL; disjunct in mountains of AZ, Mexico, and Central America south to Panama. [= RAB, C, F, G, K, L, S, W, WH]

Chimaphila umbellata (Linnaeus) W. Barton *var.* ***cisatlantica*** Blake, Prince's-pine. Forests and woodlands, mostly rather xeric and acid. May-June; July-October. Circumboreal, extending (in the interpretation of some) south into Central America. Var. *cisatlantica* is widespread in ne. North America, from NS and QC west to MN, south to NC and IN. [= C, F, G, L; < *C. umbellata* ssp. *umbellata* – FNA; < *C. umbellata* – RAB, W; = *C. umbellata* ssp. *cisatlantica* (Blake) Hultén – K; *? C. corymbosa* Pursh – S]

3. Orthilia Rafinesque 1840 (Sidebells, One-sided Shinleaf, One-sided Wintergreen)

A monotypic genus, a subshrub, circumboreal in distribution. The recognition of *Orthilia* as separate from *Pyrola* is supported by molecular data (Freudenstein 1999a). References: Freeman in FNA (2009); Stevens et al. in Kubitzki (2004).

Orthilia secunda (Linnaeus) House, Sidebells, One-sided Shinleaf, One-sided Pyrola. Forests under *Pinus virginiana*, other forests? June-July; July-September. Circumboreal, in North America south to VA, IN, IA, NE, NM, AZ, and CA; disjunct in Mexico and Guatemala. [= FNA, K, L; = *Pyrola secunda* Linnaeus – C, G, W; > *P. secunda* var. *secunda* – F]



4. Monotropa Linnaeus 1753 (Indian Pipes, Pinesap)

A monotypic genus, an herb, of North America, Central America, South America, and e. Asia. The segregation of *Monotropa, Hypopitys,* and *Monotropsis* into the Monotropaceae or their inclusion in the Ericaceae has been controversial. Recent studies suggest that their inclusion in the Ericaceae is warranted (Kron & Chase 1993, Judd & Kron 1993). References: Wallace in FNA (2009); Wallace (1975)=Z; Stevens et al. in Kubitzki (2004). [also see *Hypopitys*]

1 Flowers few to many, racemose; stem pubescent, at least in the inflorescence; plant yellow, orange, or red when fresh, aging or drying dark brown ..... ***[Hypopitys monotropa]***
1 Flower solitary; stem glabrous; plant white (rarely pink) when fresh, aging or drying black ..... ***Monotropa uniflora***

Monotropa uniflora Linnaeus, Indian Pipes. In a wide variety of forests. June-October; August-November. NL (Labrador) and AK south to s. FL, TX, CA; disjunct in s. Mexico, Central America, South America (Colombia), and e. Asia. A preliminary

molecular study suggests that splitting of worldwide *Monotropa uniflora* into several geographic species or varieties may be warranted (Neyland & Hennigan 2004). [= RAB, C, F, FNA, G, K, L, W, WH, WV, Z; > *M. uniflora* – S; > *M. brittonii* Small – S]

5. Hypopitys Crantz 1766 (Pinesap)

A genus of 1-several species, herbs, of circumboreal distribution. Recent molecular evidence supports its separation as a genus distinct from *Monotropa* (as has often been done in the past) (Neyland & Hennigan 2004). References: Wallace in FNA (2009); Wallace (1975)=Z; Stevens et al. in Kubitzki (2004).

Hypopitys monotropa Crantz, Pinesap. Forests. May-October; July-November. Circumboreal, south nearly throughout North America, to c. peninsular and Panhandle FL, TX, NM, AZ, CA, and Mexico; disjunct in Guatemala; Europe; c. and e. Asia. Recent studies suggest that several cryptic to semi-cryptic species or infraspecific taxa should be recognized (M. Klooster, pers. comm.. 2009). [= *Monotropa hypopithys* Linnaeus – RAB, C, F, G, K, L, W, WH, WV, Z; > *Hypopitys americana* (A.P. de Candolle) Small – S; > *Hypopitys lanuginosa* (Michaux) Nuttall – S; > *H. insignata* Bicknell; > *Monotropa lanuginosa* Michaux]

6. Monotropsis Schweinitz in Elliott 1817 (Pigmy Pipes, Sweet Pinesap)

A genus of probably 2 species, mycotrophic herbs, of se. North America. Often treated as monotypic, but there appears to be more to at least of the "lumped" taxa than has usually been credited; the genus warrants additional study. *Monotropsis* is mycotrophic, receiving its nutritrion by association with a mycorrhizal fungus, the intertwined root mass and fungal mantle about 1-2 cm in diameter. References: Wallace in FNA (2009); Wallace (1975)=Z; Chafin (2000)=Y; Wolf (1922); Stevens et al. in Kubitzki (2004).

1 Sepals about 0.75-1.25× as long as the corolla, ovate; corolla pink, lavender, purple, or purplish-red, the corolla lobes in the plane of the corolla tube or curved inwards from that plane; **either** flowering prematurely in September-November and the flowers not fragrant, **or** flowering February-April and the flowers strongly and spicily fragrant; [of AL and GA northwards] ..... ***M. odorata***

1 Sepals about 0.5× as long as the corolla, lanceolate; corolla white or pale lavender, the corolla lobes spreading or reflexed; flowering January-February, the flowers slightly fragrant; [of FL] ..... ***M. reynoldsiae***

Monotropsis odorata Schweinitz ex Elliott, Spring Pigmy Pipes. Dry to mesic upland woods under oaks and/or pines (*Pinus virginiana* or *P. echinata*), especially slopes or bluffs with abundant heaths, often including *Kalmia latifolia* and/or *Rhododendron maximum*. February-April (and sometimes September-November); May-June (and sometimes October-November). Centered in the Appalachians: DE, MD, and WV south to GA and AL. The flowers are very fragrant, the odor variously compared to cloves, nutmeg, cinnamon, and violets. Since the diminutive plants (3-10 cm tall) are often covered by leaf litter, fragrance is often the key to finding this species. The fall flowering form, entity "*lehmaniae*" (see synonymy), appears to represent the early development of *M. odorata* which will typically then overwinter in "suspended animation" and flower in the early spring. [< *M. odorata* – C, F, FNA, G, K, L, W, WV, Z; > *M. odorata* var. *odorata* – RAB; > *M. odorata* var. *lehmaniae* (Burnham) Ahles – RAB; > *M. odorata* – S; > *M. lehmaniae* Burnham – S]

Monotropsis reynoldsiae (A. Gray) A. Heller, Florida Pigmy Pipes. Upland mixed hardwood forests, mesic hammocks, xeric hammocks, scrub. January-February. Endemic to nc. peninsular FL, in St. Johns, Marion, Citrus, Hernando, Pasco, and Volusia counties. See Chafin (2000) for additional information; there seems little question that this is specifically distinct from *M. odorata*. [= S, Y; < *M. odorata* – FNA, K, L, W, WH, Z]

7. Arctostaphylos Adanson 1760 (Bearberry)

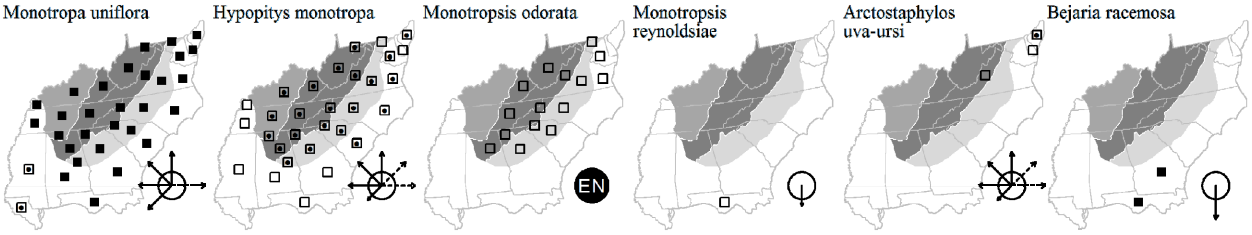
A genus of 60-70 species, shrubs, woody vines, or small trees, mostly in w. North America, but with 2 circumboreal species. References: Parker, Vasey, & Keeley in FNA (2009); Rosatti (1987b)=Z; Stevens et al. in Kubitzki (2004).

Arctostaphylos uva-ursi (Linnaeus) Sprengel, Bearberry, Kinnikinick. High elevation granitic outcrop (VA); Coastal Plain pitch pine woodlands (DE). May-June. Circumboreal, ranging in North America from NL (Labrador) west to AK, south to DE, n. VA, n. IN, IL, IA, SD, NM, AZ, and CA; disjunct in Guatemala. Following Rosatti (1987), *A. uva-ursi* is here treated inclusively, as a complex species not readily divisible into infraspecific taxa. [= C, FNA, K, L, W, Z; > *A. uva-ursi* var. *coactilis* Fernald & J.F. Macbride – F, G; > *A. uva-ursi* ssp. *coactilis* (Fernald & J.F. Macbride) A. & D. Löve & Kapoor]

8. Bejaria Mutis in Linnaeus 1771 (Tarflower)

A genus of 15 species, shrubs and trees, of se. United States to Cuba, and from Mexico south into Bolivia. The spelling of the generic name has been controversial; it was originally published as '*Befaria*,' because of Linnaeus's misreading of Mutis's handwriting, but was intended to commemorate José Béjar. The spelling has now been conserved as '*Bejaria*' (Greuter et al. 2000). References: Clemants in FNA (2009); Stevens et al. in Kubitzki (2004).

Bejaria racemosa Ventenat, Tarflower, Flycatcher. Pine flatwoods. E. GA (adjacent to se. SC) south to s. peninsular FL, west to AL. [= FNA, L, WH; = *Befaria racemosa* – GW, K, S, orthographic variant]



9. Menziesia J.E. Smith 1791 (Minniebush)

A genus of about 7-10 species, shrubs, of e. Asia (mostly), w. North America (1 species), and se. North America (1 species). *M. ferruginea* J.E. Smith of w. North America is closely related to *M. pilosa*; the e. Asian species of the genus are more distantly related. Molecular evidence suggests that *Menziesia* should be included in *Rhododendron*, and is actually closely related within *Rhododendron* to *R. vaseyi* (Goetsch, Eckert, & Hall 2005; Kurashige et al. 2001). References: Fabijan in FNA (2009); Stevens et al. in Kubitzki (2004).

Menziesia pilosa (Michaux ex Lamarck) Antoine Laurent de Jussieu ex Persoon, Minniebush. Heath balds, bogs, rocky summits, and rocky woodlands, mostly at high elevations. May-July; August-October. A Southern and Central Appalachian endemic: sc. PA, sw. PA, e. WV, w. VA, e. TN, w. NC, and ne. GA. The very prominent mucro on the leaves and the series of fascicles of trichomes along the leaf midrib below readily distinguish the species in sterile condition from similar deciduous *Rhododendron*. [= RAB, C, F, FNA, G, K, L, S, W, WV; = ***Rhododendron species 1***]

10. Rhododendron Linnaeus 1753 (Rhododendron, Azalea)

A genus of about 850 species, shrubs and trees, mostly north temperate (centered in Himalayan Asia). References: Judd & Kron in FNA (2009); Kron (1993)=Z; Judd & Kron (1995)=Y; Chamberlain (1982)=X; Cullen (1980)=Q; Davidian (1982)=D; Duncan & Pullen (1962)=V; Goetsch, Eckert, & Hall (2005); Towe (2004); Kron & Creel (1999); Stevens et al. in Kubitzki (2004).

1 Leaves evergreen, coriaceous, entire; stamens 10; [**rhododendrons**].
  2 Lower surface of leaves not punctate with brown scales; larger leaves 10-30 cm long; [subgenus *Hymenanthes*, section *Ponticum*, subsection *Pontica*].
    3 Leaves rounded at base (rarely broadly cuneate or slightly cordate), obtuse at apex; leaf generally 1.5-2.5× as long as wide; corolla usually deep pink to purple; sepals 0.5-1 mm long ..... ***R. catawbiense***
    3 Leaves cuneate at base, acute at apex; leaf generally 3-5× as long as wide; corolla usually white to pale pink; sepals 4-6 mm long..... .....***R. maximum***
  2 Lower surface of leaves punctate with brown scales; larger leaves 6-12 cm long; [subgenus *Rhododendron*, section *Rhododendron*, subsection *Caroliniana*].
    4 Corolla mostly 15-20 mm long, the corolla tube (9-13 mm long) shorter than to as long as the corolla lobes (12-18 mm long); plant flowering early relative to *R. minus*, despite occurring at higher elevations and more northern latitudes; seeds ovoid, < 1.0 mm long, < 2.5× as long as wide (reminiscent of tiny watermelon seeds), coarsely textured, unornamented at the ends; calyx lobes deltoid; [of mountain ridges, heath balds, and rocky summits, mostly either away from the Blue Ridge Escarpment or north of the Asheville Basin]. .....***R. carolinianum***
    4 Corolla mostly 25-37 mm long, the corolla tube (13-22 mm long) longer than the corolla lobes (8-12 mm long); plant flowering late relative to *R. carolinianum*; seeds usually > 1.0 mm long, usually > 3× as long as wide, ornamented at one or both ends; calyx lobes ovate; [of the Coastal Plain, Piedmont, and Mountains, in the Mountains mostly of the Blue Ridge Escarpment of sw. NC and nw. SC, ranging up to the higher granitic domes in Macon and Jackson counties, NC].
      5 Leaf apices mostly obtuse to rounded; petioles 2-6 (-7) mm long; branches erect and rigid; seeds moderately to elaborately ornamented with flared protrusions at both ends; [of n. FL] .....***R. chapmanii***
      5 Leaf apices mostly acute to acuminate; petioles (5-) 6-20 mm long; branches spreading, not notably erect and rigid; seeds somewhat ornamented at one end; [of c. GA northward]..... ***R. minus***
1 Leaves deciduous, membranaceous, ciliate or serrulate; stamens 5-7; [**azaleas**]; {also see Alternate Key to azaleas emphasizing vegetative characters}.
  6 Corolla tube 2-5 mm long, much shorter than the corolla lobes; stamens (5-) 7; leaves elliptic, often broadly so (commonly 3-6 cm wide), acuminate; capsule ellipsoid-ovoid, 10-14 mm long; [subgenus *Azaleastrum*, section *Sciadorhodion*] ..... ***R. vaseyi***
  6 Corolla tube 13-25 mm long, equal to or longer than the corolla lobes; stamens 5; leaves generally oblanceolate to narrowly elliptic, generally < 3 cm wide, acute to obtuse, mucronate; capsule cylindroid-ellipsoid, 10-25 mm long; [subgenus *Hymenanthes*, section *Pentanthera*].
    7 Corolla yellow, orange, or red.
      8 Flowers appearing after the leaves have expanded.

9 Twigs pubescent with multicellular hairs; [e. KY and w. VA south to ec. TN, n. GA, and ne. AL; apparently disjunct in the Piedmont of SC] ..... ***R. cumberlandense***
9 Twigs glabrous; [south of ec. AL and wc. GA] ..... ***R. prunifolium***
8 Flowers appearing before or with the leaves.
10 Corolla limb shorter than the length of the corolla tube, the tube gradually expanding into the limb ..... ***R. austrinum***
10 Corolla limb nearly as broad as the tube is long, the tube abruptly expanding into the limb.
11 Floral bud-scales with glandular margins, the outer surface glabrous; corolla tube glandular-pubescent on its outer surface; sepals 2.0-3.0 mm long ..... ***R. calendulaceum***
11 Floral bud-scales with ciliate margins, the outer surface glabrous to sparsely pubescent; corolla tube pubescent (not glandular or rarely very weakly so) on the outer surface; sepals 0.5-3.0 mm long ..... ***R. flammeum***
7 Corolla white or pink (white marked with yellow in *R. eastmanii* and *R. alabamense*).
12 Sepals 1.5-5 mm long.
13 Young stems glabrous (rarely very sparsely pubescent); nonclonal shrub or small tree, to 7 m tall..... ***R. arborescens***
13 Young stems densely pubescent, generally with a mixture of glandular and nonglandular hairs; clonal shrub, the upright stems up to 1.5 m tall..... ***R. atlanticum***
12 Sepals 0.1-1 mm long.
14 Leaves glabrous beneath, except for strigose bristles along the midrib and major veins.
15 Pedicels strigose to puberulent, not stipitate-glandular; flowers appearing with or before the leaves ..... ***R. periclymenoides***
15 Pedicels densely stipitate-glandular; flowers appearing after the leaves.
16 Shrubs to 7 m tall; floral winter bud scales 15-20, at least the inner acute and aristate; corolla tube glabrous within, > 2× as long as the lobes ..... ***R. viscosum*** *var.* ***serrulatum***
16 Shrubs 1-2 (-5) m tall; floral winter bud scales 8-12 (-15), rounded (-mucronate) apically; corolla tube pubescent within, < 2× as long as the lobes ..... ***R. viscosum*** *var.* ***viscosum***
14 Leaves densely and softly pubescent beneath.
17 Corolla lobes about as long as the corolla tube; capsule densely glandular-pubescent; [of northern distribution, of montane areas of w. NC, w, VA, and northward]..... ***R. prinophyllum***
17 Corolla lobes much shorter than the corolla tube; capsule sparsely pubescent, the pubescence not glandular (or with some of the hairs glandular in *R. eastmanii* and *R. alabamense*); [of southern distribution, from c. SC and se. TN southward].
18 Corolla pale to deep pink, without yellow markings; scales of the winter buds pubescent on the outer surface..... ..... ***R. canescens***
18 Corolla white, with a blotch of yellow on the upper lobe; scales of the winter buds glabrous on the outer surface.
19 Flowers opening before the leaves have expanded; flower buds with non-glandular margins ..... ***R. alabamense***
19 Flowers opening after the leaves have expanded; flower buds with margins glandular along their lower 2/3s..... ..... ***R. eastmanii***

Alternate Key to Azaleas

Identification notes: this key makes as much use as possible of vegetative characters, geography, and capsule characters; capsules are generally available for longer during the year than flowers, and even when plants are in flower, last year's capsules can often be found.

1 Corolla tube 2-5 mm long, much shorter than the corolla lobes; stamens (5-) 7; leaves elliptic, often broadly so (commonly 3-6 cm wide), acuminate; capsule ellipsoid-ovoid, 10-14 mm long; [subgenus *Azaleastrum*, section *Sciadorhodion*]..... ***R. vaseyi***
1 Corolla tube 13-25 mm long, equal to or longer than the corolla lobes; stamens 5; leaves generally oblanceolate to narrowly elliptic, generally < 3 cm wide, acute to obtuse and usually also noticeably mucronate; capsule cylindroid-ellipsoid or ovoid, 10-29 mm long; [subgenus *Hymenanthes*, section *Pentanthera*].
2 Outer (abaxial) surface of the vegetative bud scales densely pubescent; flowers appearing before or with the leaves (at least some of the leaves still folded or the vegetative bud scales still present) (except *R. viscosum*).
3 Capsule cylindroid, (3-) 4-5× as long as broad.
4 Corolla yellow-orange to orange-red; upper corolla lobe with a contrasting blotch; [of s. GA west to se. MS]..... ***R. austrinum***
4 Corolla white to pink; upper corolla lobe uniform in color (lacking a contrasting blotch); [collectively widespread in our area].
5 Corolla tube narrow and somewhat abruptly expanding into the lobes, the lobes distinctly shorter than the tube; pedicels usually eglandular (occasionally glandular), (4-) 5-10 (-13) mm long; leaves inconspicuously ciliate, the cilia appressed to the leaf margin; capsule densely covered with nonglandular hairs; flowering March-May; [widely distributed from s. NC and n. TN southward]..... ..... ***R. canescens***
5 Corolla tube broader, gradually expanding into the lobes, the lobes about as long as or longer than the tube; pedicels usually glandular, (7-) 10-16 (-26) mm long; leaves conspicuously ciliate, the cilia diverging from the leaf margin; capsule glabrous or sparsely pubescent, the hairs at least partly gland-tipped; flowering May-June; [of the Mountains and upper Piedmont from n. NC (and rarely ne. AL) northward]..... ***R. prinophyllum***
3 Capsule ovoid, 2-3 (-4)× as long as broad (if capsules absent, try both leads).
6 Corolla yellow-orange to orange-red; upper corolla lobe with a contrasting blotch; hairs of the capsule not gland-tipped; [of the Piedmont and Coastal Plain of GA and w. SC]..... ***R. flammeum***
6 Corolla white to pink; upper corolla lobe uniform in color (lacking a contrasting blotch); hairs of the capsule gland-tipped (at least in part; nonglandular hairs also present); [collectively widespread in our area].
7 Flowers appearing after the leaves have expanded (essentially all of the leaves unfolded, and the vegetative bud scales absent), typically May (Coastal Plain, low elevation, or south) to August (mountains, high elevation, or north)..... ***R. viscosum***
7 Flowers appearing before or with the leaves (at least some of the leaves still folded or the vegetative bud scales still present), typically April-May (unless stimulated by fire or weather).
8 Leaf blade (3.2-) 3.4-4.7 (-5.2) cm long, (0.8-) 1.1-1.9 (-2.0) cm wide; plant typically strongly rhizomatous; [of the Coastal Plain from s. NJ south to sc. GA]..... ***R. atlanticum***

8 Leaf blade (3.9-) 5.0-7.3 (-8.7) cm long, (1.2-) 1.8-3.0 (-3.7) cm wide; plant typically nonrhizomatous; [of the Mountains and upper Piedmont].....***R. prinophyllum***

2 Outer (abaxial) surface of the vegetative bud scales glabrous or sparsely pubescent.

9 Capsule cylindric, (3-) 4-5 × as long as broad; flowers appearing before or with the leaves (at least some of the leaves still folded or the vegetative bud scales still present).

10 Corolla white, with a contrasting yellowish blotch on the upper lobe; [of se. TN and w. GA westward].....***R. alabamense***

10 Corolla deep pink (rarely white or nearly so), lacking a contrasting blotch on the upper lobe; [widespread in our primary and secondary area] .....***R. periclymenoides***

9 Capsule ovate, 2-3.5× as long as broad; flowers appearing before, with, or after the leaves.

11 Corolla white to pink (sometimes with yellow blotches).....***R. arborescens, R. eastmanii, R. viscosum***

11 Corolla predominantly yellow, orange, or orange-red .....***R. calendulaceum, R. flammeum, R. cumberlandense, [R. prunifolium]***

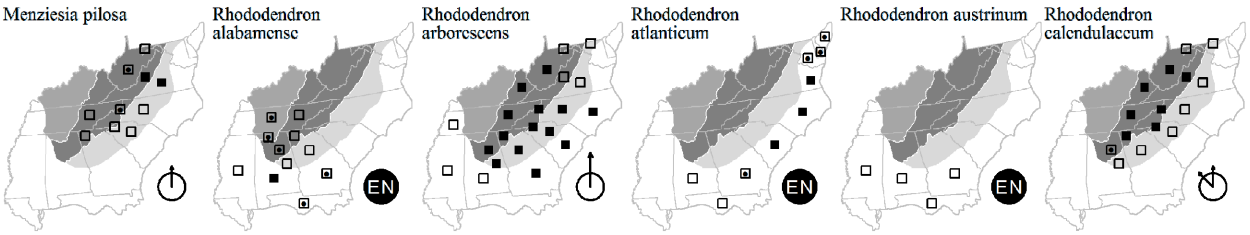
Rhododendron alabamense Rehder, Alabama Azalea. Moist slopes, bluffs, streambanks. March-April. W. GA and Panhandle FL west through AL to e. MS. *R. alabamense* is reported for Calhoun County, SC (RAB), but this record actually represents the more recently described *R. eastmanii*. [= FNA, K, L, WH, Z; = *Azalea alabamensis* (Rehder) Small – S]

Rhododendron arborescens (Pursh) Torrey, Sweet Azalea, Smooth Azalea. Rocky riversides, wooded stream banks, swamps, high elevation forests, shrub balds. Late May-July; July-October. Primarily Appalachian: ne. PA and se. KY south to sc. NC, w. SC, c. GA, and c. AL. [= RAB, C, F, FNA, G, K, L, W, WV, Z; = *Azalea arborescens* Pursh – S]

Rhododendron atlanticum (Ashe) Rehder, Dwarf Azalea. Pocosins, savannas, pine flatwoods, sandhill-pocosin ecotones. April-May (sporadically later, particularly in response to fire); August-October. An Atlantic Coastal Plain endemic: s. NJ and se. PA south to sc. GA. [= RAB, C, F, FNA, G, GW, K, L, Z; = *Azalea atlantica* Ashe – S]

Rhododendron austrinum (Small) Rehder, Florida Flame Azalea. Hammocks, bluffs, floodplain forests. Sc. GA and ne. FL west to s. AL and se. MS (Kron 1993); also reported for e. GA (Jones & Coile 1988). [= FNA, K, L, WH, Z; = *Azalea austrina* Small – S]

Rhododendron calendulaceum (Michaux) Torrey, Flame Azalea. Deciduous forests, particularly on mountain slopes, grassy balds. May-June; June-September. Largely Appalachian: s. PA and s. OH to c. GA and e. TN. This is a tetraploid species; various theories have been advanced about the origin of this polyploid chromosome complement. Kron (1993) argues that the evidence best fits an allopolyploid derivation of *R. calendulaceum*, involving hybridization between ancestors of *R. cumberlandense* and *R. prinophyllum*. [= RAB, C, F, FNA, G, K, L, W, WV, Z; = *Azalea calendulacea* Michaux – S]



Rhododendron canescens (Michaux) Sweet, Piedmont Azalea, Southern Pinxterbloom Azalea, Wild Azalea. Swamps, pocosins, and savannas. March-early May; September-October. Se. and sc. NC, n. TN, se. KY, s. IL, and e. OK, south to n. peninsular FL and se. TX. [= RAB, C, F, FNA, G, GW, L, W, WH, Z; > *R. canescens* var. *canescens* – K; > *R. canescens* var. *candidum* (Small) Rehder – K; > *R. canescens* var. *subglabrum* Rehder – K; > *Azalea candida* Small – S; > *Azalea canescens* Michaux – S]

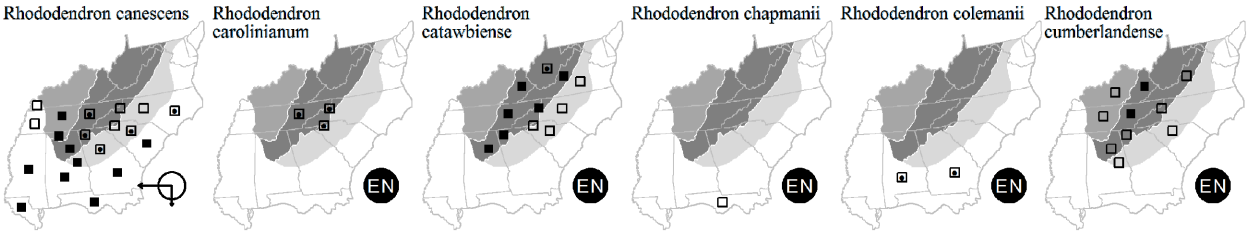
Rhododendron carolinianum Rehder, Carolina Rhododendron, Punctatum. Rocky summits, heath balds, high elevation forests, moist slopes. Late April-May; September-October. A Southern Appalachian endemic: w. NC, e. TN, ne. GA, and nw. SC, from the Linville Gorge area south and west to the Great Smoky Mountains; its precise southern limit uncertain. *R. carolinianum* is phenologically separated from *R. minus*, flowering earlier than *R. minus*, despite its occurrence at higher elevations and with a more northerly distribution. Morphological distinctions between the two taxa are subtle and inconsistent, as discussed by Duncan & Pullen (1962). From a horticultural perspective, Davidian (1982) supports recognition of *R. carolinianum* and *R. minus* as distinct. Gensel (1988, and pers.comm.) did detailed studies of the complex and supported the recognition of 3 taxa (*R. carolinianum*, *R. minus*, and *R. chapmanii*). [= D, K, S; < *R. minus* – RAB, W; < *R. minus* var. *minus* – FNA, L, Q, V]

Rhododendron catawbiense Michaux, Pink Laurel, Catawba Rhododendron, Mountain Rosebay. Rocky summits, shrub balds, acid ridges and slopes (mostly at high elevations), north-facing bluffs in the Piedmont. April (in the Piedmont and Coastal Plain)-June; July-October. A Southern Appalachian endemic: VA and KY south to GA and AL, with scattered disjunct populations in the Piedmont and extreme upper Coastal Plain. The disjunct populations in central NC are discussed by Coker (1919), who named them forma *insularis* on the basis of "the larger and broader leaves and ... the longer flowers." *R. catawbiense* is apparently most closely related to *R. macrophyllum* D. Don ex G. Don of nw. North America (Milne 2004). [= RAB, C, F, FNA, G, K, L, S, W, WV, X]

Rhododendron chapmanii (Alph. Wood) A. Gray, Chapman's Rhododendron. Flatwoods. Endemic to Panhandle FL, with an isolated disjunction in ne. FL (Clay County). [= D, K, S; = *R. minus* Michaux var. *chapmanii* (Alph. Wood) Gandhi & Zarucchi = FNA, L, V, WH; = *R. minus* var. *champanii* – Q, orthographic error]

Rhododendron colemanii R. Miller, Red Hills Azalea. Moist hammocks, moist bluffs, along streams. Early-mid May. Described in 2008 (Zhou et al. 2008). Tetraploid.

Rhododendron cumberlandense E.L. Braun, Cumberland Azalea. Balds and exposed or moist slopes. June-July; July-October. A Southern Appalachian endemic, primarily west of the Blue Ridge: e. KY and w. VA south to ec. TN, n. GA, and ne. AL; apparently disjunct in the Piedmont of SC (Kron 1993). Diploid. [= F, FNA, G, K, L, W, Z; = *R. bakeri* (Lemmon & McKay) Hume – C, misapplied]



Rhododendron eastmanii Kron & Creel, May White Azalea, Eastman's Azalea. Rich slopes. Early-mid May. This species is endemic to the Piedmont of South Carolina. It is locally fairly common, in the Broad River drainage (C. Horn, pers. comm. 2000). It should be sought in NC and GA, approaching with 4 miles of the NC border in Cherokee County, SC (M. Creel, pers. comm., 2007). Previous reports of *R. alabamense* in SC (RAB) are based on this species. [= FNA; < *Rhododendron alabamense* Rehder – RAB, misapplied]

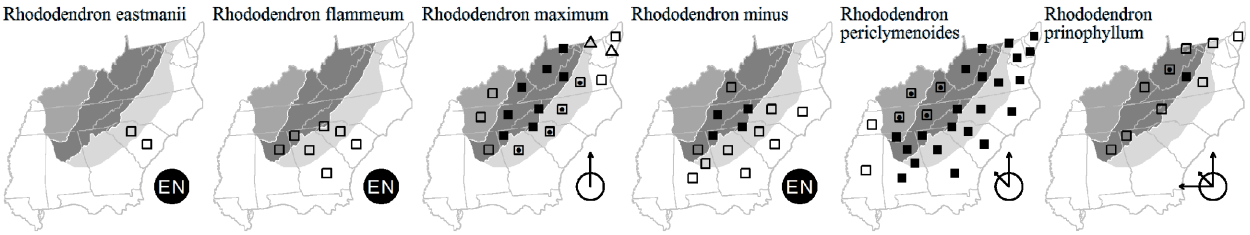
Rhododendron flammeum (Michaux) Sargent, Oconee Azalea. Sandhills, upland forests on slopes, ridges, stream bluffs. April. W. SC west to w. GA. [= FNA, K, L, Z; = *Azalea speciosa* Willdenow – S; = *Rhododendron speciosum* (Willdenow) Sweet]

Rhododendron maximum Linnaeus, Great Laurel, White Rosebay, Great Rhododendron. Moist slopes, wet flats, bogs, swamps, north-facing bluffs in the Piedmont. Apparently most closely related to *R. ponticum* Linnaeus of Turkey and vicinity (Milne 2004). June-August; September-October. Largely Appalachian: ME, NY, and OH south to GA and AL, primarily in the mountains. [= RAB, C, F, G, K, L, S, W, WV, X]

Rhododendron minus Michaux, Gorge Rhododendron, Punctatum. Rocky slopes, escarpment gorges, rocky areas in the Piedmont, sandhill bluffs in the Coastal Plain. Late April (in the Piedmont and Coastal Plain)-June (at the higher elevations along the Blue Ridge escarpment); September-October. GA and AL north to the Blue Ridge escarpment of n. GA, nw. SC, and sw. NC, and the Piedmont and inner Coastal Plain (fall-line sandhills) of sc. NC. This species ranges up to granite domes along the Blue Ridge Escarpment (such as Whiteside Mountain, Macon and Jackson counties, NC). [= D, K, S; < *R. minus* – RAB, W (also see *R. carolinianum)*; < *R. minus* var. *minus* – FNA, L, Q, V]

Rhododendron periclymenoides (Michaux) Shinners, Wild Azalea, Pinxterflower, Pinxterbloom Azalea, Election Pink. Moist to dry slopes and streambanks. Late March-May; September-October. Fairly widespread in e. United States, ranging from MA, NY, and s. OH, south to GA and AL. See Shinners (1962) for explanation of the change from the name *R. nudiflorum*. [= C, FNA, K, L, W, Z; = *R. nudiflorum* (Linnaeus) Torrey – RAB, F, G, GW, WV; = *Azalea nudiflora* Linnaeus – S]

Rhododendron prinophyllum (Small) Millais, Election Pink, Early Azalea, Roseshell Azalea. Upland forests (especially under *Quercus montana* and *Quercus rubra*), xeric pine and oak woodlands. May-June; August-October. NH, NY, and ne. OH, south to w. NC, nc. KY, and s. OH; disjunct in ne. AL and c. TN; also disjunct from s. IL and s. MO south to AR and e. OK. The only known location in NC is on Bluff Mountain, Ashe County (on a rocky plateau over amphibolite at about 1300m elevation); Kron (1993) also cites a collection from Transylvania County. See Shinners (1962) for explanation of the change from the name *R. roseum*. [= C, FNA, K, L, W, Z; = *R. roseum* (Loiseleur) Rehder – RAB, F, G, WV; = *Azalea prinophylla* Small – S]



Rhododendron prunifolium (Small) Millais, Plumleaf Azalea. Mesic ravine forests and streambanks. Endemic to a small area along the AL-GA border, in se. AL (Kron 1993) and sw. and wc. GA (Jones & Coile 1988). [= FNA, K, L, Z; = *Azalea prunifolia* Small – S]

Rhododendron vaseyi A. Gray, Pinkshell Azalea. Moist slopes, bogs, high elevation rocky summits, cliffs, high elevation heath balds. May-June; August-October. Endemic to the mountains of NC, though approaching very close to SC and GA in the vicinity of Cashiers and Highlands, NC and reported for Rabun Bald (Rabun Co. GA) without definite documentation; *R. vaseyi* occurs primarily southwest of the Asheville Basin, but is found at scattered locations farther north and is locally abundant on Grandfather Mountain (at the junction of Avery, Watauga, and Caldwell counties, NC), its northernmost outpost. Judd & Kron (1995) treat *R. vaseyi* and *R. canadense* (Linnaeus) Torrey (of ne. North America) as the only two members of section *Rhodora*. When not in flower, *R. vaseyi* is readily distinguished from our other azaleas by its distinctive foliage (see key). [= RAB, F, FNA, K, L, W, Y; = *Biltia vaseyi* (A. Gray) Small – S]

Rhododendron viscosum (Linnaeus) Torrey *var.* ***serrulatum*** (Small) Ahles, Swamp Azalea, Clammy Azalea. Bogs, pocosins, wet pine savannas. Late May-June; July-October. Se. VA south to c. peninsular FL, west to LA. [= RAB; = *R. serrulatum* (Small) Millais – C, F, G; < *R. viscosum* – FNA, GW, K, L, W, WH, WV, Z; = *Azalea serrulata* Small – S]

Rhododendron viscosum (Linnaeus) Torrey *var.* ***viscosum***, Swamp Azalea, Clammy Azalea. Moist streambanks, shrub balds, and other moist habitats. June-July; July-October. ME and OH south to FL, west to LA and TX. [= RAB; < *R. viscosum* – FNA, GW, K, L, W, WH, WV; = *R. viscosum* – C, F, G; = *Azalea viscosa* Linnaeus – S]

11. Elliottia Muhlenberg ex Elliott 1817 (Elliottia, Southern-plume)

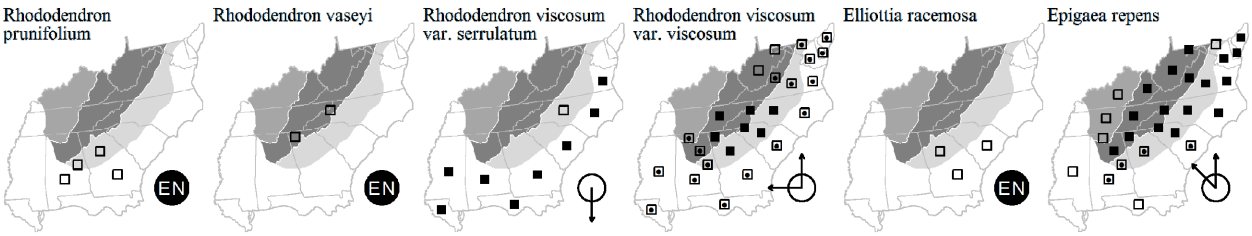
A genus of 4 species (as here circumscribed), shrubs to small trees, of se. North America, nw. North America, and Japan. As discussed by Wood (1961), the generic limits of *Elliottia* have been controversial. The closest relatives of *E. racemosa* are *E. paniculata* (Siebold & Zuccarini) Bentham & Hooker and *E. bracteata* (Maximowicz) Bentham & Hooker, both of Japan, and *E. pyroliflorus* (Bong.) S.W. Brim & P.F. Stevens [*Cladothamnus pyroliflorus* Bong.], of AK, British Colombia, WA, and OR; these have sometimes been placed in other genera. References: Tucker in FNA (2009); Stevens et al. in Kubitzki (2004).

Elliottia racemosa Muhlenberg ex Elliott, Elliottia, Southern-plume, Georgia-plume. Xeric sandy ridges, sandhills, river bluffs; serpentine woodlands. June-August. Endemic to e. GA and s. SC (Aiken County, where considered to have been extirpated). *Elliottia* extends barely into the Piedmont in Georgia, occurring on Burks Mountain on serpentine in a *Pinus palustris* woodland. [= FNA, K, L, S]

12. Epigaea Linnaeus 1753 (Trailing Arbutus)

A genus of 3 species, subshrubs, in e. North America and Eurasia; the other 2 species of the genus occur in the Caucasus and Asia Minor, and in Japan. References: Judd & Kron in FNA (2009); Stevens et al. in Kubitzki (2004).

Epigaea repens Linnaeus, Trailing Arbutus, Mayflower, Ground Laurel. In a wide variety of acidic forests, xeric to mesic, sandy, rocky, and loamy. Late February-early May; April-June. NL (Newfoundland) and QC west to MB, south to FL Panhandle, MS, and IA. At maturity, the fruits split along the sutures, exposing tiny brown seeds embedded in "sticky, white, placental tissue" which is "distinctly sweet to the taste;" ants are strongly attracted to the placental tissue, and in carrying it away disperse the seeds (Clay 1983). [= RAB, C, FNA, G, K, L, S, W, WH, WV; > *E. repens* var. *glabrifolia* Fernald – F; > *E. repens* var. *repens* – F]



13. Kalmia Linnaeus 1753 (Wicky, Sheepkill, Mountain Laurel, Ivy, Sand-myrtle)

A genus of 9-11 species, shrubs, of North America and Cuba, except the circumboreal *K. procumbens* (formerly *Loiseleuria*). *Leiophyllum*, traditionally treated as a monotypic or small genus of se. United States, is better treated as a part of *Kalmia* along with the northern *Loiseleuria*, based on molecular and morphological studies (Kron & King 1996, Kron et al. 2002). While this idea may initially seem outlandish (particularly to those whose concept of *Kalmia* is based only on *Kalmia latifolia*), the morphological and habital similarities of *Leiophyllum* to *Kalmia* are striking. The foliage and wood of all species (and the smoke from burning them) are poisonous. References: Liu, Denford, Ebinger, Packer, & Tucker in FNA (2009); Southall & Hardin (1974)=Z; Ebinger (1974)=Y; Strand & Wyatt (1991)=Q; Wilbur & Racine (1971)=R; Camp (1938)=P; Kron & King (1996); Kron et al. (2002)=V; Haines (2010)=U; Stevens et al. in Kubitzki (2004).

1 Petals separate; fruit 2-3 (-7)-locular ..... ***K. buxifolia***
1 Petals fused; fruit 5-locular.
  2 Leaves whorled or opposite; inflorescence **either** an axillary raceme **or** a terminal corymbiform raceme.
    3 Leaves opposite, 1-4 cm long, subsessile; inflorescence a terminal corymbiform raceme ..... ***K. polifolia***
    3 Leaves whorled in 3s (rarely opposite), 2-5 cm long, the petioles 4-12 mm long; inflorescence an axillary raceme.
      4 Calyx lobes glandular-canescent and with marginal stipitate glands; leaves glabrous beneath; bracts and bracteoles densely glandular; stomates 18 µ long and 13 µ wide, 15-24 per 0.2 square millimeter; shrub to 1 (-1.2) m tall; [of ne. NC northward] ..... ***K. angustifolia***

4 Calyx lobes canescent but lacking glands; leaves short puberulent beneath; bracts and bracteoles nearly glandless; stomates 13 µ long and 9 µ wide, 35-51 per 0.2 square millimeter; shrub to 2 m tall (though often much shorter when growing in burned situations); [of se. and sw. VA southward] ..... ***K. carolina***

2 Leaves alternate; inflorescence an axillary fascicle or a terminal panicle.

5 Leaves 0.5-1.5 cm long, 2-8 mm wide; twigs densely persistently hispid; [of the Coastal Plain of s. SC southward] ..... ***K. hirsuta***

5 Leaves 2.5-12 cm long, 7-50 mm wide; twigs glabrous or puberulent (glabrescent in age); [collectively widespread in our area].

6 Leaves deciduous, dull, and subcoriaceous, 1.5-3 cm wide; inflorescence a fascicle of 1-3 flowers, axillary to leaf scars near the tips of the previous year's growth; petiole 1-4 mm long; [of the Coastal Plain of NC and SC] ..... ***K. cuneata***

6 Leaves evergreen, glossy, and coriaceous, (1) 3-5 cm wide; inflorescence a terminal panicle; petiole 7-45 mm long; [widespread] ..... ***K. latifolia***

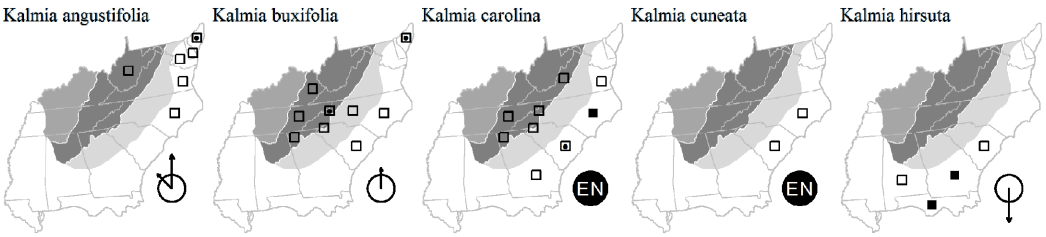
Kalmia angustifolia Linnaeus, Northern Sheepkill. Sandy, xeric to mesic hillsides and moist areas, rocky areas. April-May; September-October. NL (Labrador) west to MN, south to se. VA and extreme ne. NC, WV, s. ON, and MI, reaching its southern limit in the Coastal Plain of extreme ne. NC (Sorrie & LeBlond 2008). See *Kalmia carolina* for discussion of the taxonomy of these two taxa. [= K, S, Z; = *K. angustifolia* var. *angustifolia* – C, F, FNA, G, L, Y; = *K. angustifolia* ssp. *angustifolia* – U]

Kalmia buxifolia (P.J. Bergius) Gift, Kron, & Stevens, Sand-myrtle. Locally abundant but very restricted in wet (spodosol) pinelands of the outer Coastal Plain (in Brunswick and Carteret counties, NC), locally common in relatively dry sandhills in a few locations in the Sandhills, disjunct in the Piedmont on a few quartzite monadnocks, fairly common in the mountains on rock outcrops at high to moderate elevations (on a wide variety of rock types). Late March-June (sporadically to October); September-October. The species is curiously distributed, both in its overall range and within NC. *Kalmia buxifolia* is found in the Pine Barrens of NJ, the outer Coastal Plain of se. NC, the inner Coastal Plain (fall-line sandhills) of sc. NC and nc. SC, monadnocks of the upper Piedmont of NC, mountain peaks of NC and immediately adjacent nw. SC, ne. GA, and e. TN, and isolated in extreme e. PA (Monroe County) and in se. KY (on sandstone in Whitley County, in the Cumberland Plateau). Populations in the high mountains consist of very old, prostrate krummholz, the stems to 6 cm in diameter at the base, the branches spreading to cover at least a square meter. The disjunct distribution, various habitats, and subtle morphological variation between populations has led to periodic attempts to divide the species into two or more varieties or species, but the variability apparently cannot be successfully described taxonomically; it is here treated as a single species. See X, Y, and Q for detailed discussion of the various taxa recognized by various authors (within the genus *Leiophyllum*). Strand & Wyatt (1991) found a population from Hanging Rock, Stokes County, NC to be the most distinctive, but did not choose to give it formal taxonomic status. [= FNA, V; = *Leiophyllum buxifolium* (P.J. Bergius) Elliott – C, K, L, Q, R, W; > *Leiophyllum buxifolium* var. *buxifolium* – RAB; > *Leiophyllum buxifolium* var. *prostratum* (Loudon) Gray – RAB; > *Leiophyllum buxifolium* var. *hugeri* (Small) Schneider – F, G, P; > *Leiophyllum lyonii* Sweet – S, P; > *Leiophyllum hugeri* (Small) K. Schumann – S; = *Dendrium buxifolium* (Bergius) Desvaux]

Kalmia carolina Small, Southern Sheepkill, Carolina Wicky, Carolina Bog Myrtle. Moist to wet pinelands of the Coastal Plain, pocosin margins (or seemingly in pocosins or swamps because of fire suppression), mountain bogs and fens (and less commonly in rocky areas at high elevations) in the Mountains. April-May (sporadically to September, especially in response to fire); September-October. This species, a close relative of the more widespread and northern *K. angustifolia*, occurs in two disjunct areas: the Coastal Plain, from se. VA south through NC to wc. GA (Taylor County), and the Southern Appalachians from sw. VA south through w. NC and ne. TN to ne. GA. Southall & Hardin (1974) favored species status for *K. carolina* because of its essentially allopatric distribution relative to *K. angustifolia* (the 2 meet in Southampton County, VA), the near absence of intermediates or hybrids in nature, and because "significant morphological and anatomical differences have developed and remain constant between these two species when grown together." [= GW, K, S, W, Z; = *K. angustifolia* Linnaeus var. *caroliniana* (Small) Fernald – RAB (an orthographic error); = *K. angustifolia* var. *carolina* (Small) Fernald – C, F, FNA, G, L, Y; = *K. angustifolia* ssp. *carolina* (Small) A. Haines – U]

Kalmia cuneata Michaux, White Wicky. Pocosins and pocosin-savanna or pocosin-sandhill ecotones. Late May-June; September-October. This species is a narrow endemic of the Coastal Plain of se. NC and e. SC. It is not closely related to other species in the genus. It is most easily distinguished from other pocosin shrubs by the combination of the following characters: leaves deciduous, alternate, oblanceolate (cuneate-attenuate at base, obtuse at apex), revolute, dark green above, paler and prominently stipitate-glandular beneath, woody capsule rounded, stipitate-glandular, persistent through the winter, borne on delicate, recurved pedicels usually 2-3 cm long. [= RAB, FNA, GW, K, L, S, Y, Z]

Kalmia hirsuta Walter, Hairy Wicky. Pine savannas and pine flatwoods. June-July; September-October. Se. SC (Beaufort, Jasper, Hampton, and Colleton counties) south to nc. peninsular FL, west to s. AL. The closest relatives of *K. hirsuta* are 3 Cuban species: *K. aggregata* (Small) Copeland, *K. ericoides* Wright ex Grisebach, and *K. simulata* (Britton & Wilson) Southall. [= RAB, FNA, GW, K, L, WH, Y, Z; = *Kalmiella hirsuta* (Walter) Small – S]



Kalmia latifolia Linnaeus, Mountain Laurel, Ivy, Calico-bush. Acidic forests, bluffs, bogs, along sandhill steams, and in a wide range of other habitats, nearly ubiquitous in the mountains, up to at least 1600m, more restricted in habitat in the lower

Piedmont and Coastal Plain. April-July; September-October. ME, OH, and IN south to Panhandle FL and extreme e. LA. Unlike our other species, which are strictly shrubs, *K. latifolia* reaches the stature and diameter of a small tree. [= RAB, C, FNA, K, L, S, W, WH, WV, Y, Z; > *K. latifolia* var. *laevipes* Fernald – F, G; > *K. latifolia* var. *latifolia* – F, G]

Kalmia polifolia Wangenheim, Swamp Laurel, Bog Laurel. Bogs. NL (Labrador) and NT south to n. NJ, ne. PA, MI, WI, MN, and MT; disjunct in Tucker County, WV (where discovered by T.F. Wieboldt in 2007). [= C, F, FNA, G, K, Y, Z]

14. Corema D. Don 1826

A genus of 2 species, shrubs, one of ne. North America and one of Spain and the Azores. References: Elisens in FNA (2009); Stevens et al. in Kubitzki (2004).

Corema conradii (Torrey) Torrey ex Loudon, Broom-crowberry. Dunes. April-May. NS, QC, NB, and PE south to ME, MA, NY, and s. NJ. [= C, F, FNA, G, K]

15. Ceratiola Michaux 1803 (Florida Rosemary)

A monotypic genus, a shrub, of se. North America. *Ceratiola* has been traditionally placed in the Empetraceae. Many workers have expressed doubt about the naturalness of the Empetraceae and its distinction from the Ericaceae. Molecular data have corroborated that concern, and shown *Ceratiola* and the rest of the Empetraceae to be better included in a broader Ericaceae (Kron & Chase 1993); the affinities of *Ceratiola* may actually be with other southeastern United States genera, *Kalmia, Elliottia,* and *Bejaria* (Kron & Chase 1993). References: Kron & Chase (1993); Judd & Kron (1993); Johnson (1982); Stevens et al. in Kubitzki (2004).

Ceratiola ericoides Michaux, Rosemary, Florida Rosemary, Sandhill Rosemary, Sand Heath. Xeric sandhills, usually in white "sugar sand.". October-November. Ne. SC south to s. FL and west to s. MS. Its content of aromatic compounds makes it very flammable. [= RAB, K, L, S, WH]

16. Calluna R.A. Salisbury 1802 (Heather)

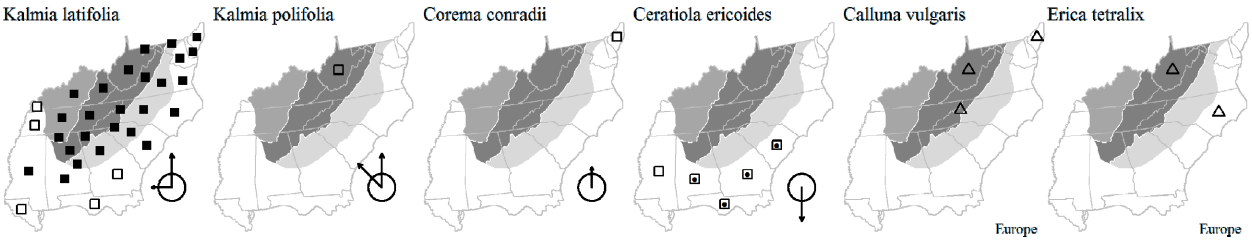
A monotypic genus, a shrub, of Europe. References: Tucker in FNA (2009); Stevens et al. in Kubitzki (2004).

* ***Calluna vulgaris*** (Linnaeus) Hull, Heather, Ling, Scotch Heather. Roadbanks, railroad grades; native of Europe. July-August. Also known to be naturalized in Tucker County, WV (Luteyn et al. 1996). [= C, F, FNA, G, K, L, WV]

17. Erica Linnaeus 1753 (Heath)

A genus of 735-860 species, shrubs and trees, of Africa and Eurasia (mostly s. Africa). References: Tucker in FNA (2009); Stevens et al. in Kubitzki (2004).

* ***Erica tetralix*** Linnaeus, Cross-leaved Heath. Sandy thickets; native of Europe. July-August; September-October. [= RAB, C, F, FNA, G, K, L, WV]



18. Oxydendrum A.P. de Candolle 1839 (Sourwood)

A monotypic genus, a tree, of se. North America. The genus *Oxydendrum* is "isolated ... among the Ericaceae, apparently with no close relatives" (Wood 1961): the only member of tribe Oxydendreae (Judd in FNA, in press). References: Judd in FNA (2009); Stevens et al. in Kubitzki (2004).

Oxydendrum arboreum (Linnaeus) A.P. de Candolle, Sourwood, Sorrel-tree. Mesic to xeric deciduous forests, especially dry-mesic to xeric oak-hickory and oak-pine forests, also in the fall line sandhills in sandhill/pocosin ecotones. Se. and sw. PA

west to IL, south to n. FL and se. and c. LA. It is an especially characteristic understory tree of upland forests of the Piedmont and lower Mountains. The bark is dark grayish-brown and fairly deeply furrowed; the tree nearly always has a characteristic lean (toward a former canopy light-gap). The finely serrate, elliptic leaves are distinctive, with the sour taste of garden sorrel (*Rumex acetosa*), sheep sorrel (*Rumex acetosella*), or wood sorrel (*Oxalis*). [= RAB, C, F, FNA, G, K, L, S, W, WH, WV]

19. Pieris D. Don 1834 (Evergreen Fetterbush)

A genus of 7 species, shrubs, of e. Asia, e. North America, and Cuba. Judd (1982) treats *Pieris* as a genus of 7 species, 4 in e. Asia, 1 in the Southern Appalachian Mountains, 1 in the se. United States Coastal Plain, and 1 in w. Cuba. References: Judd (1982)=Z; Judd in FNA (2009); Judd (1979); Stevens et al. in Kubitzki (2004).

1 Inflorescence a many-flowered panicle of racemes, borne terminally; seeds 2.5-3 mm long; [of slopes and ridges of the Mountains and upper Piedmont]; [subgenus *Pieris*, section *Pieris*] ..... ***P. floribunda***
1 Inflorescence a 3-9 flowered raceme, borne in the axils of upper leaves; seeds ca. 1 mm long; [of wetlands of the Coastal Plain, often associated with *Taxodium ascendens*]; [subgenus *Pieris*, section *Phillyreoides*] ..... ***P. phillyreifolia***

Pieris floribunda (Pursh) Bentham & Hooker f., Mountain Andromeda, Evergreen Mountain Fetterbush. Acid wooded slopes, heath balds at high elevations, summits of Piedmont monadnocks, sometimes escaped from cultivation. May-June; August-October. A Southern Appalachian endemic: e. WV, w. VA, w. NC, e. TN, and n. GA. The type locality is supposedly in n. GA. The range in NC is peculiar, the species occurring at high elevations southwest of Asheville, absent from apparently suitable habitats to the northeast (such as the Craggies, Blacks, Roan Mountain, and Grandfather Mountain), yet reappearing in a few disjunct populations at low elevations in the upper Piedmont. In w. VA (and adjacent e. WV), *P. floribunda* occurs on rather dry sandstone ridges and upper slopes, often under an oak canopy, especially in the front ranges of the Cumberland Mountains. *P. floribunda* is placed in subgenus *Pieris*, section *Pieris*, along with *P. japonica* (see below) and another Asian species. [= RAB, C, F, FNA, G, K, L, S, W, WV, Z]

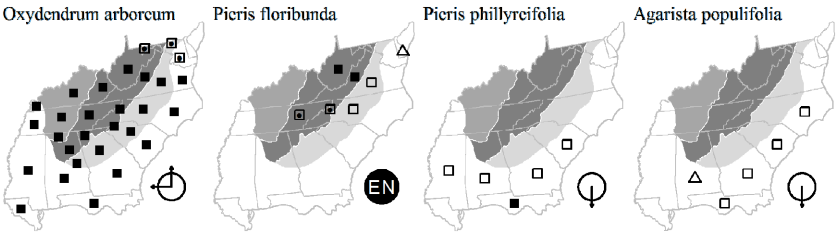
* *Pieris japonica* (Thunberg) D. Don ex G. Don, Japanese Andromeda or Lily-of-the-valley Bush, rather closely related to our *P. floribunda*, is frequently grown as an ornamental. [= FNA, Z] {not keyed}

Pieris phillyreifolia (Hooker) A.P. de Candolle, Vine-wicky, Climbing Fetterbush. Swamp forests. E. SC south to c. peninsular FL west to s. AL. This southeastern species has the remarkable habit of often growing as a creeping vine under the bark of *Taxodium ascendens*, the branches exserted through the cypress bark, sometimes ascending into the upper canopy with the main stem never visible except at the very base of the tree; it also sometimes grows as a low shrub. Godfrey (1969) documents the occurrence of this species in our area. See GW and Godfrey (1989) for excellent decriptions and illustrations of this curious "shrub-vine." It is apparently most closely related to the other two members of subgenus *Pieris*, section *Phillyreoides*, *P. cubensis* (Grisebach) Small, endemic to w. Cuba, and *P. swinhoei* Hemsley, of se. China, neither of which shares its unusual habit. [= FNA, GW, K, L, WH, Z; = *Ampelothamnus phillyreifolius* (Hooker) Small – S]

20. Agarista D. Don ex G. Don 1834 (Agarista)

A genus of about 30 species, shrubs, primarily of tropical America, but also in Africa, Madagascar, and se. North America. Judd (1979, 1984) discusses the reasons for separating *Agarista* from *Leucothoe; Agarista* is more closely related to *Pieris* than *Leucothoe* (Judd & Kron 1996). References: Judd (1984, 1979)=Z; Judd in FNA (2009); Stevens et al. in Kubitzki (2004).

Agarista populifolia (Lamarck) Judd, Agarista, Pipe-plant. Blackwater swamps, hydric hammocks, marly spring runs. April-May; September-October. E. SC (or se. NC?) south to ne. and c. peninsular FL. Reported for several locations in s. AL, likely escaped (Diamond & Woods 2009). A specimen at the University of North Carolina at Chapel Hill is labeled as coming from a nursery, originally taken from plants in a swamp in Columbus County, NC. The record is plausible and would add the species to the state's flora. [= FNA, K, L, WH, Z; = *Leucothoe populifolia* (Lamarck) Dippel – RAB, GW; = *Leucothoe acuminata* (Aiton) G. Don – S; = *Andromeda populifolia* Lamarck]



21. Lyonia Nuttall 1818 (Staggerbush, Maleberry, Fetterbush)

A genus of about 35 species, shrubs and small trees, of e. and se. Asia, e. North America, Mexico, and the West Indies. References: Judd (1981)=Z; Judd in FNA (2009); Stevens et al. in Kubitzki (2004).

1 Lower leaf surfaces stipitate-peltate with rusty scales; [of s. SC southward].
2 Ultimate branches not rigidly ascending, flowers nearly always restricted to branches of the previous year, the leaves not conspicuously reduced toward the branch tips; leaves with distal margin usually revolute, sometimes strongly so; major veins usually depressed; lower leaf surface with some scales often large and with irregular margins, others smaller and more nearly entire, at least the smaller scales more-or-less persistent; [shrub or small tree to 6 (-12) m tall] ..... ***L. ferruginea***
2 Ultimate branches rigidly ascending, flowers frequent on branches of the current year (though also on older growth), the leaves conspicuously reduced toward the branch tips; leaves with distal margin at most slightly revolute; major veins not depressed; lower leaf surface with scales usually all large and with irregular margins, the scales often deciduous; [shrub to 1.5 (-3) m tall] ..... ***L. fruticosa***
1 Lower leaf surfaces glabrous or pubescent; [collectively widespread].
3 Leaves evergreen (some leaves present on wood of the previous year), coriaceous, and shining ..... ***L. lucida***
3 Leaves deciduous (no leaves present on wood of the previous year), subcoriaceous, and dull.
4 Young twigs angled; leaf margin entire; corolla 7-14 mm long; inflorescence umbellate-racemose, in fascicles along previous year's (leafless) growth; capsule 4-6 mm long; leaf surfaces with tiny, red, short-stalked capitate glands (also often with spreading, translucent hairs on the main veins) ..... ***L. mariana***
4 Young twigs terete; leaf margin minutely serrulate; corolla 3-5 mm long; inflorescence a terminal panicle; capsule 2.5-3 mm long; leaf surfaces with appressed, strigillose hairs, pale with a red base.
5 Inflorescences (at least the lower) with conspicuous bracts; [of the Coastal Plain and lower Piedmont] ... ***L. ligustrina*** *var.* ***foliosiflora***
5 Inflorescences naked, or with only a few leafy bracts; [of the Mountains, Piedmont, and (less commonly) Coastal Plain] ..... ***L. ligustrina*** *var.* ***ligustrina***

Lyonia ferruginea (Walter) Nuttall, Crookedwood, Dragonwood, Staggerbush. Dry oak and pine woodlands, scrub, rarely pocosins, spodosolic flatwoods. February-May; April-October. Se. SC south to sc. peninsular FL, west to Panhandle FL. See discussion under *L. fruticosa*. [= FNA, GW, K, L, WH, Z; < *Lyonia ferruginea* – RAB (also see *L. fruticosa*); = *Xolisma ferruginea* (Walter) Heller – S]

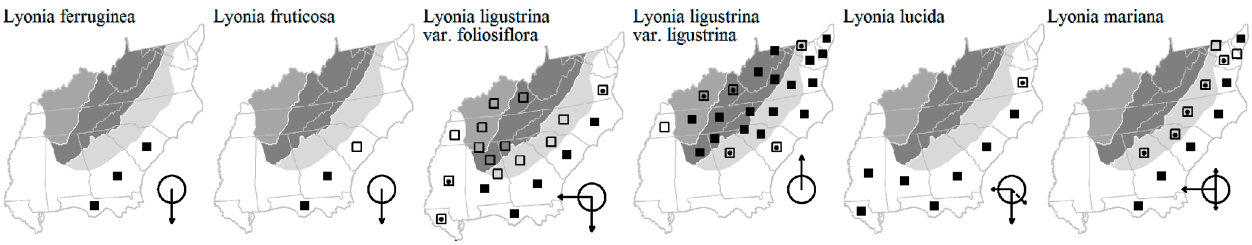
Lyonia fruticosa (Michaux) G.S. Torrey, Staggerbush, Poor-grub. Pocosins. March-July; May-October. Se. SC (at least formerly) south to s. peninsular FL, west to e. Panhandle FL. Though not included in RAB for our area, Judd (1981) cites several old specimens from SC. The species is definitely known from immediately adjacent GA, and there seems no reason to doubt its (at least historical) occurrence in SC. This species is difficult to distinguish from *L. ferruginea*, with which it often co-occurs. [= FNA, GW, K, L, WH, Z; < *L. ferruginea* – RAB; = *Xolisma fruticosa* (Michaux) Nash – S]

Lyonia ligustrina (Linnaeus) A.P. de Candolle *var.* ***foliosiflora*** (Michaux) Fernald, Southern Maleberry, He-huckleberry. Pocosins, seepage bogs, and other wet habitats. Late April-June; September-October. Se. VA south to c. FL, west to e. TX and e. OK, and (west of the mountains) north to TN and AR. Rather nondescript when sterile, the gray-green hue of the leaves is a useful character. Var. *foliosiflora* is the usual variety on the Coastal Plain (including the fall-line sandhills). [= FNA, GW, K, L, W, Z; < *L. ligustrina* – RAB, C, G; > *L. ligustrina* var. *capreaefolia* (Watson) A.P. de Candolle – F; > *L. ligustrina* var. *foliosiflora* – F; > *L. ligustrina* var. *salicifolia* (Watson) A.P. de Candolle – F; = *Arsenococcus frondosus* (Pursh) Small – S; = *Xolisma foliosiflora* (Michaux) Small]

Lyonia ligustrina (Linnaeus) A.P. de Candolle *var.* ***ligustrina***, Northern Maleberry, He-huckleberry. Mountain bogs, shrub balds, bottomlands, other moist to wet habitats, "dry" ridges at high elevations. May-July; September-October. S. ME, s. NH, s. VT, s. and e. NY, s. OH, WV, and KY south to w. and c. SC, n. GA, and ne. AL, primarily in the mountains and adjacent provinces. Var. *ligustrina* is the usual variety in the Mountains and Piedmont, but extends as well into the Coastal Plain in NC and SC. This variety is very variable in leaf shape and size, some populations having leaves about 3 cm long and 1.3 cm wide, others with leaves to as large as 8 cm long and 5 cm wide. The plants with smaller leaves occur in bogs and other distinctly wet habitats, while plants with large leaves occur in thin soils in high elevation heath balds and thin soils around rock outcrops (as, for instance, on Grandfather Mountain, NC). [= F, FNA, GW, K, L, W, Z; < *L. ligustrina* – RAB, C, G, WV; = *Arsenococcus ligustrinus* (Linnaeus) Small – S; = *Xolisma ligustrina* (Linnaeus) Britton]

Lyonia lucida (Lamarck) K. Koch, Shining Fetterbush. Pocosins, wet woodlands, blackwater swamp forests, other acidic wetlands, especially if peaty. April-early June; September-October. Se. VA south to s. FL and west to e. and c. LA; also in w. Cuba. Readily distinguished by the glossy, coriaceous leaves with a prominent vein running along the margins. When in flower in large numbers, the odor is cloyingly sweet. [= RAB, C, F, FNA, G, GW, K, L, WH, Z; = *Desmothamnus lucidus* (Lamarck) Small – S; = *Neopieris nitida* (Bartram ex Marshall) Britton]

Lyonia mariana (Linnaeus) D. Don, Staggerbush. Pine flatwoods, savannas, pocosin-sandhill ecotones, dry rocky woodlands in the lower Piedmont (especially with chestnut oak). April-May; September-October. RI (formerly) and NY (Long Island) south to c. peninsular and e. Panhandle FL; disjunct west of the Misssissippi River in sc. MO, c. AR, nw. LA, se. OK, and e. TX. Readily distinguished by the broadly elliptic leaves borne at an ascending 45 degree angle, with bright pink axillary buds. [= RAB, C, F, FNA, G, GW, K, L, WH, Z; = *Neopieris mariana* (Linnaeus) Britton – S]



22. Andromeda Linnaeus 1753 (Bog-rosemary, Andromeda)

A genus of 1-2 species, shrubs, north temperate. References: Fabijan in FNA (2009); Stevens et al. in Kubitzki (2004).

Andromeda polifolia Linnaeus *var.* ***latifolia*** Aiton, Bog-rosemary. Bogs. May-July; June-September. Circumboreal, in North America from NL (Newfoundland) and NL (Labrador) west to SK,south to NJ, ne. PA (Rhoads & Klein 1993), e. WV (at Cranberry Glades, Pocahontas County), IN, IL, and MN. Var. *polifolia* is also circumboreal, overall more northern. [= FNA; = *A. glaucophylla* Link – C, F, G, L; = *A. polifolia* var. *glaucophylla* (Link) A.P. de Candolle – K; = *A. polifolia* ssp. *glaucophylla* (Link) Hultén]

23. Zenobia D. Don 1834 (Zenobia, Honey-cups)

A monotypic genus, a shrub, of se. North America (endemic to the flora area). References: Dorr in FNA (2009); Stevens et al. in Kubitzki (2004).

Zenobia pulverulenta (Bartram ex Willdenow) Pollard, Zenobia, Honey-cups. Pocosins, margins of pineland ponds. April-June; September-October. This monotypic genus is a narrow endemic of the Coastal Plain of se. VA, NC, SC, and e. GA (Bryan Co.). It was considered by Wood (1961) to have "no close relatives," but molecular phylogeny suggests that it is sister to *Andromeda*. The crenate leaves help distinguish *Zenobia* from other pocosin shrubs. The flowers are extremely fragrant. The species is remarkably variable in leaf glaucescence. Many plants in the fall-line sandhills and upper Coastal Plain have the lower leaf surface, pedicels, and capsules covered in wax to the point that they are bright white; outer Coastal Plain plants generally lack any glaucescence. The division into two species listed below in synonymy was based largely on this character; further study appears warranted. In the centers of major peat domes in the Outer Coastal Plain and in large Carolina bays in the Bladen Lakes region, where peat depths reach 3-5 meters, occur areas of up to 25 square kilometers dominated by *Zenobia* (sometimes codominant with *Chamaedaphne* or *Sarracenia flava*). This community has been referred to as "deciduous low pocosin," to distinguish it from the dominance of evergreen shrubs found in most pocosins. [= RAB, C, F, FNA, G, GW, K, L; > *Z. pulverulenta* – S; > *Z. cassinefolia* (Ventenat) Pollard – S]

24. Chamaedaphne Moench 1794 (Leatherleaf, Cassandra)

A monotypic genus, a shrub, circumboreal in distribution. References: Fabijan in FNA (2009); Stevens et al. in Kubitzki (2004).

Chamaedaphne calyculata (Linnaeus) Moench, Leatherleaf, Cassandra. Pocosins in the Coastal Plain, bogs in the Mountains, *Chamaecyparis* bogs. March-April; June-October. Circumboreal; in North America from NL (Newfoundland) to AB, south to WV (Tucker County) (T.F. Wieboldt, pers.comm., 2007), MD, OH, n. IL, WI, n. IA, AB, and BC; disjunct to the mountains of NC (where now nearly extirpated, known only from a single bog of less than 1 hectare) and to the Coastal Plain of NC and ne. SC. The Coastal Plain occurrences in our area are mainly in the centers of large peat dome or Carolina Bay pocosins, the insufficiently famous southern blanket bogs or "southern muskeg." In these areas, *Chamaedaphne* is sometimes dominant (or codominant with *Zenobia pulverulenta* or *Sarracenia flava*) over expanses of 25 square kilometers. The southern occurrences of *Chamaedaphne* are certainly the result of Pleistocene distributions. A number of varieties have been named (the Eurasian var. *calyculata*, var. *latifolia* in Maritime Canada, south to n. New England, and var. *angustifolia*, to which our material would presumably be referred). The validity of the varieties is doubtful. [= C, FNA, G, K, L, S, W; = *Cassandra calyculata* (Linnaeus) D. Don – RAB, GW; > *Chamaedaphne calyculata* var. *angustifolia* (Aiton) Rehder – F]

25. Leucothoe D. Don 1834 (Fetterbush, Leucothoe)

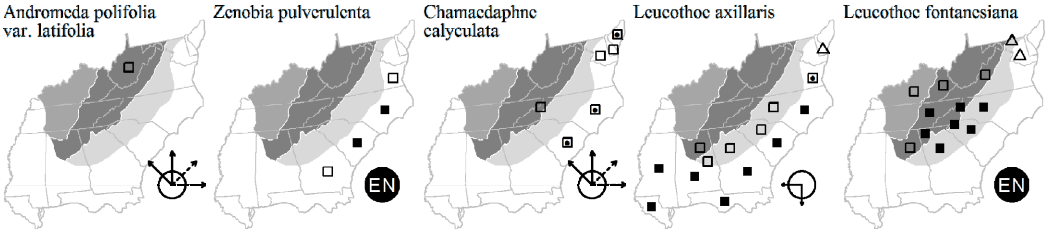
A genus of 5-6 species, shrubs, of Japan, Himalayan Asia, and e. North America. References: Tucker in FNA (2009); Stevens et al. in Kubitzki (2004). [also see *Agarista* and *Eubotrys*]

1 Leaves deciduous, dull, membranaceous ..... *[see* ***Eubotrys****]*
1 Leaves evergreen, glossy, coriaceous.
  2 Leaves with an acute or short-acuminate apex; racemes 2-4 (5) cm long; sepals ovate, with an obtuse or rounded apex; longest petioles 3-8 mm long ..... ***L. axillaris***
  2 Leaves with a long-acuminate apex; racemes 4-10 cm long; sepals lanceolate-ovate, with an acute (or subacute) apex; longest petioles 8-15 mm long ..... ***L. fontanesiana***

Leucothoe axillaris (Lamarck) D. Don, Coastal Doghobble. Pocosins, blackwater swamp forests, and moist and acid slopes. Late March-May; September-October. A Southeastern Coastal Plain endemic: se. VA south to FL and west to extreme e. LA. [= C, FNA, G, GW, K, L, S, WH; = *L. axillaris* var. *axillaris* – RAB; > *L. axillaris* var. *axillaris* – F; > *L. axillaris* var. *ambigens* Fernald – F]

Leucothoe fontanesiana (Steudel) Sleumer, Mountain Doghobble, Switch-ivy. Moist slopes, streambanks, ravines, often associated with *Rhododendron maximum* thickets. April-May; September-October. A Southern Appalachian endemic: sw. VA

south through w. NC and e. TN to nw. GA. [= FNA, GW, K, L, W; = *L. axillaris* var. *editorum* (Fernald & Schubert) Ahles – RAB; = *L. walteri* (Willdenow) Melvin – C; = *L. editorum* Fernald & Schubert – F, G; = *L. catesbaei* (Walter) Gray – S]



26. Eubotrys Nuttall 1842 (Deciduous Fetterbush)

A genus of 2 species, shrubs to small trees, of e. North America. Recent molecular evidence supports the recognition of *Eubotrys* as a genus separate from *Leucothoe*, and more closely related to *Chamaedaphne*, supporting the views, based on morphological grounds, of many earlier authors (Kron et al. 2002). References: Tucker in FNA (2009); Kron et al. (2002); Stevens et al. in Kubitzki (2004).

1 Anthers with 4 awns; capsule rounded on the sutures; sepals broadly lanceolate; racemes 3-5 cm long; seeds not winged, shaped like a section of an orange ..... ***E. racemosa***
1 Anthers with 2 awns; capsule angled on the sutures; sepals ovate; racemes 5-12 cm long; seeds winged, oblanceolate, flat ..... ***E. recurva***

Eubotrys racemosa (Linnaeus) Nuttall, Coastal Fetterbush. Swamps, pocosins, streambanks, and other wet places. Late March-early June; September-October. E. MA south to c. peninsular FL and west to LA, primarily on the Coastal Plain; disjunct inland, as in c. TN (Chester, Wofford, & Kral 1997). [= C, FNA, G; = *Leucothoe racemosa* (Linnaeus) A. Gray – RAB, GW, K, L, W, WH; > *L. racemosa* var. *projecta* Fernald – F; > *L. racemosa* var. *racemosa* – F; > *Eubotrys racemosa* – S; > *Eubotrys elongata* Small – S]

Eubotrys recurva (Buckley) Britton, Mountain Fetterbush. Heath balds, high elevation ridges and granitic domes, bogs. April-early June (rarely sporadically in the fall); August-October. A Southern Appalachian endemic: sw. VA, s. WV, and se. KY south through w. NC and ne. TN to ne. GA (Rabun County) and nw. SC. [= C, FNA, G, S; = *Leucothoe recurva* (Buckley) A. Gray – RAB, F, K, L, W, WV]

27. Gaultheria Kalm ex Linnaeus 1754 (Wintergreen, Teaberry)

A genus of 115-135 species, shrubs and subshrubs, of Asia, Australia and New Zealand, South America, West Indies, Central America, and North America (primarily Asian). References: Trock in FNA (2009); Stevens et al. in Kubitzki (2004).

1 Stems creeping, the leaves 3-10 mm long, well-distributed along the stem; berries white; flowers 4-merous ..... ***G. hispidula***
1 Stems erect, the leaves 15-50 mm long, clustered at the tip of the stem; berries red; flowers 5-merous ..... ***G. procumbens***

Gaultheria hispidula (Linnaeus) Muhlenberg ex Bigelow, Creeping Snowberry, Moxie. Spruce-fir forests, northern hardwoods forests, bogs at high elevations. May. NL (Newfoundland) and NL (Labrador) west to BC, south to NJ, MD, WV, OH, MN, ID, and WA; there is no known documentation for the attribution (by C, F, G, and S) of this species as occurring in NC. [= C, F, FNA, G, K, WV; = *Chiogenes hispidula* (Linnaeus) Torrey & A. Gray – S]

Gaultheria procumbens Linnaeus, Wintergreen, Teaberry, Checkerberry. Heath balds, woodlands, and openings, usually acidic and xeric. June-August; September-November. NL (Newfoundland) west to MB, south to e. NC, ne. GA, AL, c. TN, KY, n. IN, and MN. [= RAB, C, F, FNA, G, K, L, S, W, WV]

28. Vaccinium Linnaeus 1753 (Blueberry)

A genus of 140 species, shrubs, lianes, and small trees, semicosmopolitan. *Vaccinium* in our area is divided into 6 strongly differentiated sections, sometimes, as by Small, treated as separate genera. The taxonomy of *Vaccinium* remains unclear – past divergence of opinion is obvious in the synonymy. For instance, Small (1933) recognizes 6 genera and 25 species for our area, Ahles in RAB (1968) recognizes 1 genus and 14 species (one with 2 varieties) (not including VA), and Vander Kloet (1988) recognizes 1 genus and 9 species. The highbush blueberries of section *Cyanococcus* are particularly difficult. Vander Kloet's extremely broad concept of the highbush blueberries as consisting of a single species, *V. corymbosum*, including *V. fuscatum* (*V. atrococcum* – RAB), *V. simulatum* ("*V. constablaei*" – RAB), *V. virgatum* (*V. amoenum* – RAB), *V. elliottii*, *V. formosum* (*V. australe*), and *V. caesariense* (and many other named taxa not recognized here) has been adopted by some recent authors, at least partly for its ease of application. I agree with Godfrey (1988), though, that *V. elliottii* has "such distinctiveness as to be recognizable in the field at a glance." The other taxa are less easily recognizable, but seem to have substantial morphological and phytogeographic integrity. The fairly frequent presence of hybrid individuals and populations can make identification frustrating, but I agree with Ward (1974) that "the genus *Vaccinium* ... is difficult but not in any way an irresolvable tangle of intergrading

populations. The vast bulk of individuals encountered in the field may be assigned, as with any non-apomict genus, to a relatively few, discrete, and wholly recognizable species". Many of the taxa included in *V. corymbosum* by Vander Kloet (1988) and Luteyn et al. (1996) occur together in combinations of two to four, are immediately recognizable in the field, bloom at different times, and have different flower, fruit, and leaf morphology. Failure to recognize multiple entities within the highbush blueberries results in the taxonomic homogenization of the diversity of the group and obscures important phytogeographic patterns. Our area, with 20 species (24 taxa) in 6 sections, has a greater diversity of *Vaccinium* than any other comparably sized area in North America. References: Vander Kloet (1988)=Z; Uttal (1987)=Y; Camp (1945)=X; Ashe (1931)=V; Ward (1974)=Q; Luteyn et al. (1996)=L; Vander Kloet in FNA (2009); Vander Kloet & Hall (1981); Vander Kloet (1977, 1978a, 1978b, 1980, 1982, 1983a, 1983b); Uttal (1986a, 1986b); Stevens et al. in Kubitzki (2004). Key based in part on Uttal (1987).

1 Trailing vines, erect shoots (if present) borne on horizontal stems; leaves evergreen, glossy and dark green above, rarely exceeding 20 mm in length.
  2 Leaves narrowly elliptic, glabrous above, glaucous-white below; leaf margin entire and eglandular; berry red when ripe, 8-15 mm long; [**cranberries**, section *Oxycoccus*] ..... **Key A**
  2 Leaves elliptic, puberulent above, pale green below; leaf margin obscurely to fairly strongly serrate and glandular; berry black when ripe, 6-8 mm long; [**creeping blueberries**, section *Herpothamnus*] .....**Key B**
1 Erect shrubs, the growth form various (single-stemmed, multi-stemmed and clump-like, or clonal with numerous erect shoots from a network of subterranean rhizomes); leaves deciduous to semi-evergreen (evergreen in *V. myrsinites*), dull to somewhat glossy and medium green above (dark green and glossy in *V. myrsinites*), generally exceeding 20 mm in length (5-30 mm long in *V. myrsinites*).
  3 Twigs of the season verrucose (the surface abundantly covered with small bumps, readily visible without magnification); [**blueberries**, section *Cyanococcus*] ..... **Key C**
  3 Twigs of the season not verrucose.
    4 Corolla lobes 4, strongly recurved, 7-10 mm long; calyx lobes 4 (also visible on the berry); leaves lanceolate to ovate, the apex acuminate, the margin regularly and finely serrate with glandular teeth; [of high elevations in the Mountains]; [**mountain cranberry**, section *Oxycoccoides*] ..... **Key D**
    4 Corolla lobes 5, not or only slightly recurved, 1-8 mm long; calyx lobes 5 (also visible on the berry); leaves elliptic, obovate, oblanceolate, or nearly round, the apex generally obtuse to rounded, the margin entire to obscurely and irregularly serrate; [collectively widespread in our area, but not at high elevations].
      5 Mature leaves green (or glaucous), glandular beneath, mostly elliptic to round, generally 1.5-4.5 cm long; corolla broad-urceolate to narrow-campanulate, the stamens included; berry black, lustrous, 5-9 mm long; [**farkleberry**, section *Batodendron*] .....**Key E**
      5 Mature leaves pale and glaucous, eglandular beneath, mostly elliptic, 3-10 cm long; corolla campanulate, the stamens long-exserted; berry green, yellow, pink, or purple, usually glaucous, 7-18 mm long; [**deerberries**, section *Polycodium*] .....**Key F**

Key A – cranberries, section *Oxycoccus*

1 Leaves elliptic, broadest near middle, (5-) 7-10 (-18) mm long, (2-) 3-4 (-5) mm wide; leaves blunt-rounded and non-involute; pedicels with 2 green, leaf-like bracts 1-2 mm wide; berry 8-15 mm in diameter..... ***V. macrocarpon***
1 Leaves ovate, broadest toward base, (3-) 5-6 (-9) mm long, (1-) 2-3 (-5) mm wide; leaves involute at least along the margins, thus making the leaf tip acute; pedicels with (0-) 2 (-5) reddish, scale-like bracts < 1 mm wide; berry 6-12 mm in diameter.....***V. oxycoccos***

Key B – creeping blueberries, section *Herpothamnus*

1 Leaves (2-) 3-18 (-25) mm long, generally elliptic (less commonly ovate or obovate); angle of leaf base typically >90 degrees; margins finely glandular mucronulate-crenulate, the teeth tightly appressed and therefore often obscure, the margin superficially entire; stems mostly prostrate (ascending in areas that have been long fire-suppressed); [widespread in NC and SC, rare in se. VA and e. GA].....***V. crassifolium***
1 Leaves (4-) 7-35 (-63) mm long, elliptic to obovate (less commonly elliptic-ovate); angle of leaf base typically <90 degrees; margins glandular mucronulate-serrulate to serrulate-crenulate, the teeth apparent, especially toward the apex; stems often ascending to upright; [of Lexington County, SC].....***V. sempervirens***

Key C – blueberries, section *Cyanococcus*

Note: Hybrids and apparent local races in this section are frequent, and will key poorly. Hybrids are particularly frequent among the taxa of the highbush blueberries, somewhat less so among lowbush blueberries and between lowbush and highbush. In the Coastal Plain, *V.* ×*marianum* (*formosum* × *fuscatum*) is the most common, and will be responsible for most difficulties encountered in the key from lead 10 on. Uttal (1987) presents a complicated key with *V.* ×*marianum* (but not other hybrids) included.

1 Shrubs rhizomatous, forming clonal colonies, the upright stems < 1 m tall (and often < 0.5 m tall); ["lowbush blueberries"].
  2 Leaves evergreen, 5-15 mm long (rarely to 30 mm long on fire sprouts), subcoriaceous, glossy dark-green or dull blue-green; [restricted in our area to the Coastal Plain of se. SC southward].
    3 Plant glaucous and bluish-green throughout; leaf undersurface lacking scattered glandular hairs; [of s. GA south to s. peninsular FL, west to e. TX] ..... ***V. darrowii***
    3 Plant dark green throughout; leaf undersurface with scattered glandular hairs, these sometimes very few by late in the season (best seen in the field by folding a leaf, holding the fold up to the light, and using a 10× lens); [of se. SC southward to n. FL, west to s. AL] ..... ***V. myrsinites***
  2 Leaves deciduous to semi-evergreen, herbaceous, generally > 20 mm in length, dull to somewhat glossy and medium green; [collectively widespread in our area].

3 Lower surfaces of the leaves with red stipitate glands (sometimes pubescent as well when young); berry usually black and lustrous; [of the Coastal Plain and lower Piedmont] ..... ***V. tenellum***
3 Lower surfaces of the leaves eglandular, pubescent or glabrous; berry either blue and glaucous, or black and glandular-hirsute; [collectively widespread in our area].
4 Leaves sharply serrulate (each tooth with a small glandular tip), 20-32 mm long, 6-16 mm wide, green and shiny below (rarely glaucous), glabrous or nearly so ..... ***V. angustifolium***
4 Leaves entire or obscurely serrulate (if obscurely serrulate then 30-50 mm long and 13-25 mm wide), either glaucous and glabrous (or nearly so) beneath, or green and densely pubescent beneath.
5 Leaves pale and glaucous, glabrous on both sides or pubescent on the underside only; berry blue and glaucous; [plants collectively widespread].
6 Plants mostly 0.5-1.0 (-1.4) m tall, stems brown for much of their length; leaves entire; fruit 7-12 mm in diameter; [of moderate to high elevations of the Mountains] ..... ***V. altomontanum***
6 Plants mostly 0.2-0.6 (-1.0) m tall, stems green to the base (or brown at the very base); leaves serrulate (rarely entire); fruit 4-7 (-8) mm in diameter; [widespread, at low to moderate elevations] ..... ***V. pallidum***
5 Leaves green, pilose on both sides; berry either blue and glaucous, or black and glandular-hirsute; [of the Mountains].
7 Berry black and glandular-hirsute; calyx and corolla hirsute and stipitate-glandular; leaves mostly > 3 cm long; [of the mountains of sw. NC and adjacent TN and GA] ..... ***V. hirsutum***
7 Berry blue and glaucous; calyx and corolla glabrous; leaves mostly < 3.5 cm long; [of the mountains of n. NC and north] ..... ***V. myrtilloides***

1 Shrubs crown-forming, single-stemmed or several-stemmed from the base, the upright stems generally > 1 m tall (often 2-3 m tall, and rarely to 7 m); ["highbush blueberries"].
8 Leaves with stipitate glands on the lower surface; [of the Coastal Plain of SC and s. NC] ..... ***V. virgatum***
8 Leaves lacking stipitate glands on the lower surface (variously glabrous to pubescent with eglandular hairs); [collectively widespread].
9 Leaves 0.7-3.5 cm long, 0.3-1.5 cm wide, with serrulate margins; twigs slender, numerous ..... ***V. elliottii***
9 Leaves 3-10 cm long, 1.5-4.5 cm wide, with entire, ciliate, or serrulate margins; twigs stouter, fewer.
10 Young twigs glabrous; leaf surfaces glabrous; leaf margins eciliate or ciliate.
11 Leaves 4-10 cm long, 2.5-4.5 cm wide, most of them widest below the middle, eciliate; leaf bud scales reddish, 2-4 mm long, including the elongated (1.5-3 mm long), slender awnlike tips; corollas 8-12 mm long, cylindrical; berry 7-12 mm in diameter, dark blue with a glaucous bloom; [primarily of the Coastal Plain, very rarely disjunct in Coastal Plain like habitats in the Mountains or Piedmont] ..... ***V. formosum***
11 Leaves 3-8 cm long, 1.5-3 cm wide, most of them widest at or above the middle, ciliate or not; leaf bud scales flesh-colored or pink to reddish, 1-3 mm long, including the short (to 1.5 mm long) awnlike tips; corollas 4-10 mm long, cylindrical, subglobose, subcampanulate, or urceolate; berry 5-10 mm in diameter, blue with a glaucous bloom; [collectively widely distributed in our area].
12 Leaves 3-6 cm long, 1.5-2 cm wide, eciliate; corolla 4-6 mm long; [primarily of the Coastal Plain, very rarely disjunct in Coastal Plain like habitats in the Piedmont] ..... ***V. caesariense***
12 Leaves 3-8 cm long, 2-3 cm wide, usually ciliate-margined, at least basally; corolla 5-10 mm long; [of the Mountains and montane sites in the upper Piedmont] ..... ***V. corymbosum***
10 Young twigs puberulent, at least in lines; leaf surfaces more-or-less pubescent; leaf margins ciliate (rarely eciliate).
13 Puberulence of the young twigs merely in 2 lines; [of the Mountains and montane sites in the upper Piedmont].
14 Leaves elliptic to elliptic-obovate, broadest at or beyond the middle, the apex acute to short-acuminate; leaf margins entire to obscurely serrulate; corolla 5-10 mm long; berry blue, glaucous ..... ***V. corymbosum***
14 Leaves narrowly ovate, broadest below the middle, the apex acuminate; leaf margins distinctly serrulate; corolla 5-7 mm long; berry purple-black, not glaucous (sometimes drying so as to appear somewhat glaucous blue) ..... ***V. simulatum***
13 Puberulence of the young twigs extending around their circumference (not merely in 2 lines); [collectively widely distributed in our area].
15 Hairs of the twigs and leaf surfaces whitish; leaves medium to pale green, not darkening on drying; berry blue, glaucous; twigs and bud scales flesh-colored to reddish; corolla 5-10 mm long, usually not narrowed to the tip; blooming May; [of the Mountains and montane sites in the upper Piedmont] ..... ***V. corymbosum***
15 Hairs of the twigs and leaf surfaces dingy, brownish, or dark; leaves dark green, darkening on drying; berry black; twigs and bud scales brownish-green to black; corolla 5-8 mm long, often narrowed to the tip; blooming February-April; [widely distributed in our area, though most common in the Coastal Plain] ..... ***V. fuscatum***

Key D – mountain cranberry, section *Oxycoccoides*

One species in our area ..... ***V. erythrocarpum***

Key E – farkleberry, section *Batodendron*

One species in our area ..... ***V. arboreum***

Key F – deerberries, section *Polycodium*

[This key and treatment provisional]

1 Leaves strongly white-glaucous beneath; stamens 4-6 mm long.
2 Bracts of the inflorescence nearly as large as normal foliage leaves; [of the Coastal Plain from se. NC southward] .....

.....***V. stamineum*** *var.* ***caesium***

2 Bracts of the inflorescence much smaller than normal foliage leaves; [of the Mountains and Piedmont] .....***V. stamineum*** *var.* ***2***

1 Leaves green beneath (often slightly paler but not at all glaucous); stamens 5-8 mm long.

3 Bracts of the inflorescence nearly as large as normal foliage leaves; plants short, 0.2-0.5 (-1.0) m tall, distinctly clonal; [primarily of Coastal Plain pinelands].....***V. stamineum*** *var.* ***1***

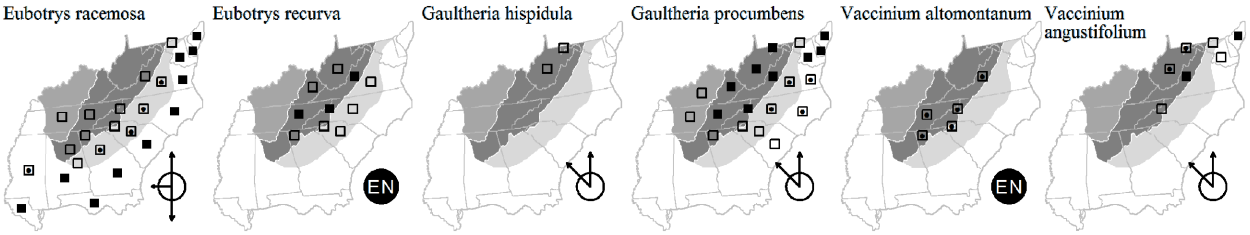
3 Bracts of the inflorescence much smaller than normal foliage leaves; plants short to taller, 0.3-5 m tall, either clonal or crown-forming; [primarily of rocky or submesic habitats of the Piedmont and Mountains].

4 Hypanthium and fruit pubescent .....***V. stamineum*** *var.* ***sericeum***

4 Hypanthium and fruit glabrous ..... ***V. stamineum*** *var.* ***stamineum***

Vaccinium altomontanum W.W. Ashe, Blue Ridge Blueberry. Mt (GA, NC, SC, VA): grassy balds, heath balds, high elevation forests and woodlands; uncommon. May-June; July-September. The tetraploid *V. altomontanum* occurs primarily in the Mountains at moderate to high elevations (the type collection is from the Fodderstacks, Macon County, NC); it differs from the diploid *V. pallidum* in forming tighter (often circular) clones, with taller plants (to 1 m tall), the leaves thick in texture, often revolute, strictly glaucous and glabrous, and with excellent berries. [< *V. corymbosum* – RAB; = *V. alto-montanum* – G, X, orthographic variant; < *V. pallidum* – FNA, K; > *Cyanococcus subcordatus* Small – S; > *Cyanococcus liparis* Small – S, as to type]

Vaccinium angustifolium Aiton, Northern Lowbush Blueberry, Sugarberry, Low Sweet Blueberry. Mt (NC, VA, WV), Pd (DE): acidic forests and woodlands, cliffs and talus (especially sandstone and quartzite), usually at high elevations; common (uncommon in WV, rare in DE and NC). NL (Labrador) and NL (Newfoundland) west to MB, south to NJ, PA, sw. VA, IL, and MN. Recently reported for the Great Smoky Mountains National Park (J. Rock, pers. comm. 2009) and from Cheoah Bald, Graham County (E. Schwartzman, pers. comm. 2010 and NCU specimen). [= C, FNA, K, W, Y, Z; > *V. angustifolium* var. *angustifolium* – F, WV; > *V. angustifolium* var. *laevifolium* House – F, WV; > *V. angustifolium* var. *hypolasium* Fernald – F; > *V. angustifolium* var. *nigrum* (Wood) Dole – F, WV; > *V. angustifolium* – G, X; > *V. lamarckii* Camp – G, X; > *V. brittonii* Porter ex Bicknell – X]



Vaccinium arboreum Marshall, Farkleberry, Sparkleberry. Rocky or sandy woodlands, bluffs, and cliffs, usually xeric and often fire-maintained, and unlike most other *Vaccinium*, often on mafic, ultramafic, or calcareous rocks. Late April-June; September-October. This species is widely distributed in se. North America, from TX and FL north to MO, IN, KY, and VA. It can be a small tree, to 35 cm DBH and 10 m tall. The leaves are coriaceous and semi-evergreen, often being retained for much or all of the winter. Var. *glaucescens* (Greene) Sargent may be worthy of recognition; it differs from var. *arborescens* in its subglaucous to conspicuously blue-green leaves (vs. dark green leaves) and the bracts at the base of the pedicels nearly equal in size and shape to the leaves (vs. bracts distinctly smaller and often also different in shape than the leaves). [= RAB, C, FNA, G, K, L, W, WH, Y, Z; > *V. arboreum* var. *arboreum* – F; > *V. arboreum* var. *glaucescens* (Greene) Sargent – F; = *Batodendron arboreum* (Marshall) Nuttall – S]

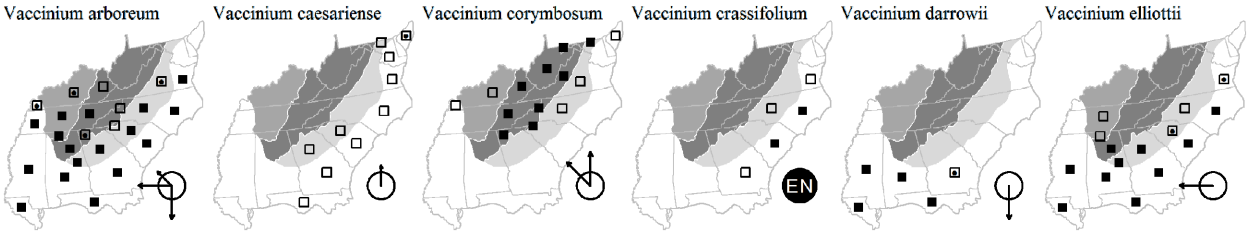
Vaccinium caesariense Mackenzie, New Jersey Highbush Blueberry. Swamps, bogs, moist ground. Late February-May; June-August. S. ME south to n. FL. This species is diploid. [= C, F, G, K, X, Y; < *V. corymbosum* – RAB, FNA, L, WH, Z]

Vaccinium corymbosum Linnaeus, Smooth Highbush Blueberry. Bogs, wet swamp forests, moist high elevation bogs, balds, and forests. May; August. NS west to MI, south to WV, OH, and IN, south in the Appalachians (and rarely on Piedmont monadnocks) to w. NC, nw. SC, n. GA, and e. TN. In our area, *V. corymbosum* (sensu stricto) appears to be limited to the Mountains, except for occurrences on Piedmont monadnocks and outlier ridges, such as Hanging Rock, Stokes County, NC, and the Brushy Mountains, NC. See the end of the genus treatment for discussion of taxonomic controversy involving this species and its allies. Note that this treatment recognizes 2 species (*V. formosum* and *V. caesariense*) included within *V. corymbosum* by RAB. *V. formosum* is the common "*corymbosum*" type blueberry of the Coastal Plain. *V. corymbosum* is primarily tetraploid; *V. constablaei* A. Gray (misapplied to *V. simulatum* by RAB) is correctly applied to hexaploid plants of the high elevation Blue Ridge of NC and TN, especially on heath balds and grassy balds. Camp (1945) considered *V. constablaei* to be an allopolyploid derivative of *V. simulatum* and *V. altomontanum* (itself a tetraploid apparently related to diploid *V. pallidum*, and of uncertain derivation). The appropriate taxonomic treatment of these plants is unclear; they are apparently not reliably identifiable based on morphology. [= K, X, Y; < *V. corymbosum* – RAB, FNA, G, L, W, Z; > *V. corymbosum* var. *corymbosum* – F, WV; > *V. corymbosum* var. *albiflorum* (Hooker) Fernald – F; > *V. corymbosum* var. *glabrum* Gray – F, WV; < *V. corymbosum* – C (also see *V. fuscatum* and *V. simulatum)*; < *V. constablaei* A. Gray – G, X; = *Cyanococcus corymbosus* (Linnaeus) Rydberg – S]

Vaccinium crassifolium Andrews, Creeping Blueberry. Savannas, pine flatwoods, pocosin-sandhill ecotones, upland sandhills over clay pans. April-May; June-July. This species is nearly endemic to the Carolinas, barely extending into immediately adjacent VA and GA. See Kirkman, Wentworth, & Ballington (1989) and Kirkman & Ballington (1990) for discussion of the systematics and ecology of this species and the closely related *V. sempervirens*. [= RAB, C, F, G, GW, Y; = *V. crassifolium* ssp. *crassifolium* – K; < *Herpothamnus crassifolius* (Andrews) Small – S; < *V. crassifolium* – FNA, L, Z]

Vaccinium darrowii Camp, Darrow's Blueberry. Pine flatwoods. S. GA south to s. peninsular FL and west to e. LA. [= FNA, K, L, WH, X, Z; = *V. darrowi* – GW, orthographic variant; = *Cyanococcus myrsinites* (Lamarck) Small var. *glaucum* A. Gray – S]

Vaccinium elliottii Chapman, Mayberry. Bottomlands, slopes, sandy river terraces, natural levees. March-April; May-June. Primarily a Coastal Plain species, *V. elliottii* ranges from se. VA south to FL, west to se. TX and AR; disjunct in Coffee County, TN (Chester, Wofford, & Kral 1997). [= RAB, C, F, G, GW, K, X, Y; = *Cyanococcus elliottii* (Chapman) Small – S; < *V. corymbosum* – FNA, L, WH, Z]



Vaccinium erythrocarpum Michaux, Bearberry, Highbush Cranberry, Mountain Cranberry. Rocky ridges, shrub or grassy balds, bogs, spruce-fir forests, usually at high elevations. Late May-July; August-September. A Southern and Central Appalachian endemic, *V. erythrocarpum* ranges from WV through VA to w. NC, e. and ec. TN, and ne. GA. The only other member of Section *Oxycoccoides* is *V. japonicum* Miguel of montane Japan, so similar as to be sometimes regarded as only a subspecies or variety of our species. [= RAB, C, F, G, K, L, W, WV, Y, Z; = *V. erythrocarpum* ssp. *erythrocarpum* – FNA; = *Hugeria erythrocarpa* (Michaux) Small – S]

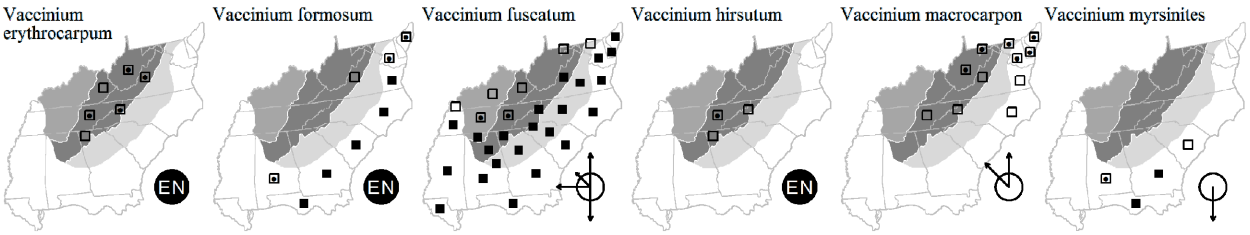
Vaccinium formosum H.C. Andrews, Southern Highbush Blueberry, Swamp Highbush Blueberry. Bogs, swamps (especially blackwater, or at least where away from strong alluvial influence), seepages, depression ponds (dolines), other moist ground. Late February-May; June-August. Apparently ranging from NJ south to n. FL and s. AL, primarily on the Coastal Plain. This species is the primary source of the cultivated highbush blueberries. It has the largest and arguably the highest quality fruit of the native highbush blueberries. [= K, Y; < *V. corymbosum* – RAB, C, FNA, L, WH, Z; = *V. australe* Small – G, GW, X; = *Cyanococcus virgatus* (Aiton) Small – S, misapplied]

Vaccinium fuscatum Aiton, Hairy Highbush Blueberry, Black Highbush Blueberry. Bogs, pocosins, swamps, also in uplands. Late February-May; June-August. The species is apparently widespread in e. United States. [= GW, K, W, X, Y; = *V. atrococcum* (Gray) Heller – RAB, F, G, X; < *V. corymbosum* – C, FNA, L, WH, Z; *? V. marianum* S. Watson – G; > *Cyanococcus fuscatus* (Aiton) Small – S; > *Cyanococcus atrococcus* (A. Gray) Small – S]

Vaccinium hirsutum Buckley, Woollyberry, Hairy Blueberry. Mountain slopes and ridges, primarily in pine-oak and oak forests. April-May; June-July. *V. hirsutum* is a narrow Southern Appalachian endemic, occurring only in a few counties of sw. NC, se. TN, and n. GA. It is the only species in our area with pubescent fruit. [= RAB, FNA, K, L, W, X, Z; = *Cyanococcus hirsutus* (Buckley) Small – S]

Vaccinium macrocarpon Aiton, Cranberry, Large Cranberry. Mountain bogs, low pocosins with deep peat, interdunal swales. May-July; August-November. Unlike the circumboreal *V. oxycoccus* Linnaeus, *V. macrocarpon* is limited to North America. This is the familiar edible cranberry, raised commercially in artificial bogs, primarily in MA, WI, and NJ. It ranges as a native plant from NL (Newfoundland) west and south to s. ON, MN, ne. IL, n. IN, n. and c. OH, PA, and NJ, extending south along the Appalachians as a disjunct rarity through WV, w. VA, and ne. and se. TN to w. NC, and south along the outer Coastal Plain as a disjunct rarity in e. MD, se. VA, and ne. and se. NC. The occurrence in the inner Coastal Plain (fall-line sandhills) along the Little River in Cumberland County, NC is questionably native. [= RAB, C, F, FNA, G, GW, K, L, W, WV, Y, Z; = *Oxycoccus macrocarpus* (Aiton) Persoon – S]

Vaccinium myrsinites Lamarck, Southern Evergreen Blueberry. Pine flatwoods. March-April; May-June. Se. SC south to s. peninsular FL, west to s. AL. *V. myrsinites* is readily distinguished from all our species by the following combination of characteristics: clonal shrub with upright stems usually < 50 cm tall, the young twigs verrucose, leaves evergreen, mostly 5-15 mm long and 2-10 mm wide, lower surface of young leaves with stout glandular hairs. Further south, it can be difficult to distinguish from the closely related *V. darrowii* Camp (see key), with which it often co-occurs in their area of overlap. [= RAB, FNA, GW, K, L, WH, X, Z; = *Cyanococcus myrsinites* (Lamarck) Small var. *myrsinites* – S]



Vaccinium myrtilloides Michaux, Velvetleaf Blueberry, Sourtop, Canada Blueberry. Acidic, high elevation slopes and cliffs. May-July. NL (Labrador) west to BC, south to PA, VA, w. NC, WV, IN, and MN. Reported for the NC side of Great Smoky Mountains National Park (Haywood County) (K. Langdon, pers. comm. 2009). The possible occurrence of this species on Grandfather Mountain is based on somewhat ambiguous specimens and needs additional confirmation. See Vander Kloet & Hall (1981) for a summary of information on this diploid species. [= C, F, FNA, G, K, W, WV, X, Y, Z]

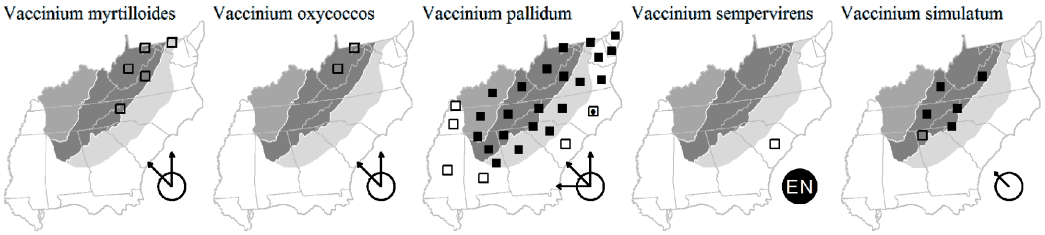
Vaccinium oxycoccos Linnaeus, Small Cranberry. Bogs. Circumboreal, south in North America to NJ, PA, WV (Grant, Mineral, Pendleton, Pocahontas, Preston, Randolph, and Tucker counties), IN, and MN. This species has been reported for NC,

by Fernald (1950) as *V. oxycoccos* var. *ovalifolium* Michaux, by Scoggan (1979) as *Oxycoccus ovalifolius* (Michaux) Porsild, and by Kartesz (1999). Most likely, ambiguous collections of *V. macrocarpon* are the basis for these reports. [= C, FNA, G, K; > *V. oxycoccos* Linnaeus var. *ovalifolium* – F; = *Oxycoccus palustris* Persoon; > *Oxycoccus palustris* Persoon var. *ovalifolius* (Michaux) Seymour; > *Oxycoccus ovalifolius* (Michaux) Porsild]

Vaccinium pallidum Aiton, Hillside Blueberry, Dryland Blueberry. Forested slopes, usually rather xeric. March-April; June-July. Widespread in e. United States, *V. pallidum* is centered in the Appalachians and Ozarks. Vander Kloet (1978, 1988) and Uttal (1987) do not favor Camp's (1945) separation of *V. pallidum* and *V. vacillans*. If the two taxa are combined (as here), *V. pallidum* has nomenclatural priority. *V. pallidum* is primarily diploid. See *V. altomontanum* for discussion of its relationship to *V. pallidum*. [= C, K, L, W, WV, Y, Z; = *V. vacillans* Kalm ex Torrey – RAB; > *V. vacillans* Torrey var. *vacillans* – F; > *V. vacillans* var. *crinitum* Fernald – F; > *V. pallidum* – F, G, X; > *V. vacillans* – G, X; < *V. pallidum* – FNA; ; > *Cyanococcus pallidus* (Aiton) Small – S; > *Cyanococcus vacillans* (Kalm ex Torrey) Rydberg – S]

Vaccinium sempervirens Rayner & Henderson, Rayner's Blueberry. Seepage bogs in the fall-line Sandhills, longleaf pine woodlands over sandstone and gravel outcrops. Endemic to Lexington County, SC, known from only a few sites. This species is clearly closely allied to *V. crassifolium*. Kirkman & Ballington (1990) reduce it to a subspecies. Because it is allopatric and relatively discrete morphologically, despite occurring in similar habitats, I prefer to retain it as a species. See Kirkman, Wentworth, & Ballington (1989) and Kirkman & Ballington (1990) for further discussion of the systematics and ecology of this species and *V. crassifolium*. [= *V. crassifolium* Andrews ssp. *sempervirens* (Rayner & Henderson) Kirkman & Ballington – K; < *V. crassifolium* – FNA, L, Z]

Vaccinium simulatum Small, Mountain Highbush Blueberry. Forested slopes (northern hardwoods, spruce-fir forests), ridges, and shrub balds, at moderate and high elevations. Late April-early June; July-August. A Southern and Central Appalachian endemic, *V. simulatum* ranges from e. KY and sw. VA south through w. NC and e. TN to n. GA and n. AL. The name *V. constablaei* has been misapplied to this species, as by RAB; see *V. corymbosum* for a discussion of the correct application of *V. constablaei*. [= G, K, X, Y; = *V. constablaei* Gray – RAB, G, misapplied; < *V. corymbosum* – C, FNA, L, W, Z; = *Cyanococcus simulatus* (Small) Small – S]



Vaccinium stamineum Linnaeus *var.* ***1***, Dwarf Deerberry. Pinelands. April-June; August-October. This dwarf taxon is characteristic of Coastal Plain pinelands; its stature is not the result of fire; it never achieves greater height, even following decades of fire suppression. Se. NC south to GA. [< *V. stamineum* var. *stamineum* – RAB; < *Vaccinium stamineum* – C, FNA, K, L, W, Y, Z; = *Polycodium arenicola* W.W. Ashe – V]

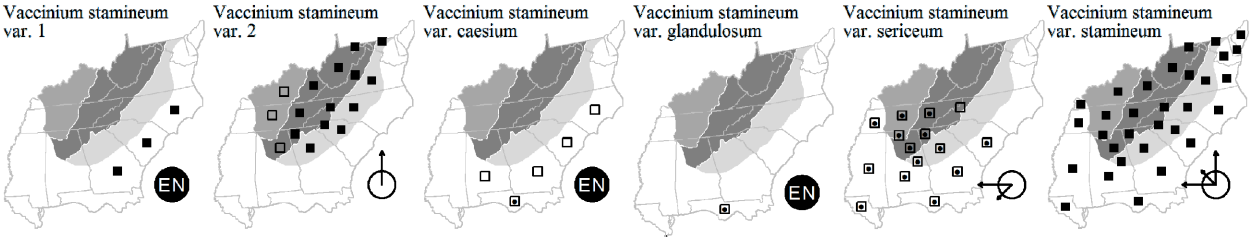
Vaccinium stamineum Linnaeus *var.* ***2***, Appalachian Deerberry. Xeric to submesic woodlands and forests, including pine-oak/heath and shrub balds. April-June; August-October. PA south to GA, in the Appalachians and adjacent provinces. [< *V. stamineum* var. *stamineum* – RAB, F, WV; < *V. stamineum* – C, FNA, K, L, W, Y, Z; = *Polycodium candicans* Small – S, V; = *V. candicans* (C. Mohr) Sleumer]

Vaccinium stamineum Linnaeus *var.* ***caesium*** (Greene) D.B. Ward, Florida Deerberry, Whiteleaf Deerberry. Xeric woodlands. April-May; August-October. Se. NC south to c. peninsular FL, and west to s. AL. [= Q; < *V. stamineum* var. *stamineum* – RAB; < *V. stamineum* – C, FNA, K, L, W, WH, Y, Z; *? V. caesium* Greene – F (probably misapplied); > *Polycodium floridanum* (Nuttall) Greene – S; > *Polycodium ashei* Harbison – S; > *Polycodium floridanum var. floridanum* – V; > *Polycodium floridanum var. caesium* – V]

Vaccinium stamineum Linnaeus *var.* ***glandulosum*** (Ashe) D.B. Ward. Pine flatwoods. Supposedly endemic to the FL Panhandle, probably in GA. [= *Polycodium glandulosum* Ashe; < *Vaccinium stamineum* – FNA, L, WH] {not yet keyed; synonymy incomplete}

Vaccinium stamineum Linnaeus *var.* ***sericeum*** (C. Mohr) D.B. Ward, Southern Deerberry. Xeric woodlands. April-June; August-October. S. SC, w. NC, TN, and AR south to Panhandle FL and TX; disjunct in Mexico. [= Q; ? *V. stamineum* var. *melanocarpum* C. Mohr – RAB, F, misapplied; < *V. stamineum* – C, FNA, K, L, W, WH, Y, Z; ? *V. melanocarpum* (C. Mohr) C. Mohr ex Kearney – G, misapplied; ? *Polycodium melanocarpum* (C. Mohr) Small – S, misapplied; = *Polycodium sericeum* (C. Mohr) C.B. Robinson – V]

Vaccinium stamineum Linnaeus *var.* ***stamineum***, Common Deerberry. Xeric to submesic woodlands, forests, and rock outcrops (unlike most *Vaccinium*, often on mafic, ultramafic, or calcareous rocks). April-June; August-October. MA, NY, s. ON, and MO south to Panhandle FL and TX. [= Q; < *V. stamineum* var. *stamineum* – RAB; < *Vaccinium stamineum* – C, FNA, K, L, W, Y, Z; > *V. stamineum* var. *stamineum* – F, WV; > *V. stamineum* var. *interius* (Ashe) Palmer & Steyermark – F, WV; > *V. stamineum* var. *neglectum* (Small) Deam – F, WV; > *Vaccinium neglectum* (Small) Fernald – G; > *Polycodium stamineum* (Linnaeus) Greene – S, V; >< *Polycodium candicans* Small – S; > *Polycodium neglectum* Small – S, V]



Vaccinium tenellum Aiton, Southern Blueberry, Small Cluster Blueberry. Sandhills, pine flatwoods, other xeric woodlands. Late March-early May; June-July. Though abundant in the Carolinas, *V. tenellum* is rather restricted, occurring as a common species from se. VA to c. GA, with a range extension (where it is scattered and rare) south and west to n. FL, s. AL, and se. MS. [= RAB, C, F, FNA, G, K, L, X, Y, Z; = *Cyanococcus tenellus* (Aiton) Small – S]

Vaccinium virgatum Aiton, Swamp Blueberry, Rabbiteye Blueberry. Pocosins and *Chamaecyparis* swamps, also in various drier habitats, including turkey oak sandhills. March-April; May-June. A Southeastern Coastal Plain species, *V. virgatum* occurs from se. NC south to FL and west to e. TX. [= GW, K; = *V. amoenum* Aiton – RAB; = *Cyanococcus amoenus* (Aiton) Small – S; < *V. corymbosum* – L, WH, Z; > *V. virgatum* – X; > *V. amoenum* – X; > *V. ashei* Reade – X]

29. Gaylussacia Kunth 1819 (Huckleberry)

A genus of ca. 50 species, shrubs, of North and South America (centered in South America). The sections and subsections follow Sleumer (1967a). A study of the phylogeny of the genus *Gaylussacia* provided some evidence for the treatment of *Gaylussacia brachycera* as a monotypic genus or within *Vaccinium*; additional study is needed. References: Sorrie, Weakley, & Tucker in FNA (2009); Sleumer (1967a)=Z; Camp (1935)=Y; Godfrey (1988)=X; Duncan & Brittain (1966)=V; Sorrie & Weakley (2007a)=U; Gajdeczka et al. (2010)= Q; Fernald (1911); Stevens et al. in Kubitzki (2004).

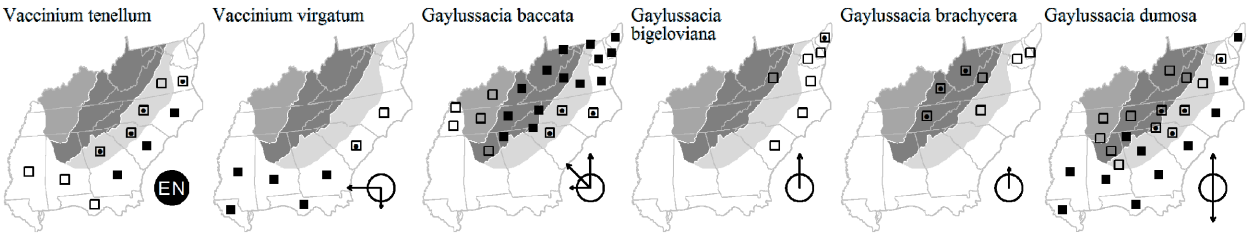
1 Leaves 0.7-2.2 cm long, serrulate, leathery, evergreen, lacking punctate glands; [section *Vitis-idaea*] ..... ***G. brachycera***
1 Leaves 1.5-10 cm long, entire (or minutely glandular-crenate), membranaceous to subcoriaceous, deciduous, with punctate glands.
2 Leaves subcoriaceous, upper surface shining, dark green, 1.5-4 cm long; bracts of the inflorescence equal to or longer than the pedicels (5-12 mm long), persistent; sepals, pedicels, bracts, and leaves stipitate-glandular and pubescent; [section *Gaylussacia*].
3 Plant < 3 dm high.
4 Corollas averaging 7.0 mm long; anthers averaging 3.7 mm long; glandular hairs on hypanthium dense, 0.3-0.5 mm long; plants usually 4-10 dm high, rarely less than 3 dm; plants of wet boggy habitats; [northeastern, south to DE, disjunct to NC and SC] ..... ***G. bigeloviana***
4 Corollas averaging 5.8 mm long; anthers averaging 3.0 mm long; glandular hairs on hypanthium moderately dense to relatively sparse, 0.2-0.3 mm long; plants occasionally up to 4 dm high; [plants of xeric to moist habitats; southeastern range, north to VA and scattered inland to n. AL, n. GA, c. TN, w. SC, w. NC, and s. WV]..... ***G. dumosa***
3 Plant 4-10 (-15 dm) tall.
5 Sessile glands on upper leaf surface absent; glandular hairs on hypanthium 1.0-1.5 mm long; [East Gulf Coastal Plain endemic, sw. GA, n. FL, s. AL, s. MS, and se. LA]..... ***G. mosieri***
5 Sessile glands on upper leaf surface numerous; glandular hairs on hypanthium 0.3-0.5 mm long; ranging from SC northward.
6 Corollas averaging 7.0 mm long; anthers averaging 3.7 mm long; plants of peat bogs, raised bogs, peat-based pocosins, and Atlantic white cedar-red maple swamps; [from NL (Newfoundland) to DE, and as a rare disjunct in the Coastal Plain of NC and SC] ..... ***G. bigeloviana***
6 Corollas averaging 6.0 mm long; anthers averaging 2.9 mm long; plants of montane bogs, seepage over rock, and possibly drier forests; [rare endemic of southern Appalachians of w. NC] ..... ***G. orocola***
2 Leaves membranaceous to subcoriaceous, upper surface dull, yellow-green to medium-green, 2-10 cm long; bracts of the inflorescence shorter than the pedicels, early deciduous; sepals, pedicels, bracts, and leaves with sessile glands, pubescent or not pubescent; [section *Decamerium*].
7 Leaves glandular on both surfaces; racemes 0.5-1.5 cm long; [section *Decamerium*, subsection *Baccatae*] ..... ***G. baccata***
7 Leaves glandular on the lower surface only; racemes 1-5 cm long.
8 Leaves membranaceous, medium-green, with acuminate apices; [section *Decamerium*, subsection *Ursinae*] ..... ***G. ursina***
8 Leaves subcoriaceous, yellow-green to glaucous, with obtuse to emarginate apices; [section *Decamerium*, subsection *Frondosae*].
9 Young twigs glabrous; leaves glabrous or pubescent beneath, often glaucous; shrub to 20 dm tall; [widespread in our area] ..... ***G. frondosa***
9 Young twigs densely pubescent with short, curled hairs; leaves sparsely to densely pubescent beneath, glaucous or not; shrub to 10 dm tall; [of se. NC and southward in the Coastal Plain].
10 Larger leaves mostly 2-4 cm long and 1-2 cm wide; lower leaf surface usually strongly glaucous, sparsely pubescent, with the longest nonglandular hairs < 0.27 mm long; floral tube and calyx glaucous; shrub 2-6 (-10) dm tall ..... ***G. nana***
10 Larger leaves mostly 3-6 cm long and 2-3.5 cm wide; lower leaf surface not glaucous, sparsely to densely pubescent, with the longest nonglandular hairs 0.46-0.64 mm long; floral tube and calyx not glaucous; shrub to 10 dm tall ..... ***G. tomentosa***

Gaylussacia baccata (Wangenheim) K. Koch, Black Huckleberry, Crackleberry. Xeric, acidic forests and woodlands, rock outcrops, to 1600m elevation. April-June; July-August. NL (Newfoundland) and QC west to ON and MB, south to ne. NC, nw. SC, n. GA, AL, and MO; in GA, NC, and SC it is primarily montane in distribution, but in VA it occurs throughout the state. [= C, F, FNA, G, K, L, Q, RAB, V, W, WV, Y, Z; = *Decachaena baccata* (Wangenheim) Small – S]

Gaylussacia bigeloviana (Fernald) Sorrie & Weakley, Northern Dwarf Huckleberry. Peat dome pocosins (in NC and VA), sandhill seepage bogs (SC), *Chamaecyparis* bogs (DE), generally growing in peat, forms transitional to var. *dumosa* in wet pinelands and disturbed pocosins. April-June; June-October. Var. *bigeloviana* ranges from NL (Newfoundland) south to NJ, with forms transitional to var. *dumosa* as far south as se. VA, and disjunct in Carteret, Dare, and Pender counties, NC (in low pocosins of large peat domes with *Chamaedaphne* and *Zenobia*), in a Sandhill seepage bog in Lexington County, SC. [= FNA, Q, U; = *G. dumosa* (Andrews) Torrey var. *bigeloviana* Fernald – C, F, G, Y; < *G. dumosa* – GW, K, L, RAB, W, X, Z]

Gaylussacia brachycera (Michaux) A. Gray, Box Huckleberry. Dry, acidic ridgetops and upper slopes, locally forming large clones. May-June. Sc. PA and DE south to e. KY and ec. TN, primarily on the Cumberland and Alleghany Plateaus; also disjunct on a steep, xeric, west-facing bluff in Durham Co. NC, where evidently native. Treatment of this species in a monotypic genus may be warranted, but the genus name *Buxella* (as used by Small) is unavailable, as it had already been used prior to Small in a different application (Wilbur & Bloodworth 2004). [= C, F, FNA, G, K, L, Q, W, WV, Y, Z; = *Buxella brachycera* (Michaux) Small – S (but *Buxella* is preoccupied); = *Vaccinium brachycerum* Michaux; note that the report in RAB is based on a misidentification]

Gaylussacia dumosa (Andrews) Torrey & A. Gray, Southern Dwarf Huckleberry. Xeric to mesic, acidic forests and woodlands. March-June; June-October. This variety is one of the most common shrubs of the Southeastern Coastal Plain, with an overall range from NJ south to FL and west to e. LA, primarily in the Coastal Plain, less commonly inland (as in sc. TN and se. WV). [= FNA, Q, U; = *G. dumosa* (Andrews) Torrey var. *dumosa* –C, F, G, Y; < *G. dumosa* – GW, K, L, RAB, V, W, WH, WV, X, Z; = *Lasiococcus dumosus* (Andrews) Small – S]



Gaylussacia frondosa (Linnaeus) Torrey & A. Gray ex Torrey, Dangleberry. Mesic, acidic woodlands, especially in sandhill-pocosin and savanna-pocosin ecotones, also in xeric chestnut oak forests in the lower Piedmont. Late March-May; June-August. Primarily a Southeastern Coastal Plain species: s. NH south to s. SC, less commonly inland to w. NY, c. and w. PA, w. VA, and w. SC. [= C, F, FNA, G, K, L, Q, W, V; = *G. frondosa* var. *frondosa* – GW, RAB, X, Y, Z; = *Decachaena frondosa* (Linnaeus) Torrey & Gray – S]

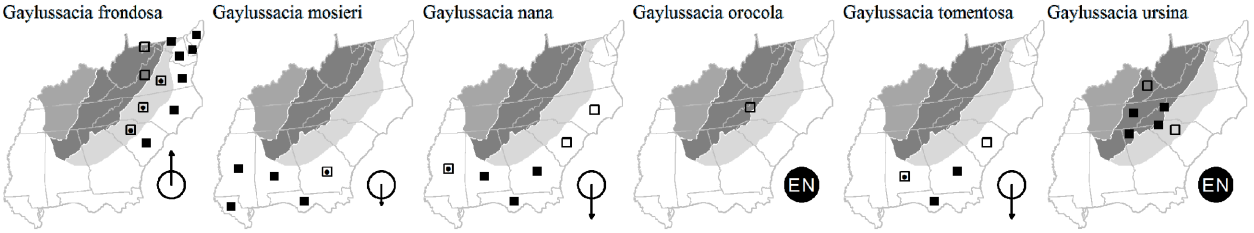
Gaylussacia mosieri Small, Mosier's Huckleberry, Hirsute Huckleberry. Savannas and seepages. S. GA and Panhandle FL and west to e. LA. Material from Lexington County, SC originally identified as this taxon has been reassigned to *G. bigeloviana*. [= FNA, GW, K, L, Q, U, V, X, Y, Z; = *Lasiococcus mosieri* (Small) Small – S]

Gaylussacia nana (A. Gray) Small, Dwarf Dangleberry. Xeric sandhills. Se. SC (Beaufort County) south to n. and c. FL peninsula, FL Panhandle, and west to e. LA (Florida prishes); disjunct in se. NC (New Hanover County) (Sorrie & LeBlond 2008). This species is disjunct at several sites in xeric sandhills of se. NC (on the Carolina Beach peninsula and the 421 Sandhills nw. of Wilmington). *G. nana* has a diploid chromosome complement (n=12), compared to tetraploid for *G. tomentosa* (n=12) (Luteyn et al. 1996). [= FNA, K, L, Q, V, Y; = *G. frondosa* (Linnaeus) Torrey & A. Gray ex Torrey var. *nana* A. Gray – GW, X, Y; = *Decachaena nana* (A. Gray) Small – S; < *G. frondosa* (Linnaeus) Torrey & A. Gray ex Torrey var. *tomentosa* A. Gray – WH]

Gaylussacia orocola (Small) Camp, Blue Ridge Bog Huckleberry. Bogs, seepages over granite. Endemic to the sw. NC mountains. The montane plants named *Lasiococcus orocola* by Small are probably most closely allied to northern *G. bigeloviana*, and occur with other notable northern disjuncts, such as *Myrica gale* and *Chamaedaphne calyculata* (often associated with var. *G. bigeloviana* in northern peat bogs); they differ in several respects, however, and are here given taxonomic standing (Sorrie & Weakley 2007a). [= FNA, Q, U, Y, Z; < *G. dumosa* – RAB, GW, K, L, W, X; = *Lasiococcus orocola* (Small) Small – S]

Gaylussacia tomentosa (A. Gray) Pursh ex Small, Hairy Dangleberry. Pine flatwoods, sandhills, xeric coastal fringe sandhills. March-May; June-August. Se. SC (spodosolic flatwoods in Beaufort County) south to c. peninsular FL, west to s. GA and sw. AL. As discussed by Godfrey (1988) and Duncan & Brittain (1966), probably better treated as a species than as a variety of *G. frondosa*. *G. tomentosa* has a tetraploid chromosome complement (n=24), compared to diploid for *G. nana* and *G. frondosa* (n=12) (Luteyn et al. 1996). [= FNA, K, L, Q, V, Y; = *G. frondosa* (Linnaeus) Torrey & A. Gray ex Torrey var. *tomentosa* A. Gray – GW, RAB, X, Z; = *Decachaena tomentosa* (Pursh ex Small) Small – S; < *G. frondosa* (Linnaeus) Torrey & A. Gray ex Torrey var. *tomentosa* A. Gray – WH]

Gaylussacia ursina (M.A. Curtis) Torrey & A. Gray ex A. Gray, Bear Huckleberry, Mountain Huckleberry. Mesic to xeric forests, frequently dominant, but limited to areas southwest of the Asheville Basin; common. May-June; July-September. A narrow Southern Appalachian endemic: sw. NC, nw. SC, ne. GA, and se. TN; disjunct at Cumberland Gap National Historic Park, Bell County, KY. On mountain slopes and summits in that area it is often the dominant shrub, forming large clonal patches. [= FNA, K, L, Q, RAB, V, W, Y, Z; = *Decachaena ursina* (M.A. Curtis) Small – S]



349. GARRYACEAE Lindley 1834 (Garrya Family) [in GARRYALES]

Garryaceae is here circumscribed to include *Aucuba* (Bremer et al. 2002). References: Bremer et al. (2002)

Aucuba Thunberg (Aucuba, Japanese-laurel)

* ***Aucuba japonica*** Thunberg, Aucuba, Japanese-laurel, Spotted-laurel. Pd (NC): commonly planted throughout our area, rarely escaping and naturalizing in suburban woodlands; rare, native of Japan and se. Asia. The most frequently planted cultivars have the dark green leaves prominently speckled with yellow. [= K]

350. RUBIACEAE A.L. de Jussieu 1789 (Madder Family) [in GENTIANALES]

A family of about 630-650 genera and 10,200-13,000 species, trees, shrubs, vines, and rarely herbs, cosmopolitan, but especially diverse in tropical and subtropical areas. References: Rogers (1987, 2005).

1 Trees, shrubs, or woody vines.
2 Woody vine; corolla lilac; [alien]; [subfamily *Rubioideae*; tribe *Paederieae*] ... ***Paederia***
2 Shrub or tree; corolla white, green, or maroon; [native].
3 Inflorescence spherical; [widespread in our area]; [subfamily *Cinchonoideae*; tribe *Naucleeae*] ... ***Cephalanthus***
3 Inflorescence cymose or thyrsoid; [in the Coastal Plain, from s. SC southward].
4 Inflorescence cymose; some calyx lobes expanded into pink or reddish "flags"; leaves deciduous; domatia not present; [of s. SC southward] ... ***Pinckneya***
4 Inflorescences thyrsoid; calyx lobes inconspicuous; leaves evergreen; domatia present in secondary vein axils; [of ne. FL southward]
5 Lateral veins 3-6 on either side of the midvein; fruit white; flowers yellowish, > 6 mm long; [subfamily *Cinchonoideae*; tribe *Chiococceae*] ... ***Chiococca***
5 Lateral veins 8-14 on either side of the midvein; fruit red; flowers white, <5 mm long; [subfamily *Rubioideae*; tribe Psychotrieae]. ... ***Psychotria***
1 Herbs (or creeping subshrubs in *Mitchella*).
6 Leaves whorled; [subfamily *Rubioideae*; tribe *Rubieae*] ... ***Galium***
6 Leaves opposite
10 Flowers paired, the ovaries connate and developing into a single fleshy red fruit; leaves roundish; [subfamily *Rubioideae*; tribe *Mitchelleae*] ... ***Mitchella***
10 Flowers single or in inflorescences with multiple flowers, the fruits **either** dry **or** fleshy and yellowish or black; leaves various; [subfamily *Rubioideae*; tribe *Spermacoceae*].
11 Carpels with few to many seeds.
12 Corolla 5-lobed ... ***Pentodon***
12 Corolla 4-lobed.
13 Capsule longer than the calyx tube flowers blue, pink, or white ... ***Houstonia***
13 Capsule not longer than the calyx tube; flowers white ... ***Oldenlandia***
11 Carpels 1-seeded.
14 Flowers in dense, terminal, involucrate heads; flowers 4- or-6-lobed; styles 3 ... ***Richardia***
14 Flowers in axillary or terminal clusters, or single in axils, not involucrate; flowers 4-lobed; styles 2.
15 Flowers usually solitary in leaf axils; fruit separating into 2 parts ... ***Diodia***
15 Flowers in terminal and axillary clusters; fruits not separating into 2 parts.
16 Carpels opening transversely ... ***Mitracarpus***
16 Carpels opening longitudinally ... ***Spermacoce***

Cephalanthus Linnaeus (Buttonbush)

A genus of about 6 species, of tropical and temperate America. References: Rogers (1987)=Z; Ridsdale (1976)=Y.

Cephalanthus occidentalis Linnaeus, Buttonbush. Cp (DE, GA, NC, SC, VA), Pd (DE, GA, NC, SC, VA), Mt (GA, NC, SC, VA, WV): streambanks, riverbanks, depressional wetlands, lakes, often in standing water; common. June-July. Widespread

in North America, and south into Mexico, Guatemala, and Honduras. [= RAB, K, W, S, Y, Z; > *C. occidentalis* var. *occidentalis* – C, F, G; > *C. occidentalis* var. *pubescens* – C, F, G; = *C. occidentalis* var. *occidentalis* – GW (including var. *pubescens*)]

Chiococca P. Browne 1759

A genus of about 30 species, of FL and the West Indies south to s. South America. References: Rogers (2005).

Chiococca alba (Linnaeus) A.S. Hitchcock, Snowberry, Milkberry. Cp (FL): coastal hammocks, shell middens; rare. N. FL (St. Johns and Dixie counties) south to s. FL. [= K, S, WH]

Diodia Linnaeus

A genus of about 30 species, of tropical and warm temperate America and Africa. Bacigalupo & Cabral (1999) suggest that *Diodella* Small should be recognized as distinct from *Diodia*. References: Bacigalupo & Cabral (1999)=Z; Rogers (2005).

1 Sepals 4 and similar in size; style entire; [of dry habitats] ..... ***D. teres***
1 Sepals 2 (or 4, and then markedly dimorphic); style cleft; [of moist to wet habitats] ..... ***D. virginiana***

Diodia teres Walter, Poorjoe. Cp (DE, GA, NC, SC, VA), Pd (DE, GA, NC, SC, VA), Mt (GA, NC, SC, VA, WV): dunes, sandy roadsides, glades, other dry habitats; common. June-December. MA, NY and WI, south to FL, TX, and CA, south through Mexico and Central America. [= RAB, C, GW, W, WV; > *Diodia teres* var. *hirsutior* Fernald & Griscom – F, K; > *Diodia teres* var. *hystricina* Fernald & Griscom – F, G, K; > *Diodia teres* var. *oblongifolia* Fernald – F, K; > *Diodia teres* var. *teres* – F, G, K; = ***Diodella teres*** (Walter) Small – Z]

Diodia virginiana Linnaeus. Cp (DE, GA, NC, SC, VA), Pd (DE, GA, NC, SC, VA), Mt (GA, NC, SC, VA, WV): pondshores, ditches, other moist to wet habitats; common. June-December. CT, PA, IL, and KS south to FL and TX. [= RAB, C, G, GW, W, WV; > *D. virginiana* var. *attenuata* Fernald – F, K; > *D. virginiana* var. *latifolia* Torrey & A. Gray – K; > *D. virginiana* var. *virginiana* – F, K; > *D. virginiana* – S; > *D. tetragona* Walter – S; > *D. hirsuta* Pursh – S; > *D. harperi* Small – S]

Galium Linnaeus 1753 (Bedstraw, Cleavers, Woodruff)

A genus of ca. 500 species, herbs, cosmopolitan. Here circumscribed to include *Asperula*, *Cruciata*, and *Sherardia*, following an analysis by Soza & Olmstead (2010) that shows the genera *Galium*, *Cruciata*, and *Sherardia* each to be paraphyletic relative to one another, if circumscribed as traditionally. Other solutions are possible, including the dispersal of *Galium* into two or more genera. Interestingly, the number of leaves per whorl appears to be a more fundamental character than those (such as tubular corollas) used to separate genera in the past. References: Soza & Olmstead (2010); Puff (1976, 1977)=Z; Lipscomb & Nesom (2007)=Y; Rogers (2005); Dempster (1978, 1981).

1 Leaves mostly in whorls of 4 (rarely a few in whorls of 5-6) at the primary nodes ..... **Key A**
1 Leaves mostly in whorls of 5-8 or more at the primary nodes.
  2 Leaves mostly 6 per node (ranging from 5-8) at the primary nodes ..... **Key B**
  2 Leaves mostly 8 or more per node at the primary nodes ..... **Key C**

Key A – Bedstraws with leaves mostly in whorls of 4 (rarely a few in whorls of 5-6)

1 Flowers yellow; plant an annual, 0.5-3 dm tall ..... ***G. pedemontanum***
1 Flowers white, creamy, greenish-purple, maroon, or purple; plant a perennial, 1-8 dm tall.
  2 Flowers solitary, sessile or subsessile in the leaf axils; leaves 4-10 mm long ..... ***G. virgatum***
  2 Flowers on pedicels, usually in complex inflorescences; leaves >10 mm long.
    3 Larger leaves 6-25 mm wide, mostly 1.5-4× as long as wide; fruits uncinate-hispid (except smooth in *G. latifolium*); flowers greenish or purplish.
      4 Larger leaves 4-8 cm long, 1-2 cm wide, widest below the middle, tapering to a long-acuminate apex, averaging about 3-4× as long as wide.
        5 Fruits uncinate-hispid; flowers yellowish, turning maroon ..... ***G. lanceolatum***
        5 Fruits smooth; flowers purple ..... ***G. latifolium***
      4 Larger leaves 1-5 cm long, 0.6-2.5 cm wide, widest at about the middle, tapering to an obtuse (or broadly acute) apex, averaging about 2× as long as wide.
        6 Flowers (some of them) sessile or subsessile along the inflorescence branches; leaves 1.5-5 cm long, the larger usually > 2.5 cm long, not punctate.
          7 Lower leaf surface glabrous or sparsely short-hispid on the veins; larger leaves 1.5-2.5 (-4.0) cm long and 0.7-1.4 (-1.8) cm wide; [more southern] ..... ***G. circaezans* *var. circaezans***
          7 Lower leaf surface appressed-pilose, long-hirsute on the veins; larger leaves 2-5 cm long, 1-2.5 cm wide; [more northern] ..... ***G. circaezans* *var. hypomalacum***

6 Flowers all distinctly pedicelled; leaves 1-2.5 cm long, glandular-punctate beneath.
8 Stem glabrous ..... ***G. orizabense*** *ssp.* ***laevicaule***
8 Stem pubescent.
9 Stem and leaves pubescent with spreading, straight hairs; [more northern] ..... ***G. pilosum*** *var.* ***pilosum***
9 Stem and leaves pubescent with short, upwardly incurved hairs; [more southern] ..... ***G. pilosum*** *var.* ***puncticulosum***
3 Larger leaves 1-6 mm wide, mostly 4-20× as long as wide; fruits smooth or pubescent (if pubescent, the hairs not hooked at the end, though they may curve through their length), either fleshy or dry; flowers white or creamy.
10 Fruits fleshy, blue-black; leaves firm, more-or-less evergreen, glandular-punctate beneath.
11 Leaves elliptic, 7-18 mm long, 3-6 mm wide, 2-3.5× as long as wide ..... ***G. hispidulum***
11 Leaves linear, 15-25 mm long, 2-4 mm wide, 5-10× as long as wide ..... ***G. uniflorum***
10 Fruits dry, black; leaves herbaceous, deciduous, not glandular-punctate beneath.
12 Stems erect or nearly so; leaves 15-45 mm long, 2-6 mm wide..... ***G. boreale***
12 Stems sprawling, matted; leaves 6-30 mm long, 0.5-5 (-6) mm wide.
13 Corollas 4-lobed, the lobes longer than wide.
14 Leaves (8-) 10-20 (-25) mm long, (0.5-) 0.8-2 mm wide, margin usually smooth, with strongly down-rolled margins; corolla (1.8-) 2-2.5 (-3) mm across; pedicels filiform; stems 15-50 (-60) cm long, delicate..... ***G. obtusum*** *var.* ***filifolium***
14 Leaves (10-) 15-25 (-30) mm long, (2-) 3-5 (-6) mm wide, margin scabrous, not down-rolled; corolla (2-) 2.5-3.5 (-4) mm across; pedicels thicker; stems (15-) 25-60 (-80) cm long, firm ..... ***G. obtusum*** *var.* ***obtusum***
13 Corollas 3-(4)-lobed, the lobes about as wide as long, or wider than long.
15 Flowers and fruits borne on arcuate pedicels, (5-) 7-15 (-20) mm long and densely retrorsely scabrous..... ***[G. trifidum*** *var.* ***trifidum]***
15 Flowers and fruits borne on straight pedicels, these (2-) 2.5-8 (-12) mm long and smooth.
16 Fruiting pedicels (4-) 5-8 (-12) mm long; pairs of fruits (3-) 3.5-5 mm across at maturity; leaves 2-3 (-4) mm wide..... ***G. tinctorium*** *var.* ***floridanum***
16 Fruiting pedicels (2-) 2.5-5 (-6) mm long; pairs of fruits 2-3 mm across at maturity; leaves (1.5-) 2-2.5 (-2.8) mm wide..... ***G. tinctorium*** *var.* ***tinctorium***

Key B – Bedstraws with leaves mostly 6 per node (ranging from 4-8)

1 Flowers in terminal heads, subtended by an involucre of leaves fused at the base; stem rough-hairy, but not retrorse-scabrid; [clade IV] ..... ***G. sherardia***
1 Flowers in axillary or terminal diffuse inflorescences, not subtended by an involucre; stems either smooth, retrorse-scabrid, or pubescent.
2 Largest leaves < 10 mm long; fruits 0.7-1 mm across; annual; [alien]; [clade III].
3 Inflorescence relatively diffuse, branches divaricate; ultimate fruits (2-) 3–6 (-7) nodes beyond primary stem axis (with largest leaves); first inflorescence internode (beyond primary stem axis) 15-50 mm long; fruit surface glabrous (without hairs)..... ***G. divaricatum***
3 Inflorescence relatively strict, branches ascending; ultimate fruits 2-3 (-4) nodes beyond primary stem axis (with largest leaves); first inflorescence internode (beyond primary stem axis) 3-12 (-20) mm long; fruit surface glabrous or bristly-hispid.
4 Fruit surface without hairs, smooth to shallowly papillate ..... ***G. anglicum***
4 Fruit surface bristly-hispid with uncinate-tipped hairs, distinctly papillate ..... ***G. parisiense***
2 Largest leaves > 10 mm long; fruits 1-2.5 mm across; perennial; [native].
5 Fruits and ovaries uncinate-hispid; leaves 15-50 mm long, 7-10 mm wide; [clade III] ..... ***G. triflorum***
5 Fruits and ovaries glabrous or papillose; leaves 5-25 mm long, 1-6 mm wide.
6 Corolla 1.5-2.5 mm across, 3-lobed; [collectively widespread in our area]; [clade V].
7 Fruiting pedicels (4-) 5-8 (-12) mm long; pairs of fruits (3-) 3.5-5 mm across at maturity; leaves 2-3 (-4) mm wide..... ***G. tinctorium*** *var.* ***floridanum***
7 Fruiting pedicels (2-) 2.5-5 (-6) mm long; pairs of fruits (2-) 2.5-3 mm across at maturity; leaves (1.5-) 2-2.5 (-2.8) mm wide ..... ***G. tinctorium*** *var.* ***tinctorium***
6 Corolla 2.5-4.5 mm across, 4-lobed; [mostly of the Mountains in our area, extending into the Piedmont or even Coastal Plain in n. VA and northward].
8 Leaf margins retrorsely ciliate-scabrid; leaves 3-5× as long as wide; [plants of bogs and moist thickets]..... ***G. asprellum***
8 Leaf margins antrorsely ciliate-scabrid; leaves 4-8× as long as wide; [plants of dry forests and woodlands].
9 Leaves sharply acute or cuspidate; corolla 2.5-3 mm across..... ***G. concinnum***
9 Leaves rounded, obtuse, or barely acute; corolla ca. 4 mm across..... ***G. palustre***

Key C – Bedstraws with leaves mostly 8 or more per node (ranging from 5-12)

1 Leaves 8-12 per whorl (many whorls with > 8 leaves); flowers bright yellow, in a large showy terminal compound inflorescence; fruits glabrous; perennial.
2 Flowers golden-yellow, fragrant; inflorescence dense, usually not interrupted..... ***G. verum***
2 Flowers lemon-yellow, odorless; inflorescence interrupted ..... ***[G. wirtgenii]***
1 Leaves (5-) 8 (-10) per whorl (few if any whorls with > 8 leaves); flowers white or greenish, in a terminal compound inflorescence or in small axillary inflorescences; fruits glabrous, papillose, or uncinate-hispid; annual or perennial.
3 Stems retrorsely scabrous; annual.
4 Fruits and ovaries uncinate-hispid; flowers and fruits mainly in clusters of 2-5 ..... ***G. aparine***
4 Fruits and ovaries sharply papillose; flowers and fruits mainly in clusters of 3 ..... ***G. tricornutum***
3 Stems glabrous or pubescent, but not scabrous; perennial.
5 Fruits and ovaries uncinate-hispid; nodes bearded, the stem otherwise glabrous..... ***G. odoratum***
5 Fruits and ovaries glabrous; nodes not bearded, the stem either glabrous or pubescent toward the base of the plant.

6 Corolla 3-5 mm across, the pedicels usually shorter than the width of the corolla; inflorescence branches ascending, mostly at < 45 degrees ..... ***G. mollugo*** *var.* ***erectum***

6 Corolla 2-3 mm across, the pedicels usually longer than the width of the corolla; inflorescence branches spreading, mostly at > 45 degrees ..... ***G. mollugo*** *var.* ***mollugo***

* ***Galium anglicum*** Hudson. Pastures, disturbed areas; native of w. Europe. June-July. [= Y; < *G. parisiense* Linnaeus – RAB, F, G, S, W, WV; < *G. parisiense* var. *leiocarpum* Tausch – C; < *G. divaricatum* – K; = *G. parisiense* ssp. *anglicum* (Hudson) Arcangeli]

Galium aparine Linnaeus, Cleavers. Mt (GA, NC, SC, VA, WV), Pd (DE, GA, NC, SC, VA), Cp (DE, GA, NC, SC, VA): meadows, thickets, disturbed areas, forests; common. April-June. Nearly cosmopolitan, from n. North America south through Central and South America. Apparently represented in North America (including our area) by both native and introduced genotypes. [= RAB, F, G, GW, K, S, W, WV; > *G. aparine* var. *aparine* – C; > *G. aparine* var. *echinospermum* (Wallroth) Farwell – C]

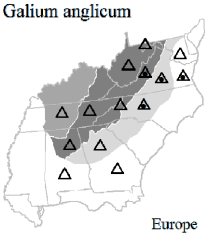
Galium asprellum Michaux, Rough Bedstraw. Mt (NC, VA, WV), Pd (DE, VA), Cp (VA): bogs, streambanks, wet meadows; uncommon (rare in DE). June-September. NL (Newfoundland) west to MN, south to n. VA, w. NC, ne. TN (Chester, Wofford, & Kral 1997), and MO. The report for sc. TN is an error (D. Estes, pers. comm. 2005). [= RAB, C, F, G, GW, K, S, W, WV]

Galium boreale Linnaeus, Northern Bedstraw. Mt (VA, WV), Pd (DE): rocky areas, woodlands, and fields; uncommon (rare in DE and WV). May-August. Circumboreal, south in North America to DE, sw. VA, KY, MO, and CA. [= C, K, W; > *G. boreale* var. *intermedium* A.P. de Candolle – F, G]

Galium circaezans Michaux *var.* ***circaezans***, Southern Forest Bedstraw. Mt (GA, NC, SC, VA, WV), Pd (DE, GA, NC, SC, VA), Cp (DE, GA, NC, SC, VA): moist forests; common. April-July. NY, KY, and MI, south to FL and TX. The varieties need additional study. [= C, F, G, K, WV; < *G. circaezans* – RAB, S, W]

Galium circaezans Michaux *var.* ***hypomalacum*** Fernald, Northern Forest Bedstraw. Mt (NC, VA, WV), Pd (DE, VA), Cp (DE), {GA?, SC?}: moist forests; common. April-July. QC west to MN and NE, south to VA, w. NC, KY, MO, and TX (?). The varieties need additional study. [= C, F, G, K, WV; < *G. circaezans* – RAB, S, W]

Galium anglicum



Europe

Galium concinnum Torrey & A. Gray, Shining Bedstraw. Mt (VA, WV), Pd (VA): dry woodlands; uncommon. June-August. NJ west to MN and NE, south to sw. VA, e. TN, nc. TN, and AR. [= C, F, G, K, W, WV]

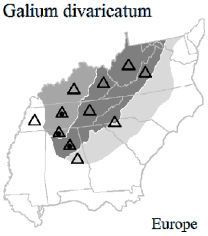
* ***Galium divaricatum*** Pourret ex Lamarck. Disturbed areas; native of s. Europe. June-July. [= Y; < *G. parisiense* var. *leiocarpum* Tausch – C; < *G. parisiense* Linnaeus – F, G, S; < *G. divaricatum* – K; = *G. parisiense* var. *divaricatum* (Pourret ex Lamarck) Koch; = *G. anglicum* var. *divaricatum* (Pourret ex Lamarck) Reichenbach; = *G. parisiense* ssp. *divaricatum* (Pourret ex Lamarck) Rouy] {add to synonymy}

Galium hispidulum Michaux. Cp (DE, GA, NC, SC, VA), Mt (NC): maritime forests, sandhills, dry sandy forests; common (rare in Mountains, rare in DE and VA). June-August; August-September. S. NJ south to FL, west to LA, primarily on the Coastal Plain. [= RAB, C, F, G, K, W; = *G. bermudense* Linnaeus – S, misapplied]

Galium lanceolatum Torrey, Wild-licorice. Mt (NC, SC, VA, WV), Pd (DE, VA), Cp (VA): moist hardwood forests; uncommon (rare in VA Coastal Plain, rare in Piedmont). June-July. QC west to MN, south to w. NC and e. TN. [= RAB, C, F, G, K, S, W, WV]

Galium latifolium Michaux, Wideleaf Bedstraw. Mt (GA, NC, SC, VA, WV), Pd (NC, VA): moist hardwood forests; common (uncommon in Piedmont). May-August. C. PA and KY south to n. GA and n. AL, a Southern and Central Appalachian endemic. The closely related *G. arkansanum* A. Gray is the Ozarkian sibling of the Appalachian *G. latifolium*. Var. *hispidum*, named from VA, needs additional study. [= RAB, C, K, S, W; > *G. latifolium* var. *latifolium* – F, G; > *G. latifolium* var. *hispidum* Small – F, G]

Galium divaricatum



Europe

* ***Galium mollugo*** Linnaeus *var.* ***erectum*** (Hudson) Domin. Mt?, Pd?, Cp? (DE?, NC?, VA?) {WV?}: moist roadsides, disturbed areas; {abundance}, native of Europe. May-June. The varieties need additional study. [= C, G; < *G. mollugo* – RAB, K, W, WV; = *G. erectum* Hudson – F; *? G. album* P. Miller]

* ***Galium mollugo*** Linnaeus *var.* ***mollugo***. Mt (NC, VA), Pd?, Cp? (VA?), {DE, GA, WV}: moist roadsides, disturbed areas; uncommon, native of Europe. May-June. The varieties need additional study. [= C, G; < *G. mollugo* – RAB, K, W, WV; = *G. mollugo* – F]

Galium obtusum Bigelow *var.* ***filifolium*** (Wiegand) Fernald, Carolina Bedstraw. Cp (DE, GA, NC, SC, VA), Pd (GA?, NC, SC, VA), Mt (VA): marshes, swamps, creekbanks, alluvial forests; common (uncommon in DE). April-May. S. NJ south to c. GA, primarily on the Coastal Plain. [= RAB, C, F, W; < *G. obtusum* – GW; = *G. obtusum* ssp. *filifolium* (Wiegand) Puff – K, Z; = *G. filifolium* (Wiegand) Small – S]

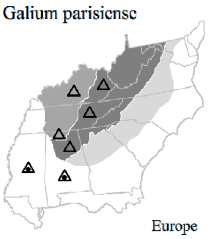
Galium obtusum Bigelow *var.* ***obtusum***, Bluntleaf Bedstraw. Cp (DE, GA, NC, SC, VA), Pd (DE, GA, NC, SC, VA), Mt (GA, NC, SC, VA, WV): marshes, swamps; common. April-May. NS west to SD, south to FL and TX. "Ssp. *australe* Puff", cited in Kartesz (1999) and allegedly endemic to GA, was never published and is not now considered a useful entity by its putative author (Puff, pers. comm. 2004). [= RAB, C, F, W; < *G. obtusum* – GW, WV; > *G. obtusum* var. *obtusum* – G; > *G. obtusum* var. *ramosum* Gleason – G; > *G. obtusum* ssp. *obtusum* – K, Z; > *G. obtusum* "ssp. *australe*" – K, Z, not validly published; = *G. tinctorium* – S, misapplied]

* ***Galium odoratum*** (Linnaeus) Scopoli, Sweet Woodruff, Waldmeister. Mt (NC, VA), Pd (DE, NC, VA): commonly cultivated, rarely escaped or persistent, native of Europe. May. Used fresh as a flavoring for May-wine. [= C, K; = *Asperula odorata* Linnaeus – F, G]

Galium orizabense Hemsley *ssp.* ***laevicaule*** (Weatherby & Blake) Dempster, Smoothstem Bedstraw. Cp (GA, NC, SC, VA): forests; uncommon? (VA Watch List) May-August. Se. VA south to FL, west to se. TX; West Indies. The typic subspecies, ssp. *orizabense*, is distributed from Tamaulipas south through Mexico, Central America, to northern South America (Dempster 1981). [= K; < *G. pilosum* – RAB, S; = *G. pilosum* Aiton var. *laevicaule* Weatherby & Blake – F]

Galium palustre Linnaeus, Marsh Bedstraw, Ditch Bedstraw. Mt (WV): marshes, wet soil; rare. June-August. NL (Labrador) and ON south to MD, s. PA (Rhoads & Klein 1993), MD, WV, OH, IN, and IL; also in Europe and nw. North America. [= C, F, G, K]

* ***Galium parisiense*** Linnaeus. Disturbed areas; native of s., w., and c. Europe. June-July. [= K, Y; = *G. parisiense* ssp. *parisiense*] {add to synonymy}



* ***Galium pedemontanum*** (Bellardi) Allioni, Piedmont Crosswort. Mt (GA, NC, VA, WV), Pd (GA, VA), Cp (VA), {SC}: lawns, grassy roadsides, pastures; uncommon, native of s. Europe. April-June. The Piedmont referred to in the name is the "original" Piedmont of southern Europe. In GA Mountains and Piedmont (T. Govus, pers. comm. 2005). [= RAB, C, F, W, WV= ***Cruciata pedemontana*** (Bellardi) Ehrend – K, Z]

Galium pilosum Aiton *var.* ***pilosum***. Mt (NC, SC?, VA, WV), Pd (DE, NC, SC?, VA), Cp (DE, NC, SC?, VA), {GA}: forests, woodland borders, clearings; common. May-August. S. NH west to MI, south to NC, TN, MO, and TX. The varieties need additional study. [= C, F, G, K; < *G. pilosum* – RAB, S, W, WV]

Galium pilosum Aiton *var.* ***puncticulosum*** (Michaux) Torrey & A. Gray. Cp (DE, GA, NC, SC, VA), Pd (DE), Mt (WV): forests, woodland borders, clearings; common (rare in WV). May-August. S. NJ south to FL, west to MS. The varieties need additional study. [= C, F, G, K; < *G. pilosum* – RAB, S, W, WV]

* ***Galium sherardia*** E.H.L. Krause, Field-madder. Pd (DE, GA, NC, SC, VA), Cp (DE, FL, GA, NC, SC, VA), Mt (NC, SC, VA, WV): lawns, disturbed areas; uncommon (rare in FL), native of Europe. February-August. Differing in its involucrate inflorescence and the more tubular, pink to purple flowers, and usually treated as a monotypic genus, *Sherardia*. Soza & Olmstead (2010) show *Sherardia* to be deeply embedded within a paraphyletic *Galium*. [= ***Sherardia arvensis*** Linnaeus – RAB, C, F, G, K, S, W, WH, WV]

Galium tinctorium (Linnaeus) Scopoli *var.* ***floridanum*** Wiegand, Florida Three-lobed Bedstraw. Cp (GA, NC, SC, VA), Mt (NC, SC, VA), Pd (NC, SC): swamps, marshes, and ditches; common (VA Watch List). April-June. MA south to FL, west to e. TX, mostly on the Coastal Plain, but extending inland to w. VA, w. NC, se. KY, s. IL, and se. MO. See Puff (1976) for additional information. [= F; < *G. tinctorium* – RAB, C, K, W; = *G. obtusum* var. *floridanum* (Wiegand) Fernald – G; < *G. claytonii* Michaux – S; = *G. tinctorium* ssp. *floridanum* (Wiegand) Puff – Z]

Galium tinctorium (Linnaeus) Scopoli *var.* ***tinctorium***, Southern Three-lobed Bedstraw. Mt (GA, NC, SC, VA), , WVPd (DE, NC, SC, VA), Cp (DE, NC?, SC?, VA?): swamps, marshes, and ditches; common. April-June. NL (Newfoundland) west to MN and NE, south to SC, n. GA, KY, and ne. MO. See Puff (1976) for additional information. [= F, G, GW; < *G. tinctorium* – RAB, C, K, W, WV; < *G. claytonii* Michaux – S; = *G. tinctorium* ssp. *tinctorium* – Z]

* ***Galium tricornutum*** Dandy, Small Bedstraw. Pd (GA, SC): disturbed areas; rare, introduced. This species has been reported from Cherokee and Greenwood counties, SC, nearby GA, and se. PA (Rhoads & Klein 1993). [= K; < *G. tricorne* Stokes – F]

Galium triflorum Michaux, Sweet-scented Bedstraw. Mt (GA, NC, SC, VA, WV), Pd (DE, GA, NC, SC, VA), Cp (DE, GA, NC, SC, VA): woodlands, roadsides, disturbed areas; common (rare in DE Coastal Plain). July-August. Circumboreal,

south in North America to FL and Mexico (Veracruz). [= RAB, K, S, W; > *G. triflorum* var. *triflorum* – C, F, G, WV; > *G. triflorum* var. *asprelliforme* Fernald – C, F, G, WV]

Galium uniflorum Michaux. Cp, Pd (GA, NC, SC, VA): moist slope forests and alluvial forests; uncommon. April-September. Se. VA south to FL, west to TX. [= RAB, C, F, G, K, S]

* ***Galium verum*** Linnaeus, Yellow Bedstraw, Our Lady's Bedstraw. Mt (NC, VA, WV), Pd (DE, VA): meadows, pastures, roadsides; uncommon (rare in DE and NC), native of Europe. May-September. [= C, F, G, K1; = *G. verum* var. *verum* – K2; < *G. verum* – RAB, W, WH (also see *G. wirtgenii*)]

Galium virgatum Nuttall, Ozark Bedstraw. Cp (GA, SC*): (in GA) open blackland prairies, (in SC) waif around wool-combing mill; rare. Native from TN, c. GA (Houston County), and AL west to KS, OK, and TX. [= C, F, G, K; > *G. virgatum* var. *leiocarpum* Torrey & A. Gray – S; > *G. virgatum* var. *virgatum* – S]

* ***Galium arvense*** (Linnaeus) F. Hermann, Blue Woodruff. Pd (DE), Mt (WV): disturbed areas, rare, native of Europe. Naturalized south to WV, MD, DE (USDA NRCS 2007), and se. PA (Rhoads & Klein 1993). [= ***Asperula arvensis*** Linnaeus C, G, K, WV] {not yet keyed}

Galium trifidum Linnaeus var. *trifidum*, Northern Three-lobed Bedstraw. Moist places, bogs, and swamps. Circumboreal, south in North America to MD, DE, PA, and NJ. [= C, F, G; = *G. trifidum* ssp. *trifidum* – K, Z]

* *Galium wirtgenii* F.W. Schultz, Yellow Bedstraw. Not definitely known from our area, but likely to be present. [= C, F, G, K1; = G. verum var. wirtgenii (F.W. Schultz) Oborny – K2; < *G. verum* – W]

Houstonia Linnaeus 1753 (Bluet)

The generic limits of *Houstonia, Hedyotis, Oldenlandia*, and *Stenaria* remain unclear. References: Terrell (1959)=Z; Terrell (1991)=Y; Terrell (1996)=X; Rogers (1987)=Q; Ward (2004c)=V; Church & Taylor (2005); Church (2003); Turner (1995b)=U; Terrell (2001)=M; Rogers (2005); Terrell (2007). Key adapted in part from the references.

Identification notes: In the key below, all leaf measurements and length/width ratios are based on median cauline leaves.

1 Flowers solitary on terminal (rarely axillary) pedicels (2-) 6-50 (-70) mm long; corolla salverform; leaves 2-15 mm long; [subgenus *Houstonia*].
  2 Stems prostrate and creeping.
    3 Corolla white (rarely pale lavender); capsule (2.3-) 3.0-6.3 mm across; leaves 2-13 mm wise; pedicels usually single, 2-25 mm long; flowers chasmogamous and cleistogamous (the cleistogamous borne underground); [of the outer Coastal Plain]; [section *Mullera*] ..... ***H. procumbens***
    3 Corolla blue (rarely white); capsule 2.5-5.0 mm across; leaves 0.5-7 mm wide; pedicels single or paired, to 60 mm long; flowers all chasmogamous and aerial; [of the Mountains]; [section *Houstonia*] ..... ***H. serpyllifolia***
  2 Stems erect or spreading.
    4 Stems 1-4 (-7) cm tall; leaves mostly oblanceolate, 0.3-3.0 mm wide; corolla 5-12 mm long, white to pale pink; seeds with a hilar ridge in an elliptical depression; [section *Mullera*]..... ***H. rosea***
    4 Stems 1-26 cm tall; leaves elliptic, ovate or spatulate, 0.3-9.0 mm wide (at least some on a plant generally > 3 mm wide); corolla 2-21 mm long, purple, pale blue, pink, or white; seeds subglobose with a ventral cavity; [section *Houstonia*].
      5 Plants perennial, with a well-developed, persistent basal rosette; corolla 5.8-16 (-21) mm long, the tube (2-) 4-11 (-12) mm long ..... ***H. caerulea***
      5 Plants annual, with at most a few short-lived basal leaves; corolla 2-10 (-12) mm long, the tube 0.8-5.5 mm long.
        6 Calyx lobes slightly shorter than to slightly longer than the corolla tube; corollas white, 2.0-5.5 mm long, the tube 0.8-2.5 mm long..... ***H. micrantha***
        6 Calyx lobes 1/5 as long as to slightly longer than the corolla tube; corollas purple or violet (rarely white), 3.5-10 (-12.5) mm long, the tube 2.0-5.5 mm long ..... ***H. pusilla***
1 Flowers several to many, in terminal cymes; corolla funnelform; leaves (8-) 10-60 mm long; [subgenus *Chamisme*, section *Amphiotis*].
  7 Capsule obovoid-cylindric, longer than wide, the free calyx lobes distinctly shorter than the capsule; stipules of mid-cauline leaves ciliate or fringed, and also often bristle-tipped; leaves 1-3 mm wide; [of calcareous glades and barrens] ..... ***H. nigricans*** *var.* ***nigricans***
  7 Capsule as long as wide or wider, depressed globose, the free calyx lobes about as long as the capsule; stipules of mid-cauline leaves not cilate, fringed, or bristle-tipped; leaves 0.5-34 mm wide; [of various habitats, including calcareous glades and barrens]
    8 Basal leaves persistent in a rosette until and past flowering; leaves distinctly ciliate ..... ***H. canadensis***
    8 Basal leaves absent at the onset of flowering; leaves smooth-margined or ciliate.
      9 Leaves ovate or lanceolate, 1-6× as long as wide, 4-34 mm wide, widest toward the base or at the middle; calyx lobes 1-7 mm long.
        10 Calyx lobes 4-7 mm long; leaves mostly lanceolate (varying from narrowly lanceolate to broadly ovate), 17-33 mm long, 4-10 mm wide, 3.3-6× as long as wide ..... ***H. purpurea*** *var.* ***calycosa***
        10 Calyx lobes 1-4 mm long; leaves mostly ovate (varying from broadly ovate to ovate-lanceolate), 8-63 mm long, 6-34 mm wide, 1-3.2× as long as wide.
          11 Corollas light purple to white, (4-) 5-8 (-10) mm long; leaves (10-) 25-50 (-60) mm long, (6-) 12-30 (-34) mm wide; stems sparsely to densely pubescent; median internodes 2-9 cm long; leaves with pubescence ciliate on the leaf margin, on the midrib, and scattered on the surface; [of various habitats, widely distributed]..... ***H. purpurea*** *var.* ***purpurea***
          11 Corollas deep purple, 8-12 mm long; leaves 8-20 (-30) mm long, 3-8 (-13) mm wide; stems glabrous (or slightly short-pubescent on the lower nodes only); median internodes 0.5-4 cm long; leaves entirely glabrous or with pubescence ciliate on the leaf margin, on the midrib, but lacking from the leaf surface; [of high elevation rocky summits and adjacent grassy balds in w. NC and e. TN]..... ***H. montana***
      9 Leaves linear to narrowly elliptic, 4-20× as long as wide, 0.5-6 mm wide, widest at the middle or near the apex or nearly equally wide for most of their lengths; calyx lobes 0.5-3 mm long.

12 Leaves 1.3-4.7 cm long, 0.5-4.0 mm wide (mostly < 2.5 mm wide), 7-20× as long as wide; inflorescence very diffuse and open, to 20 cm long, the branches ascending, spreading, or deflexed, slender and often ultimately filiform, with 1-4 remote nodes bearing reduced leaves, the pedicels to 14 mm long; internodes mostly 4-9; mature capsules mostly 1.5-2.5 mm long and wide; stem densely cinereous-puberulent, especially at the nodes ..... ***H. tenuifolia***

12 Leaves 1.6-4.0 cm long, 1.5-6.0 mm wide (mostly > 2.5 mm wide), 4-11× as long as wide; inflorescence rather open to rather compact, < 12 cm long, the branches ascending or spreading, slender, pedicels to 8 mm long; internodes mostly 7-11; mature capsules mostly 1.8-3.0 mm long and wide; stem densely cinereous-puberulent, glabrate, or glabrous.

13 Stems glabrous or glabrate (sometimes puberulent on the nodes only); internodes 7-10, the median internodes (1.1-) 2.0-4.5 (-6.0) cm long; [of seasonally wet soil mats on moderate to high elevation granitic domes in sw. NC, nw. SC, and ne. GA]..... ..... ***H. longifolia*** *var.* ***glabra***

13 Stems densely cinereous-puberulent; internodes (6-) 7-11 (-13), the median internodes (1.0-) 1.5-3.5 (-4.4) cm long; [of dry sandy, shaley, gravelly, or rocky soil, widely distributed] ..... ***H. longifolia*** *var.* ***compacta***

Houstonia caerulea Linnaeus, Quaker Ladies, Innocence, Common Bluet. Mt (GA, NC, SC, VA, WV), Pd (DE, GA, NC, SC, VA), Cp (DE, GA, NC, SC, VA): forests, woodlands, openings, lawns, a wide variety of disturbed sites; common. April-July; May-August. This species is widespread in e. North America. The flowers of this species and *H. serpyllifolia* are very similar; *H. caerulea* is a somewhat duller blue. [= RAB, G, K, S, W, WV, X, Y; = *Houstonia caerulea* var. *caerulea* – F; = *Hedyotis caerulea* (Linnaeus) Hooker – C, GW; < *Hedyotis caerulea* – Q]

Houstonia canadensis Willdenow ex Roemer & J.A. Schultes, Canada Bluet. Mt (GA, VA, WV): dry limestone barrens, locally abundant in shallow soils over limestone; rare (VA Rare). April-August. ME and s. ON west to MN, south to sw. VA, se. and c. TN, nw. GA, and AR. Terrell (1959) determined that *Houstonia setiscaphia* (allegedly a narrow endemic of sw. VA) fell within the range of variation of southern populations of *H. canadensis*. Further study is perhaps warranted. [= G, K, W, WV, X, Y, Z; = *Hedyotis canadensis* (Willdenow ex Roemer & J.A. Schultes) Fosberg – C, Q; > *Houstonia canadensis* – F; > *Houstonia setiscaphia* L.G. Carr – F; > *Houstonia canadensis* var. *setiscaphia* (L.G. Carr) C.F. Reed]

Houstonia longifolia Gaertner *var.* ***compacta*** Terrell, Eastern Longleaf Bluet. Mt (GA, NC, VA, WV), Pd (GA, NC, SC, VA), Cp (FL, GA, NC, SC, VA): dry rock outcrops and adjacent open woodlands, dry sandy woodlands, dry roadbanks, glades and barrens; uncommon. Early June-August; September-October. Var. *compacta* is centered in the central Appalachians of VA, WV, e. KY, and se. OH, with extensions north to VT, west into n. IL, and south in the Piedmont and adjacent Coastal Plain to SC, GA, and Panhandle FL). The typic variety is more northern, apparently reaching its southern limit in IN, not reaching our area. [= WV, Z; < *Houstonia longifolia* – RAB, C, F, G, S, W; < *Hedyotis longifolia* (Gaertner) Hooker – C, Q, WH; < *Houstonia longifolia* var. *longifolia* – Y; = *Houstonia longifolia*, "Appalachian Group" – X; < *Houstonia longifolia* – K (also see *H. tenuifolia*)]

Houstonia longifolia Gaertner *var.* ***glabra*** Terrell, Granite Dome Bluet. Mt (GA, NC, SC): seasonally and periodically wet soils of shallow soil mats and crevices of granitic domes; rare. June-August; September-October. Var. *glabra* is endemic to the granitic dome district centered around Highlands, NC, occurring in sw. NC, nw. SC, and ne. GA. Terrell (1959) says "the lower internodes [are often] so smooth they appear to have been polished," and gives an altitudinal range of 850-1750 m. Although the morphological differences between var. *glabra* and var. *compacta* are not great, the combination of distinctive morphology correlated with a distinctive habitat and a disjunct range seem to warrant recognition at the varietal level. [= Z; < *Houstonia longifolia* – RAB, S, W; < *Hedyotis longifolia* (Gaertner) Hooker – C, Q; < *Houstonia longifolia* var. *longifolia* – Y; = *Houstonia longifolia*, "Glabra Group" – X; < *Houstonia longifolia* – K (also see *H. tenuifolia*)]

Houstonia micrantha (Shinners) Terrell. Cp (FL, GA), Pd (GA): dunes, sandy soils, granitic flatrocks; uncommon (rare in FL and GA). February-April. E. and c. GA west to sw. TN, nw. AR, south to w. FL Panhandle, s. MS, s. LA, and e. TX. [= K, X; = *Hedyotis australis* W.H. Lewis & D.M. Moore – Q; = *Houstonia pusilla* – S, misapplied]

Houstonia montana Small, Roan Mountain Bluet. Mt (NC): in crevices of rock outcrops at the summits of high elevation peaks of the Southern Blue Ridge, also in thin, frost-heaved, gravelly soils of grassy balds near summit outcrops, from 1250-1950 m in elevation; rare. June-July; July-August. This species is endemic to the high Blue Ridge of nw. NC and ne. TN, most notably occurring on Roan Mountain, Grandfather Mountain, Bluff Mountain, and Three Top Mountain. It was first noted by Asa Gray in 1841, who described it as "a remarkable dwarfish form." There has been debate over whether it is not indeed merely a weather-induced form, but recent studies show that it is distinct. In addition to the characters given above in the key, *H. montana* also differs from *H. purpurea* in having larger calyx lobes, corolla, capsules, and seeds. See Terrell (1959), Yelton (1974), and Terrell (1978) for further discussion. [= S, W; < *Houstonia purpurea* – RAB; = *Houstonia purpurea* Linnaeus var. *montana* (Small) Terrell – K, X, Y, Z; < *Hedyotis purpurea* – Q; = *Hedyotis purpurea* (Linnaeus) Torrey & A. Gray var. *montana* (Small) Fosberg]

Houstonia nigricans (Lamarck) Fernald *var.* ***nigricans***, Diamond-flower. Mt (VA), Cp (GA): limestone barrens dominated by *Andropogon gerardii*, blackland prairies; rare. Sw. VA (Ludwig 1999), s. MI, IA, NE, and e. CO, south to s. FL, TX, e. NM, and along the Sierra Madre Oriental to Hidalgo, Mexico. This species has been variously placed in *Houstonia*, *Hedyotis*, and *Stenaria*. Based primarily on seed characters and chromosome numbers, Terrell (2001) has concluded that this taxon is not congeneric with the Sri Lankan type of the genus *Hedyotis*, and is also not a *Houstonia*, so has published the new genus *Stenaria* for *Hedyotis nigricans* and its close relatives. Church (2003) considers *Stenaria* congeneric with *Houstonia*, based on molecular phylogeny. The resolution of generic limits in this group is still unresolved. As interpreted by Terrell (1991, 2001) and Turner (1995b), *Houstonia nigricans* is a polymorphic species, with *Houstonia nigricans* var. *nigricans* as a widespread "matrix variety," and other, much more local varieties warranting recognition. Turner (1995b) reports *Houstonia nigricans* var. *nigricans* (as *Hedyotis nigricans* var. *nigricans*) from Pickens County, SC; the documentation is not known to me, and suitable habitats there are unlikely. [= *Hedyotis nigricans* (Lamarck) Fosberg var. *nigricans* – K, U, Y; = *Stenaria nigricans* (Lamarck) Terrell var. *nigricans* – M; < *Hedyotis nigricans* – C, Q; < *Houstonia nigricans* (Lamarck) Fernald – F, G; > *Houstonia angustifolia* Michaux – S; > *Houstonia filifolia* (Chapman) Small – S; < *Stenaria nigricans* (Lamarck) Terrell var. *nigricans* – WH]

Houstonia procumbens (Walter ex J.F. Gmelin) Standley, Creeping Bluet, Fairy-footprints, Roundleaf Bluet. Cp (FL, GA, SC): beach dunes, moist to wet sandy pinelands; common. October-April. Se. SC south to s. FL, west to se. LA. Gaddy &

Rayner (1980) note that this plant is fairly common on SC barrier islands, but flowers in the winter and is easily overlooked in other seasons (when botanists are more likely to be afield). See Wilbur (1968) and Ward (2004c) for differing opinions about the merits of the taxonomic recognition of the glabrous and pubescent plants. [= RAB, K, S, WH, X, Y; = *Hedyotis procumbens* (Walter ex J.F. Gmelin) Fosberg – Q; = *Houstonia rotundifolia* Michaux; > *Houstonia procumbens* var. *procumbens* – V; > *Houstonia procumbens* var. *hirsuta* (W.H. Lewis) D. B. Ward – V]

Houstonia purpurea Linnaeus *var.* ***calycosa*** Shuttleworth ex A. Gray, Midwestern Summer Bluet. Mt (GA, NC, WV): dry woodlands, banks, rock outcrops, shallow soils around mafic and calcareous rock outcrops; rare. May-July; July-August. The distribution and ecology of var. *calycosa* in our area are poorly known; it apparently occupies drier and typically more circumneutral sites than var. *purpurea*. Var. *calycosa* ranges from s. ME and w. NY west to s. OH, and sw. MO, south to w. NC, n. GA, AL, MS, AR, and e. OK. [= G, K, WV, X, Y, Z; < *Houstonia purpurea* – RAB, W; < *Hedyotis purpurea* (Linnaeus) Torrey & A. Gray – C, Q; = *Houstonia lanceolata* (Poiret) Britton – F, S; = *Hedyotis purpurea* (Linnaeus) Torrey & A. Gray var. *calycosa* (Shuttleworth ex A. Gray) Fosberg]

Houstonia purpurea Linnaeus *var.* ***purpurea***, Summer Bluet. Mt (GA, NC, SC, VA, WV), Pd (DE, GA, NC, SC, VA), Cp (DE, FL, GA, NC, SC, VA): moist and dry woodlands and forests, roadbanks, thinner soils around rock outcrops, a variety of disturbed sites; common (rare in Coastal Plain, rare in DE Piedmont). May-July; July-August. Var. *purpurea* ranges from DE, MD, and s. PA west to s. OH, s. IL, and sw. MO south to SC, sw. GA, Panhandle FL, MS, s. LA, e. TX, and e. OK. Plants growing in high elevation and exposed sites are sometimes dwarfed, and in that respect only, superficially resemble *H. montana*. [= G, K, WV, X, Y, Z; < *Houstonia purpurea* – RAB, W, WH; = *Houstonia purpurea* – F, S; < *Hedyotis purpurea* (Linnaeus) Torrey & A. Gray – C, Q; = *Hedyotis purpurea* (Linnaeus) Torrey & A. Gray var. *purpurea*]

Houstonia pusilla Schoepf, Tiny Bluet. Pd (GA, NC, SC, VA), Cp (DE, GA, NC, SC, VA), Mt (GA, NC): woodlands, lawns, cemeteries, and other disturbed sites; common (uncommon in FL, rare in DE). March-April. MD south to Panhandle FL, west to TX, and inland from IL west to NE, south to TN and TX. [= RAB, G, K, S, W, WH, X, Y; = *Houstonia patens* Elliott – F; = *Hedyotis crassifolia* Rafinesque – C, GW; < *Hedyotis caerulea* (Linnaeus) Hooker – Q; = *Houstonia minima* L.C. Beck – S]

Houstonia rosea (Rafinesque) Terrell, Rose Bluet. {habitats}. AL west to TX and OK. [= K; = *Hedyotis rosea* Rafinesque] {synonymy incomplete}

Houstonia serpyllifolia Michaux, Appalachian Bluet, Thyme-leaf Bluet. Mt (GA, NC, SC, VA, WV): streambanks, grassy balds, moist forests, seepy rock outcrops, spray cliffs, and moist disturbed areas; common (uncommon in GA, VA, and WV). (March-) May-June. A Southern and Central Appalachian endemic: PA south to nw. SC and ne. GA. The flowers are very similar to, but usually a brighter blue than, the more widespread *H. caerulea*. [= RAB, F, G, K, S, W, WV, X, Y; = *Hedyotis michauxii* Fosberg – C, GW, Q]

Houstonia tenuifolia Nuttall, Diffuse-branched Bluet. Pd (GA, NC, SC, VA), Mt (GA, NC, SC, VA, WV), Cp (NC, SC, VA): usually in dry woodlands, often rocky (especially mafic rocks) or sandy; uncommon (rare in Coastal Plain). May-July; July-October. This species is centered in the Southern Appalachians and the Ozarks, extending into provinces adjacent to both areas of concentration, ranging overall from PA west to MO and OK, south to SC, GA, and TX. [= RAB, F, G, S, W, WV, Z; = *Hedyotis nuttalliana* Fosberg – C; < *Hedyotis longifolia* (Gaertner) Hooker – Q; = *Houstonia longifolia* var. *tenuifolia* (Nuttall) Wood; = *Houstonia longifolia*, "Tenuifolia Group" – X; < *Houstonia longifolia* – K]

Mitchella Linnaeus (Partridge-berry)

A genus of 2 species, perennials, ours and 1 in e. Asia. References: Rogers (2005)=Z.

Mitchella repens Linnaeus, Partidge-berry. Mt (GA, NC, SC, VA, WV), Pd (DE, GA, NC, SC, VA), Cp (DE, FL, GA, NC, SC, VA): deciduous and coniferous forests, stream-banks, heath balds, maritime forests, on rotten logs; common. May-June; June-July. NS west to MN, south to c. peninsular FL and TX; disjunct in Guatemala. Plants in maritime forests are more robust than others and often have an ascending habit, the stems sometimes 20-30 cm tall. [= RAB, C, F, G, GW, K, S, W, WH, ZWV,]

Mitracarpus Zuccarini (Girdle-pod)

A genus of about 30 species, of tropical America. References: Rogers (2005).

* ***Mitracarpus hirtus*** (Linnaeus) A.P. de Candolle, Girdle-pod. Cp (FL, GA, LA): disturbed areas; uncommon (rare in GA and LA), native of tropical America. Reported for GA Coastal Plain (Charlton County) (Carter, Baker, & Morris 2009). [= K, WH; *? M. villosus* (Swartz) Chamisso & Schlechtendahl ex A.P. de Candolle]

Oldenlandia Linnaeus (Oldenlandia)

A genus of about 100 species, pantropical, but circumscription is controversial and uncertain. References: Terrell & Robinson (2006)=X; Terrell (1991)=Z; Rogers (1987)=Y; GW; Rogers (2005).

1 Creeping, mat-forming perennial, rooting at nodes; leaves 1.5-5.2 mm long; flowers solitary on slender axillary pedicels; seeds 4-14 per capsule ..... ***O. salzmannii***

1 Erect, spreading, decumbent, or prostrate annual or perennial, not rooting at nodes; leaves 3-40 mm long; flowers usually > 1, in axillary clusters or pedunculate umbels; seeds > 50 per capsule.
2 Flowers (1) 2-5 in pedunculate axillary umbels, the filiform peduncle 5-10 mm long, the filiform pedicels 3-5 mm long ..... ***O. corymbosa***
2 Flowers 1-10 in sessile or subsessile axillary clusters.
3 Stem glabrous or nearly so; leaves mostly linear or linear-oblanceolate, 1-3 mm wide, generally 5-10× as long as wide; flowers solitary or (rarely) in 2-3-flowered clusters; plant a perennial ..... ***O. boscii***
3 Stem pilose or villous (rarely glabrous); leaves mostly ovate or broadly lanceolate, 4-10 mm wide, generally 2-3× as long as wide; flowers in compact clusters of 3-10, rarely solitary; plant an annual ..... ***O. uniflora***

Oldenlandia boscii (A.P. de Candolle) Chapman, Bosc's Bluet. Cp (FL, GA, NC, SC, VA), Mt (GA): clay-based Carolina bays, rivershore and millpond drawdown shores, sagponds, other seasonally saturated habitats; uncommon (rare in GA, NC, SC, and VA). August-September. A Southeastern Coastal Plain endemic, ranging from se. VA south to FL and west to TX. Similar in vegetative condition to *Polypremum procumbens*. [= RAB, G, K, S, WH, X, Z; = *Hedyotis boscii* A.P. de Candolle – C, F, GW, Y]

* ***Oldenlandia corymbosa*** Linnaeus, Diamond-flower. Cp (FL, GA, NC, SC), Pd (NC): moist lawns, gardens; common (rare in GA, NC, SC), native of South America. July-October. Reported for NC by Nesom (2000e). [= RAB, K, S, WH, X, Z; = *Hedyotis corymbosa* (Linnaeus) Lamarck – GW, Y]

* ***Oldenlandia salzmannii*** (de Candolle) Bentham & Hooker ex B.D. Jackson. Cp (FL): roadside ditches, marshes; rare, native of South America. Introduced in s. AL and w. Panhandle FL. [= K, WH, X]

Oldenlandia uniflora Linnaeus, Oldenlandia. Cp (DE, FL, GA, NC, SC, VA), Pd (GA, NC, SC, VA): pondshores, muddy drawdown shores, moist to wet ecotones of Coastal Plain streamheads, other moist to wet places; common (uncommon north of FL, rare in Piedmont). August-October. Mostly a species of the Southeastern Coastal Plain: NY (Long Island) south to s. FL and west to TX, north in the interior to MO. [= RAB, G, K, S, WH, X, Z; = *Hedyotis uniflora* (Linnaeus) Lamarck – C, F, GW, Y]

Paederia Linnaeus (Skunk-vine)

A genus of about 30 species, woody vines, of the Tropics. References: Rogers (2005)=Z; Diamond (1999).

* ***Paederia foetida*** Linnaeus, Skunk-vine. Cp (FL, GA, LA, SC), Pd (NC): disturbed areas, rarely spreading from plantings; uncommon (rare in LA, NC, and SC), native of se. Asia. Diamond (1999) reports its naturalization in Randolph County, NC; Carter, Baker, & Morris (2009) report its naturalization in several counties in the GA Coastal Plain. [= RAB, K, S, WH, Z]

Pentodon Hochstetter in Krauss 1844

A genus of 2 species, herbs, of tropical and warm temperate America and Africa. References: Terrell (1991)=Z; Rogers (1987)=Y; Rogers (2005).

* ***Pentodon pentandrus*** (K. Schumacher & Thonning) Vatke. Cp (FL, GA, SC): pond edges, wet meadows, moist ground; uncommon (rare in GA and SC), apparently native of Africa (GA Special Concern). July-September. In North America, ranging from e. SC south to s. FL, west to se. TX. [= GW, K, WH, Y, Z; *? P. halei* (Torrey & A. Gray) A. Gray – S; *? Oldenlandia halei* (Torrey & A. Gray) Chapman]

Pinckneya Michaux (Pinckneya, Fever-tree)

A monotypic genus, a small tree of the se. United States. References: Godfrey (1988); Rogers (1987)=Z.

Identification notes: *Pinckneya* is showy when in flower because of the development of 1 of the 5 calyx lobes of some of the flowers of the inflorescence into a large (to 7 cm by 5 cm), petaloid (pink or cream) appendage.

Pinckneya bracteata (Bartram) Rafinesque, Pinckneya, Fever-tree. Cp (FL, GA, SC): margins of acidic, peaty (blackwater) swamps; uncommon (rare in GA and SC). May-June (-July); September. Se. SC south to ne. FL and Panhandle FL. [= GW, K, WH, Z; = *P. pubens* Michaux – RAB, S]

Psychotria Linnaeus 1759 (Wild Coffee)

A genus of about 2000 species, mostly shrubs, tropical and subtropical. References: Rogers (2005)=Z.

Psychotria nervosa Swartz, Wild Coffee. Cp (FL): hammocks; rare. Ne. FL (Duval County) south to s. FL, West Indies, Central America, and South America. [= K, S, WH, Z]

Richardia Linnaeus (Richardia)

A genus of about 15 species, of subtropical and tropical America, and introduced in the Old World. References: Lewis & Oliver (1974)=Z; Krings (2002). Key based in part on Krings (2002).

1 Mericarps smooth; corolla 4-lobed; [section *Asterophyton*]..... ***R. humistrata***
1 Mericarps **either** conspicuously and densely hispidulous to strigose **or** papillose to tuberculate; corolla 6-lobed; [section *Richardia*].
2 Stems hirsute, generally densely and evenly so from tip to base; adaxial leaf surface evenly strigose; mericarps conspicuously and densely hispidulous to strigose, the adaxial face broad, with a pronounced median keel; perennial from a woody rhizome (or annual) ..... ***R. brasiliensis***
2 Stems hirsute or villous near the tips, but progressively more sparsely so to glabrate toward the base; adaxial leaf surface glabrous to strigillose near the margins only, the median portion of the leaf blade glabrous; mericarps papillose to tuberculate, the adaxial surface closed to a narrow groove; annual.
3 Corolla (8-) 12-20 (-25) mm long, pink to lilac; mericarp papillae blunt and rounded; [FL peninsula only]..... ***[R. grandiflora]***
3 Corolla (2.5-) 5-7 (-10-5) mm long, white (sometimes with the lobes pale pink or lilac); mericarp papillae acute; [widespread]..... ***R. scabra***

* ***Richardia brasiliensis*** Gomes. Cp (FL, GA, NC, SC, VA), Pd (GA, NC, SC, VA): roadsides, fields, vacant lots, urban areas, disturbed areas; common, native of South America. May-November. [=RAB, C, F, K, S, WH, Z]

* ***Richardia humistrata*** (Chamisso & Schlechtendahl) J.A. & J.H. Schultes. Cp (FL) {AL, MS}: disturbed areas, savannas, pine flatwoods; rare, native of South America. Also collected in 1886 as a ballast waif in Camden County, NJ; first noted on the Gulf Coast only in 1941, but perhaps early introduced there on ballast as well, such as at Pensacola. [= K, WH, Z]

* ***Richardia scabra*** Linnaeus. Cp (FL, GA, NC, SC, VA), Pd (GA, NC, SC, VA): roadsides, fields, vacant lots, urban areas, disturbed areas; common, native of South America. June -December. Lewis & Oliver (1974) consider this species to be native from our area south through Central America into northern South America, based on the semi-contiguous distribution, but occurrences in our region seem to be in altered habitats. [= RAB, C, F, G, K, S, WH, Z]

Richardia grandiflora (Chamisso & Schlechtendahl) J.A. & J.H. Schultes, Largeflower Richardia. Cp (FL): disturbed areas; rare, native of South America (mainly Brazil). Reported for Alachua County, immediately south of our area (Kunzer et al. 2009), and "rapidly spreading." [= K, WH, Z]

Spermacoce Linnaeus (Buttonweed)

A genus of about 50 species, herbs, of tropical and warm-temperate Old and New World. References: Rogers (2005).

1 Calyx with 2 long lobes, the other 2 absent or vestigial..... ***S. densiflora***
1 Calyx with 4 lobes of nearly equal length.
2 Calyx lobes with a conspicuous white margin ..... ***S. prostrata***
2 Calyx lobes green throughout.
3 Fruit pubescent ..... ***S. assurgens***
3 Fruit glabrous ..... ***S. glabra***

Spermacoce assurgens Ruiz & Pavón. Cp (FL, GA): wet hammocks, bottomland forests, marshes; uncommon (rare in GA). July-September. In sw. GA (Jones & Coile 1988), AL, and FL; also in the New World tropics? [> *S. assurgens* – K; ? *Borreria laevis* (Lamarck) Grisebach – GW, S, misapplied; ? *Spermacoce remota* Lamarck – WH; *Borreria brachysepala*, misapplied] {add to synonymy}

* ***Spermacoce densiflora*** (deCandolle) Alain. Cp (FL): disturbed areas; rare, native of the Neotropics. [= K, WH; = *Borreria densiflora* deCandolle] {add to synonymy}

Spermacoce glabra Michaux, Smooth Buttonweed. Mt (VA, WV), Cp (FL, GA, SC*, VA*): rocky riversides in the mountains, disturbed areas in the Coastal Plain; rare (GA Rare). Perhaps only introduced in at least some parts of our area; see Wieboldt et al. (1998) for discussion. [= RAB, C, F, G, GW, K, S, WH]

Spermacoce prostrata Aublet. Cp (FL): wet pine flatwoods, floodplain forests; uncommon. FL, AL, MS, south through the New World tropics. July-September. [= K, WH; = *Borreria ocimoides* (Burmann f.) de Candolle – S, misapplied] {add to synonymy}

Spermacoce tenuior Linnaeus, reported from sw. GA (Kartesz 1999). {ID needs checking} [= K; *? S. riparia* Chamisso & Schlechtendahl] {not yet keyed; add to synonymy}

351. GENTIANACEAE A.L. de Jussieu 1789 (Gentian Family) [in GENTIANALES]

A family of about 87 genera and over 1600 species, herbs, shrubs, and trees, cosmopolitan (Struwe & Albert 2002). References: Wood & Weaver (1982); Struwe & Albert (2002). [also see *MENYANTHACEAE*]

1 Leaves all scale-like, 1-3 (-5) mm long, appressed to the stem; [tribe *Gentianeae*, subtribe *Swertiinae*]..... ***Bartonia***
1 Leaves larger, spreading or ascending.
2 Stem leaves whorled; plants robust, 1-3 m tall; [tribe *Gentianeae*, subtribe *Swertiinae*] ..... ***Frasera***

2 Stem leaves opposite; plants generally < 1 m tall.
3 Calyx lobes 2; stem leaves obovate, widest near the rounded tip), 0.5-1.5 cm long, crowded near the tip of the stem, basal rosette never present; [of nutrient-rich, mesic forests]; [tribe *Gentianeae*, subtribe *Swertiinae*]..... ***Obolaria***
3 Calyx lobes 4-5; stem leaves lanceolate, ovate, elliptic or narrowly elliptic (widest near the middle or toward the base, the tip acute or acuminate), mostly > 1.5 cm long, distributed fairly evenly along the stem, basal rosettes sometimes present; [of various more-or-less open habitats (except some species of *Gentiana*, which can occur in nutrient-rich, mesic forests)].
4 Corolla lobes 5-14, much longer than the corolla tube, pink or white; [tribe *Chironieae*, subtribe *Chironiinae*]..... ***Sabatia***
4 Corolla lobes 4-5, shorter than the corolla tube, blue, lavender, pink or white.
5 Corolla tube < 2 mm wide; [tribe *Chironieae*, subtribe *Chironiinae*]..... ***Centaurium***
5 Corolla tube > 3 mm wide.
6 Corolla lobes alternating with corolla appendages (appearing as plaits or lobes, these often toothed, notched, or lacerate, sometimes as long as or longer than the true corolla lobes); main stem leaves cuneate at the base; perennial; [tribe *Gentianeae*, subtribe *Gentianinae*] ..... ***Gentiana***
6 Corolla lobes not alternating with corolla appendages; main stem leaves rounded to cordate at the base; biennial or annual; [tribe *Gentianeae*, subtribe *Swertiinae*].
7 Corolla lobes 4, finely fringed; main stem leaves rounded at base, with lateral veins obscure; biennial ..... ***Gentianopsis***
7 Corolla lobes 5, entire, not fringed; main stem leaves cordate (the cordate bases often overlapping the opposite leaf), with 2-3 well-developed lateral veins (prominently visible on the lower surface); annual ..... ***Gentianella***

Bartonia Muhlenberg ex Willdenow (Bartonia)

A genus of 3 species, herbs, of e. North America. The genus has coralloid mycorrhizae and lacks root hairs, and is thus presumably partially mycotrophic. References: Mathews et al. (2009)=Y; Gillett (1959)=Z.

1 Corolla lobes white, 4-9 mm long, spreading, spatulate to obovate, rounded at the apex; flowering in early spring (rarely to early summer) ..... ***B. verna***
1 Corolla lobes green to creamy white, 2-3 (-5.2) mm long, ascending or erect, oblong to ovate or lance-ovate, acuminate or rounded-mucronate at the apex; flowering in summer or fall (July-October).
2 Mid-cauline scale leaves alternate; corolla lobes acuminate at the apex, their margins entire; anthers 0.3-0.5 mm long ..... ***B. paniculata*** *ssp.* ***paniculata***
2 Mid-cauline scale leaves opposite; corolla lobes rounded at the apex, abruptly narrowed to a mucro, their margins erose (uncommonly entire); anthers 0.5-1.1 mm long..... ***B. virginica***

Bartonia paniculata (Michaux) Muhlenberg *ssp.* ***paniculata***, Screwstem Bartonia. Swamps, bogs, pocosins, pocosin ecotones, sphagnous seepages, sinkhole ponds. August-October; September-October. Ssp. *paniculata* ranges from MA south to c. peninsular FL and west to e. TX, chiefly on the Coastal Plain, but with scattered occurrences inland (to c. VA, w. NC, KY, and AR). Ssp. *iodandra* (B.L. Robinson) J. Gillett is more northern, ranging from NL (Newfoundland) south to MA. Ssp. *texana* (Correll) K. Mathews, Dunne, E. York, & Struwe is endemic to the West Gulf Coastal Plain of w. LA and e. TX, where it is more-or-less sympatric with ssp. *paniculata* (Mathews et al. 2009). [= K, Y, Z; < *B. paniculata* – RAB, GW, WH; = *B. paniculata* – G; = *B. paniculata* var. *paniculata* – C, F; = *B. lanceolata* Small – S]

Bartonia verna (Michaux) Rafinesque ex Barton, Spring Bartonia, White Bartonia. Wet pine savannas, shores of Coastal Plain depression ponds, other moist sands. (November-) February-April (-June); April-June. VA (one site known from City of Virginia Beach) (Belden et al. 2004) and se. NC (Carteret County) south to s. FL, west to se. TX. Wood & Weaver's (1982) speculation that *B. verna* is an outlier relative to the other species appears not to be true, with the true division being between *B. verna*/*virginica* on one hand and *B. paniculata* and its infrataxa on the other (Mathews et al. 2009). [= RAB, GW, K, S, WH, Y, Z]

Bartonia virginica (Linnaeus) Britton, Sterns, & Poggenburg, Virginia Bartonia. Bogs, swamps, savannas, pocosin ecotones, pocosins. July-October; September-October. NS and QC west to WI, south to n. FL and LA. [= RAB, C, F, G, GW, K, S, WH, Y, Z]

Centaurium Hill (Centaury)

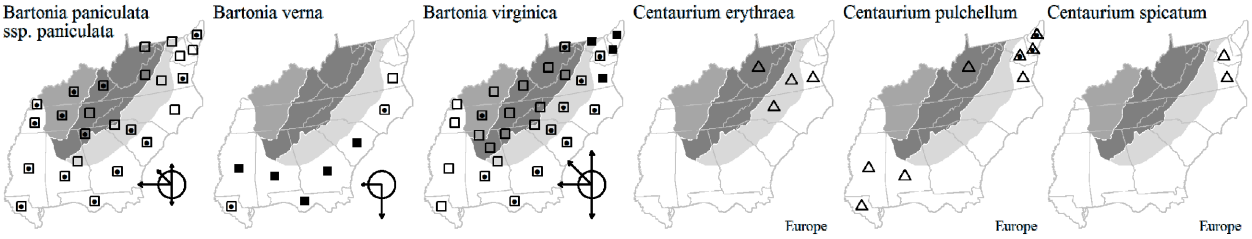
A genus of about 20 species, herbs, mainly north temperate.

1 Flowers pedicellate, the pedicels 3-5 mm long..... ***C. pulchellum***
1 Flowers sessile or nearly so (sometimes appearing stalked but with bracteal leaves immediately below the calyx).
2 Inflorescence a corymbiform cyme (about as broad as long, the central axis poorly developed)..... ***C. erythraea***
2 Inflorescence a spikelike cyme (distinctly elongate, the central axis straight)..... ***C. spicatum***

* ***Centaurium erythraea*** Rafn, Common Centaury, Forking Centaury. Lawns, disturbed areas; native of Europe and w. Asia. July-September. [= C, K; = *C. minus* – RAB, later homonym; = *C. umbellatum* – F, G, later homonym]

* ***Centaurium pulchellum*** (Swartz) Druce, Lesser Centaury, Branching Centaury. Disturbed areas; native of Europe. June-September. [= C, F, G, K, S]

* ***Centaurium spicatum*** (Linnaeus) Fritsch, Spiked Centaury. Disturbed areas; native of s. Europe. July-August. [= C, F, G, K]



Eustoma Salisbury ex G. Don (Prairie-gentian)

A genus of 3 species, annual to perennial herbs, of se., c., and sw. North America south to Mexico and Belize and in the West Indies. References: Shinners (1957)=Z; Wood & Weaver (1982)=Y.

Eustoma exaltatum (Linnaeus) Salisbury ex G. Don, Prairie-gentian. Cp (FL): alkaline prairies, saline coastal areas; rare. AL and peninsular FL west to TX, south to Mexico and Belize; West Indies. June-November. [= GW, S, WH, Y, Z; = *Eu. exaltatum* ssp. *exaltatum* – K] {not yet keyed in generic key}

Frasera Walter (Columbo)

A genus of 15 species, herbs, primarily of w. North America. References: Threadgill & Baskin (1978)=Z; Horn (1997).

Frasera caroliniensis Walter, American Columbo. Mt (GA, NC), Pd (GA, SC): rich forests over mafic rocks, upper slopes of cove forests, floodplain forests; rare. Late May-June; September-October. W. NY, nw. PA, and s. ON west to IL, MI, MO, and e. OK, south to w. SC, n. GA, and LA, primarily west of the Blue Ridge. Horn (1997) studied the ecology of this species in the Piedmont of SC. [= C, K, S, W, Z; = *Swertia caroliniensis* (Walter) Kuntze – RAB, F, G]

Gentiana Linnaeus 1753 (Gentian)

A genus of about 350-400 species, herbs, primarily temperate and arctic. Even following the removal of *Gentianopsis* and *Gentianella, Gentiana* is a large and apparently heterogeneous group, perhaps not monophyletic. No satisfactory comprehensive treatment is available, however. All of the species treated here as *Gentiana* are in the distinctive group often treated as section, subgenus, or genus *Pneumonanthe*. References: Pringle (1967)=Z; Halda (1996)=Y; Ho & Liu (2001)=X; Pringle & Weakley (2009)=Q; Ho & Liu (1990); Yuan, Küpfer, & Doyle (1996); Pringle (1977). Key adapted from Z.

Identification Notes: In some species it may be somewhat difficult to interpret the corolla lobes and the corolla appendages. The filaments are alternate to the corolla lobes, and are therefore attached to the lower portion of the corolla appendages.

1 Flower solitary (rarely 2 or 3); corolla spotted within; leaves twisted, oblanceolate to oblinear; [subgenus *Pneumonanthe*, series *Angustifoliae*].
  2 Calyx lobes widest at base, the sides then parallel upwards for a distance; corolla exterior intensely indigo blue; [of s. NJ and adjacent DE, and from se. VA south through e. NC to nc. SC]..... ***G. autumnalis***
  2 Clayx lobes widest above the base, narrowing upwards and downwards from that point; corolla exterior dull purplish-green; [of FL Panhandle]..... ***G. pennelliana***
1 Flowers clustered; corolla not spotted within; leaves planar, mostly lanceolate, elliptic, or ovate (rarely linear); subgenus *Pneumonanthe*, series *Pneumonanthe*].
  3 Calyx lobes keeled, the keel decurrent on the calyx tube, the margins of the lobes entire (as seen at 10×); corolla greenish-white or yellowish-white; leaves ovate to lanceolate, acuminate..... ***G. alba***
  3 Calyx lobes not keeled, the margins of the lobes conspicuously ciliate (as seen at 10×, except entire to minutely denticulate in *G. linearis* and *G. villosa*); corolla white, greenish-white, or variously blue; leaves various.
    4 Corolla greenish-white (sometimes somewhat purplish); seeds wingless; lower leaves spatulate to obovate..... ***G. villosa***
    4 Corolla blue, purplish, pale blue, or nearly white; seeds winged; lower leaves linear, lanceolate, elliptic, or ovate.
      5 Margins of leaves and calyx lobes entire to minutely denticulate; corolla appendages obliquely triangular, broader than high (sometimes with a minute deflexed segment) ..... ***G. linearis***
      5 Margins of leaves and calyx lobes conspicuously ciliate (as seen at 10×); corolla appendages with 2 teeth, as long as broad or longer (sometimes with a deflexed segment, if so, the deflexed segment about as long as the erect one).
        6 Anthers separate at anthesis; outer surfaces of petals suffused with green; calyx lobes linear-subulate, about as long as the tube; corolla lobes 6-14 mm long, about 2× as long as the the free portions of the corolla appendages ..... ***G. puberulenta***
        6 Anthers connate at anthesis; outer surfaces of petals not suffused with green; calyx lobes various; corolla lobes usually shorter.
          7 Calyx lobes linear-subulate, broadest at the base, 4× or more as long as broad, shorter than the densely puberulent calyx tube; stems densely puberulent; corolla appendages very unevenly bifid, the narrower segment often deflexed into the corolla tube .... ***G. decora***
          7 Calyx lobes lanceolate, oblanceolate, ovate, or orbicular, 1-5× as long as broad, longer or shorter than the glabrous or puberulent calyx tube; stems glabrous or puberulent; corolla appendages subequally bifid, both segments erect.

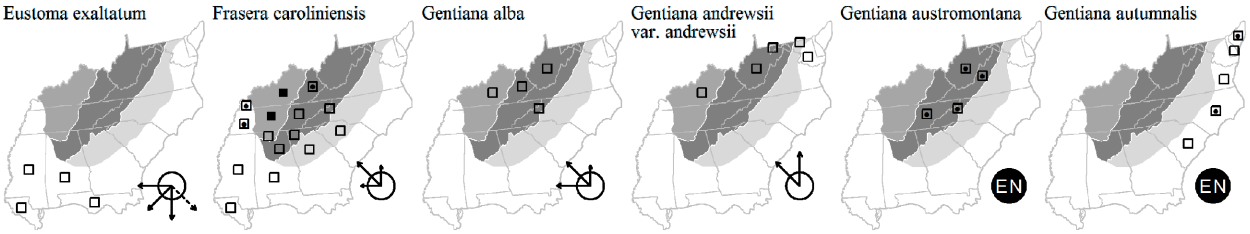
8 Corollas open to loosely closed; involucral and upper leaves obtuse to acute (rarely acuminate); calyx lobes lanceolate.
9 Leaves ovate, widest near the base, bright green; calyx lobes longer than the calyx tube; corolla lobes spreading, usually 2-4 mm longer than the appendages ..... ***G. catesbaei***
9 Leaves linear to elliptic, widest near the middle, dark green; calyx lobes shorter than or about equal to the calyx tube; corolla lobes usually incurved, rarely exceeding the appendages by > 2 mm ..... ***G. saponaria***
8 Corollas tightly closed; involucral and upper leaves acuminate; calyx lobes ovate-orbicular.
10 Corolla lobes reduced to a minute mucro or triangular tooth, much exceeded by the corolla appendages ..... ***G. andrewsii*** *var.* ***andrewsii***
10 Corolla lobes about as long as the corolla appendages.
11 Calyx tubes densely puberulent; calyx lobes lanceolate, erect or ascending; stems puberulent; filaments 7-12 mm long; corolla lobes 1.5-3 mm, often triangular, about 0.5-0.6× as wide as the corolla appendages ..... ***G. austromontana***
11 Calyx tubes glabrous; calyx lobes widely elliptic, ovate, obovate, orbicular, or rhombic, spreading widely; stems glabrous; filaments 10-15 mm long; corolla lobes **either** 0.7-2.0 mm long **or** 2.5-5.0 mm long, usually rounded, about as wide as the corolla appendages.
12 Calyx lobes widely obovate to orbicular, 2-10 mm; corolla lobes 0.7-2.0 mm; [more widespread] ..... ***G. clausa***
12 Calyx lobes obovate, elliptic, ovate, orbicular, or rhombic, (3-) 5-25 (-35) mm; corolla lobes 2.5-5.0 mm; [Mountains of NC, south of Asheville] ..... ***G. latidens***

Gentiana alba Muhlenberg ex Nuttall, Pale Gentian. Moist meadows. August-October. MI west to MN, south to n. AR; with scattered disjunctions eastward to PA, OH, WV, KY, and w. NC. *G. alba* has nomenclatural over *G. flavida* as the older name; there is controversy, however, over whether it was validly published and applies clearly to the species at hand (see Wilbur 1988c for discussion). [= RAB, K, W, WV, X, Y, Z; = *Gentiana flavida* A. Gray – C, F, G; = *Dasystephana flavida* (A. Gray) Britton – S; = *Pneumonanthe flavida* (A. Gray) Greene]

Gentiana andrewsii Grisebach *var.* ***andrewsii***, Prairie Closed Gentian. Meadows, seeps, forest edges. NH, s. QC, MN, and s. MB, south to s. MD, WV, MO and WY; earlier reports of it as far south as GA or NC (as by F and G) are apparently based on misidentifications. An additional variety, var. *dakotica* A. Nelson, occurs from MB and SK south in the Great Plains to MO and IL. [= C, K, X, Y, Z; < *G. andrewsii* – F, G, WV; < *Dasystephana andrewsii* (Grisebach) Small – S; = *Pneumonanthe andrewsii* (Grisebach) W.A. Weber var. *andrewsii*]

Gentiana austromontana J.S. Pringle & Sharp, Blue Ridge Gentian. Mountain forests and grassy balds, especially at medium to high elevations, but descending to ca. 600 m (2200 feet). August-October. A Southern Appalachian endemic: s. WV and sw. VA south to w. NC and ne. TN. The flowers of *G. austromontana* are usually a deeper and more intense blue-violet than the similar *G. clausa* and *G. decora*. See Pringle & Sharp (1964) for additional discussion. [= C, K, Q, W, WV, X, Y, Z; < *G. clausa* Rafinesque – RAB, F, G, GW; < *Dasystephana decora* (Pollard) Small – S]

Gentiana autumnalis Linnaeus, Pinebarren Gentian. Savannas, pine flatwoods, sandhills, in a variety of sites varying from moist to very xeric, nearly always associated with *Pinus palustris* and/or *Aristida stricta* (in se. VA, NC, and SC). Late September-mid January (rarely at other times of the year, such as spring, in response to fire). This species is a "bimodal endemic," occurring in s. NJ and adjacent DE (at least formerly), and from se. VA south through e. NC to nc. SC. The related *G. pennelliana* Fernald (sometimes reduced to a subspecies of *G. autumnalis*) is endemic to the FL Panhandle; other siblings, *G. bicuspidata* (G. Don) Briq., *G. hooperi* Pringle, and *G. longicollis* Nesom, occur in Mexico. *G. autumnalis* is often overlooked, since it is very inconspicuous except when in flower, it usually flowers at a season when few botanists are about, and sterile plants greatly outnumber fertile ones. Vegetatively it is extremely distinctive once learned; the leaves are glossy, dark-green, opposite, oblanceolate to "oblinear," and twisted and curved in a manner reminiscent of an airplane propellor. [= RAB, C, F, GW, K, X, Z; = *Gentiana porphyrio* J.F. Gmelin – G; = *Dasystephana porphyrio* (J.F. Gmelin) Small – S; = *Gentiana autumnalis* ssp. *autumnalis* – Y; = *Pneumonanthe porphyrio* (Linnaeus) Greene]



Gentiana catesbaei Walter, Coastal Plain Gentian. Pocosins, moist savanna edges, edges of moist hardwood forests, bluff seepages. Late September-November. S. NJ south to ne. FL and e. Panhandle FL, on the Coastal Plain. [= RAB, C, G, GW, K, WH, X, Y, Z; > *G. catesbaei* var. *catesbaei* – F; > *G. catesbaei* var. *nummulariifolia* Fernald – F; > *Dasystephana latifolia* (Chapman) Small – S; > *D. parvifolia* (Chapman) Small – S; = *Pneumonanthe catesbaei* (Walter) F.W. Schmidt]

Gentiana clausa Rafinesque, Meadow Closed Gentian, Meadow Bottle Gentian. Forests. September-October. Mostly Appalachian: ME south to w. NC and ne. TN, extending east and west to adjacent physiographic provinces. [= – C, Q, WV; < *G. clausa* – C, K, W, X, Y, Z (also see *G. latidens*); < *G. clausa* – RAB, F, G, GW (also see *G. austromontana* and *G. latidens*); < *Dasystephana decora* (Pollard) Small – S; < *Pneumonanthe clausa* (Rafinesque) Greene]

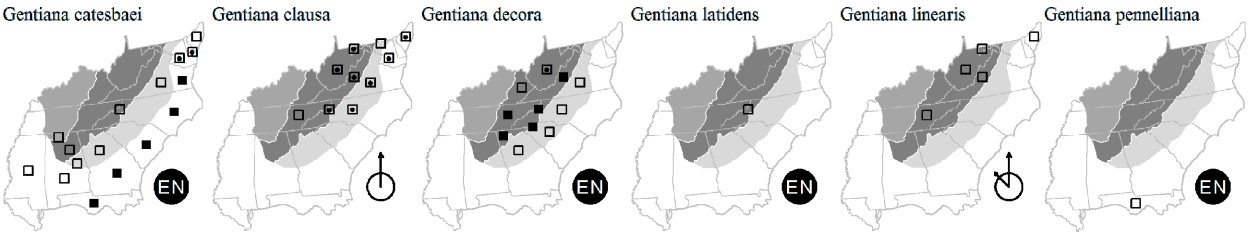
Gentiana decora Pollard, Appalachian Gentian. Forests. September-October. A Southern Appalachian endemic: c. WV south through w. VA to w. NC, e. TN, nw. SC, ne. GA. [= RAB, C, F, G, K, W, WV, X, Y, Z; < *Dasystephana decora* (Pollard) Small – S; = *Pneumonanthe decora* (Pollard) Greene]

Gentiana latidens (House) J.S. Pringle & Weakley, Balsam Mountain Gentian. Moist, often seeping, more or less open sites on rocky slopes. September-October. Restricted to the higher mountains sof NC south of Asheville, NC (Haywood,

Jackson, Macon, and Transylvania counties). [= Q; < *G. clausa* – RAB, GW, K, W, X, Y, Z; < *Dasystephana decora* (Pollard) Small – S; < *Pneumonanthe clausa* (Rafinesque) Greene; = *G. saponaria* var. *latidens* House]

Gentiana linearis Frölich, Narrowleaf Gentian. Openings in spruce-fir forests, bogs, at high elevations. September-October. Mainly occurring in ne. United States and e. Canada, west to Lake Superior, and south (scattered) in the Appalachians to sw. VA (in openings in spruce-fir forest near summit of Whitetop Mountain) and e. TN (Chester, Wofford, & Kral 1997). On Mount LeConte (Sevier County, TN), *G. linearis* occurs in thin soils around high elevation outcrops of Anakeesta Slate. See Pringle (1977) for extensive discussion of actual and putative southern occurrences of this species. [= C, F, G, K, W, WV, X, Y, Z; = *Pneumonanthe linearis* (Frölich) Greene]

Gentiana pennelliana Fernald, Wiregrass Gentian. Pine flatwoods. December-March. Endemic to Panhandle FL. [= GW, WH; = *Dasystephana tenuifolia* (Rafinesque) Pennell – S] {add to synonymy X, Y, Z}



Gentiana puberulenta J.S. Pringle, Prairie Gentian. {habitats}. W. NY west to ND, south to KY, sc. TN (Coffee County) (Chester, Wofford, & Kral 1997), LA, n. AR, and KS. Reports for WV are unconfirmed (Harmon, Ford-Werntz, & Grafton 2006). [= C, K, X, Y, Z; = *G. puberula* – F, G, misapplied; = *Dasystephana puberula* (Michaux) Small – S, misapplied]

Gentiana saponaria Linnaeus, Soapwort Gentian. Bogs, marshes, wet hardwood forests, other moist to wet habitats. Late September-November. NY west to n. IL, south to Panhandle FL and e. TX. A peculiar form with very narrow leaves has been found at several localities in Ashe and Watauga counties, NC and in the South Mountains, NC; it may warrant taxonomic recognition after further study. [= RAB, C, GW, K, W, WH, X, Y, Z; > *G. saponaria* – F, G, WV; > *G. cherokeensis* (W.P. Lemmon) Fernald – F, G; = *G. saponaria* var. *saponaria* – K; = *Dasystephana saponaria* (Linnaeus) Small – S; = *Pneumonanthe saponaria* (Linnaeus) F.W. Schmidt]

Gentiana villosa Linnaeus, Striped Gentian. Upland forests, sandhill/pocosin ecotones. Late August-November. Se. PA west to n. KY and w. TN, south to Panhandle FL and e. LA. [= RAB, C, F, G, K, W, WH, X, Y, Z; = *Dasystephana villosa* (Linnaeus) Small – S; = *Pneumonanthe villosa* (Linnaeus) F.W. Schmidt]

Gentianella Moench (Agueweed)

A genus of about 125-250 species, herbs, temperate. The separation of *Gentianella* from *Gentiana* appears to be well warranted; some characters suggest that *Gentianella* is more closely allied to *Swertia*, *Halenia*, and *Lomatogonium* than to *Gentiana* (Wood & Weaver 1982). A molecular analysis has confirmed this (Yuan & Küpfer 1995). References: Gillett (1957)=Z. Key based on Gillett (1957).

1 Calyx 8-10 mm long; calyx tube 3.0-3.5 mm long; calyx lobes 5-6 mm long, elliptic-lanceolate to oblanceolate with thickened margins, and with broadly flattened, frequently nerve-like keels; corolla ca. 20 mm long..... ***G. quinquefolia*** *var.* ***occidentalis***
1 Calyx 4-5 mm long; calyx tube 1.5-2.0 mm long; calyx lobes 2.0-2.5 mm long, narrowly triangular with hyaline margins and very prominent keels; corolla 16-18 mm long..... ***G. quinquefolia*** *var.* ***quinquefolia***

Gentianella quinquefolia (Linnaeus) Small *var.* ***occidentalis*** A. Gray, Western Agueweed. Calcareous barrens, dry and dry-mesic limestone woodlands. Late August-October. Var. *occidentalis* A. Gray is more western, from OH and s. ON west to MN, east and south to w. VA, sc. KY, AR, and se. KS. [= C, G; < *Gentiana quinquefolia* Linnaeus – RAB, GW, W; = *Gentiana quinquefolia* var. *occidentalis* (A. Gray) Hitchcock – F; = *Gentianella quinquefolia* ssp. *occidentalis* (A. Gray) J. Gillett – K, Z; = *Gentianella occidentalis* (A. Gray) Small – S]

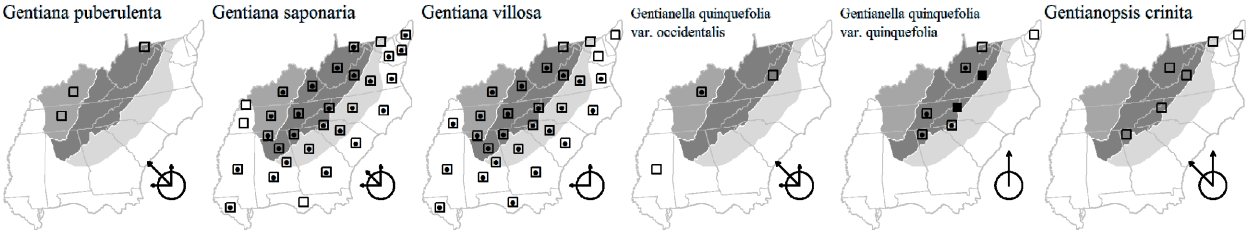
Gentianella quinquefolia (Linnaeus) Small *var.* ***quinquefolia***, Eastern Agueweed. Forests, grassy balds. Late August-October. Var. *quinquefolia* is primarily Appalachian, from ME west to w. NY and s. ON, south to n. GA and sc. TN. [= C, G; < *Gentiana quinquefolia* Linnaeus – RAB, GW, W, WV; = *Gentiana quinquefolia* var. *quinquefolia* – F; = *Gentianella quinquefolia* ssp. *quinquefolia* – K, Z; = *Gentianella quinquefolia* – S]

Gentianopsis Ma 1951 (Fringed-gentian)

A genus of about 20 species, herbs, of north temperate Asia and North America. The reasons for the recognition of *Gentianopsis* are enumerated by Ma (1951), Iltis (1965), and Wood & Weaver (1982). References: Gillett (1957)=Z; Iltis (1965); Ma (1951).

Gentianopsis crinita (Frölich) Ma, Eastern Fringed-gentian. Sunny or semi-shaded seepage areas over calcareous, mafic, or ultramafic rocks (such as limestone, amphibolite, or serpentinized olivine). September-October. ME, s. ON, and ND south to NJ, n. DE, IN, and IA (mostly north of the glacial maximum) and from PA south to nw. NC and ne. GA in the unglaciated

Appalachians. Certainly one of the most beautiful of our native plants. [= C, K; = *Gentiana crinita* Frölich – RAB, F, G, GW, W, WV; = *Anthopogon crinitum* (Frölich) Rafinesque – S; = *Gentianella crinita* (Frölich) G. Don ssp. *crinita* – Z]



Obolaria Linnaeus (Pennywort)

A monotypic genus, herb, of e. North America. References: Gillett (1959)=Z.

Obolaria virginica Linnaeus, Pennywort. Nutrient-rich, moist forests, mesic hammocks. March-May; May-June. NJ west to OH, s. IN, and s. IL, south to Panhandle FL and se. LA (reported from TX). The small purplish-green plants are inconspicuous, often nearly hidden under fallen leaves. *Obolaria* has well-developed mycorrhizae and may be substantially mycotrophic. [= RAB, C, F, G, K, S, W, WH, WV, Z]

Sabatia Adanson 1763 (Sabatia, Rose-gentian, Rose-pink, Marsh-pink, Sea-pink)
(contributed by B.A. Sorrie and A.S. Weakley)

A genus of about 20 species, of North America and the West Indies. References: Wilbur (1955)=Z.

1 Flowers with (7-) 8-12 (-14) corolla lobes.
  2 Pedicels < 5 mm long; calyx subtended by linear bracts that usually exceed the corolla lobes; terminal flowers in capitate clusters (less commonly single).
    3 Basal leaves similar in shape and size to the stem leaves; cauline leaves (25-) 35-50 (-65) mm long, (7-) 10-20 (-25) mm wide, 2-4× as long as wide; corolla lobes pale rose or white; [of mountain slopes, restricted in our area to sw. NC and nw. GA] ..... ***S. capitata***
    3 Basal leaves much broader and shorter than the stem leaves; cauline leaves (15-) 40-80 (-100) mm long, 1-3 mm wide, 20-60× as long as wide; corolla lobes medium rose to deep rose; [of bogs and savannas, of the Coastal Plain]..... ***S. gentianoides***
  2 Pedicels > 10 mm long; calyx not subtended by long bracts; terminal flower single.
    4 Upper stem leaves about as wide as the diameter of the stem, or narrower; calyx lobes terete or semi-terete; stems 6-12 dm tall; [of *Taxodium ascendens-Nyssa biflora* depressions and wet pine flatwoods in se. SC] ..... ***S. bartramii***
    4 Upper stem leaves much wider than the diameter of the stem; calyx lobes flat, linear to narrowly oblanceolate; stems 3-12 dm tall; [of various habitats, primarily along the shores of blackwater rivers or ponds, or in tidal marshes].
      5 Primary branches opposite; terminal flower short-stalked (much shorter than the first internode of the adjacent branch); stems 5-12 dm tall; [of drawdown blackwater riverbanks and similar situations]..... ***S. kennedyana***
      5 Primary branches usually alternate; terminal flower long-stalked (usually longer than the first internode of the adjacent branch); stems 3-7 dm tall; [of brackish marshes or openings along blackwater streams].
        6 Surficial stolons usually absent or poorly developed; internodes commonly much longer than leaves; [of tidal brackish or freshwater marshes]..... ***S. dodecandra***
        6 Surficial stolons usually present and well-developed, elongate; internodes shorter than to equaling the leaves; [of openings of blackwater streams]..... ***S. foliosa***
1 Flowers with 5-6 (-7) corolla lobes.
  7 Upper branches of main stem alternate.
    8 Calyx tube strongly winged; corolla lobes pink (rarely white); [w. KY, MS, and e. LA westward, and very rarely introduced further east].
      9 Leaves thick, succulent; leaf base broadly cuneate, nut at all clasping; [se. LA westwards]..... ***S. arenicola***
      9 Leaves thin; leaf base truncate to rounded, and clasping the stem; [w. KY, MS, and e. LA westward, and very rarely introduced further east] ..... ***S. campestris***
    8 Calyx tube not winged; corolla lobes pink or white; [more widespread, primarily Coastal Plain].
      10 Calyx lobes foliaceous, 5-8 mm wide, oblong to oblanceolate, mostly exceeding the corolla lobes ..... ***S. calycina***
      10 Calyx lobes linear-setaceous, 0.5-2 mm wide, if equaling the corolla lobes then very narrow and not foliaceous.
        11 Calyx lobes (3-) 4-7 (-8) mm long; corolla lobes white ..... ***S. brevifolia***
        11 Calyx lobes (4-) 6-17 (-23) mm long; corolla lobes pink (rarely white in individual plants).
          12 Plants perennial, often with several stems from a caudex; calyx lobes > 3/4× as long as the corolla lobes, and sometimes exceeding them; [of saturated soils from Coastal Plain savannas to Mountain bogs]..... ***S. campanulata***
          12 Plants annual, solitary; calyx lobes up to 3/4× as long as the corolla lobes
            13 Corolla lobes (18-) 20-25 mm long; leaves succulent (usually drying rugose and green) ..... ***S. grandiflora***
            13 Corolla lobes 10-15 mm long; leaves thin (usually drying flat and darkening)..... ***S. stellaris***
  7 Upper branches of main stem opposite.
    14 Corolla lobes pink (rarely white); pedicels at least in part > 5 mm long.
      15 Lower half of stem winged; leaves ovate, clasping, < 2× as long as wide; [widespread in our area]..... ***S. angularis***

15 Lower half of stem not winged; leaves elliptic to lanceolate, more or less tapered to the base, mostly > 3× as long as wide; [of the Coastal Plain or very rarely Piedmont] ..... ***S. brachiata***

14 Corolla lobes white or creamy white; pedicels (above the uppermost bracts or branches) ca. 1-2 (-5) mm long.

16 Lower portion of stem quadrangular, narrowly winged; plants annual or biennial, with 1 (-several) stems arising from a taproot..... ***S. quadrangula***

16 Lower portion of stem terete, not winged (though the upper stem is quadrangular or angled in *S. difformis*); plants perennial, with several stems arising from a short rhizome; [section *Eusabatia*, subsection *Difformes*].

17 Leaves and upper stem not glaucous; stem terete below, becoming quadrangular or quadrangular-angled above; corolla lobes (5-) 7-15 (-21) mm long; [widespread in our area]..... ***S. difformis***

17 Leaves and upper stem glaucous; stem terete throughout; corolla lobes (4-) 5-7 (-8) mm long; [of GA southward and westward].

18 Calyx-lobes erect, (0.1-) 0.2-1.5 (-2.0) mm long, as long as or shorter than the calyx-tube; [of sw. GA and n. FL westward to e. LA]..... ***S. macrophylla*** *var.* ***macrophylla***

18 Calyx lobes strongly recurved, (1.0-) 1.5-3 mm long, longer than the calyx-tube; [of e. and sc. GA south to ne. FL] ..... ***S. macrophylla*** *var.* ***recurvans***

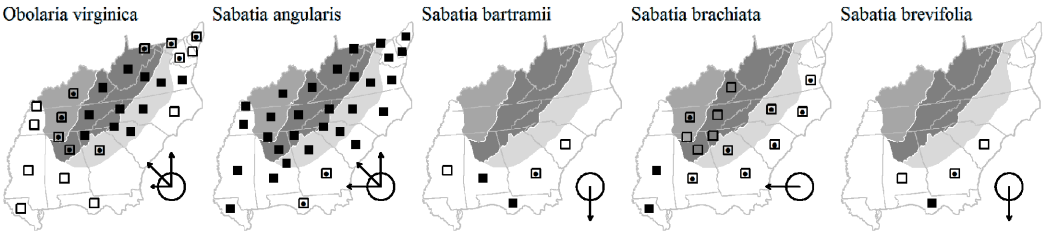
Sabatia angularis (Linnaeus) Pursh, Bitter-bloom, Common Marsh-pink. Forests, woodlands, marshes, fields, calcareous hammocks (in FL). July-August; September-October. NY west to s. MI, IL, and e. KS, south to Panhandle FL and e. TX. [= RAB, C, F, GW, K, W, WH, WV, Z; = *Sabbatia angularis* –S]

Sabatia arenicola Greenman, Sand Rose-gentian. Interdune depressions, wet savannas, saline flats. April-July. Se. LA west through TX to ne. MX. [= GW, K, Z]

Sabatia bartramii Wilbur, Bartram's Rose-gentian. Margins of *Taxodium ascendens-Nyssa* depressions, wet pine flatwoods. June-August; August-October. Ne. SC south to s. FL, west to s. AL and se. MS. [= GW, K, WH, Z; = *S. dodecandra* var. *coriacea* (Elliott) Ahles – RAB; = *Sabbatia decandra* (Walter) R.M. Harper – S]

Sabatia brachiata Elliott, Narrowleaf Rose-pink. Mesic pinelands, sandhills, pine savannas, pine flatwoods. Late May-July; August-September. Se. VA south to s. GA, west to LA, north in the interior to c. TN and se. MO. [= RAB, C, F, GW, K, W, Z; = *Sabbatia brachiata* – S]

Sabatia brevifolia Rafinesque. Pine savannas. September-October; October-November. E. SC south to peninsular FL, west to s. AL. [= RAB, GW, K, WH, Z; = *Sabbatia elliottii* Steudel – S]



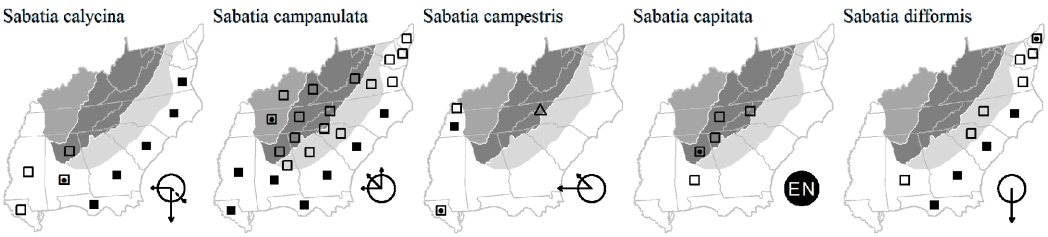
Sabatia calycina (Lamarck) Heller, Coastal Rose-pink. Swamp forests, river banks. June-October; July-October. Se. VA south to s. FL, west to se. TX; e. Cuba and Hispaniola. [= RAB, C, F, GW, K, WH, Z; = *Sabbatia calycina* – S]

Sabatia campanulata (Linnaeus) Torrey, Slender Marsh-pink. Pine savannas, bogs. June-August; September-October. MA south to ne. FL, oanhandle FL, west to LA and AR; scattered inland as in w. VA, w. NC, c. TN, and KY. [= RAB, C, GW, K, W, WH, Z; > *S. campanulata* var. *campanulata* – F; > *S. campanulata* var. *gracilis* (Michaux) Fernald – F; < *Sabbatia campanulata* – S]

* ***Sabatia campestris*** Nuttall, Western Marsh-pink, Prairie Rose-gentian, Prairie Sabatia. Roadsides and woodland edges; native of c. United States. July-August; September-October. [= RAB, C, F, GW, K, Z]

Sabatia capitata (Rafinesque) Blake, Cumberland Rose-gentian. Sloping woodlands and meadows, over sandstone or shale. July-August; September-October. Sw. NC and se. TN south to nw. GA and c. AL. Apparently present in NC, at least formerly, based on a specimen collected "from Cherokee", probably Cherokee County, NC, a remarkably poorly botanized area. [= K, Z; = *Lapithea capitata* (Rafinesque) Small – S]

Sabatia difformis (Linnaeus) Druce, Lanceleaf Rose-gentian, White Sabatia. Pine savannas, bogs, pocosins. May-September; September-December. S. NJ south to c. peninsular FL, west to s. AL. [= RAB, C, F, GW, K, WH, Z; = *Sabbatia difformis* – S]



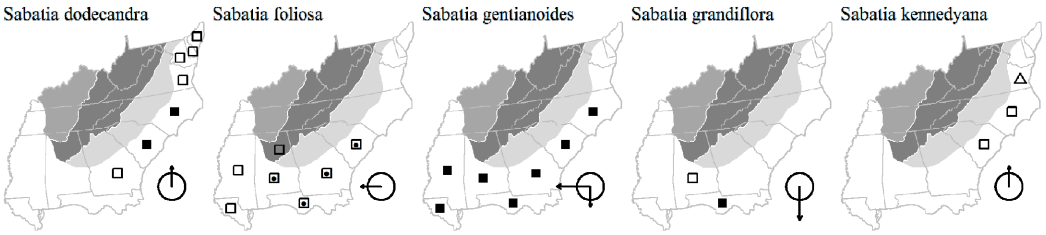
Sabatia dodecandra (Linnaeus) Britton, Sterns, & Poggenburg, Perennial Sea-pink, Large Marsh Rose-pink. Tidal brackish and freshwater marshes. June-August; August-October. CT south to e. SC and e. GA (Sorrie 1998b). [= F; < *S. dodecandra* var. *dodecandra* – RAB (also see *S. foliosa*); = *S. dodecandra* var. *dodecandra* – C, GW, K, Z; = *Sabbatia dodecandra* – S]

Sabatia foliosa Fernald. Openings along blackwater rivers, cypress ponds. June-August; August-October. E. SC south to ne. FL and Panhandle FL, west to se. TX. [< *S. dodecandra* var. *dodecandra* – RAB; = *S. dodecandra* (Linnaeus) Britton, Sterns, & Poggenburg var. *foliosa* (Fernald) Wilbur – GW, K, Z; > *Sabbatia foliosa* – S; > *Sabbatia harperi* Small – S; = *S. dodecandra* – WH]

Sabatia gentianoides Elliott. Pine savannas, bogs. July-August; September-October. NC south to ne. FL and Panhandle FL, west to se. TX. [= RAB, GW, K, WH, Z; = *Lapithea gentianoides* (Elliott) Grisebach – S]

Sabatia grandiflora (Gray) Small, Largeflower Rose-gentian. Cp (FL): wet flatwoods, marshes, cypress-gum depressions, limesink ponds, borrow pits; common. Ne. FL, Panhandle FL, s. AL, south to s. FL. [= GW, K, WH, Z; = *Sabbatia grandiflora* – S]

Sabatia kennedyana Fernald, Plymouth Gentian. Seasonally exposed drawdown banks of the Waccamaw River, in adjacent ditches and disturbed flats (in se. NC and ne. SC), and very rarely on shores of beaver ponds (in e. VA, by introduction). June-August; August-October. This species has a strange, disjunct range, likely related to Pleistocene refugia on the (now) Continental shelf, present in s. NS; e. MA and RI; se. NC and ne. SC. The record of the species in e. VA (Caroline County) reported by Fleming & Ludwig (1996) has now been determined to be a deliberate introduction. Studies underway suggest that the Carolina plants may differ varietally from those in New England (Sorrie, pers. comm.). [= C, F, GW, K, Z; = *S. dodecandra* var. *kennedyana* (Fernald) Ahles – RAB]

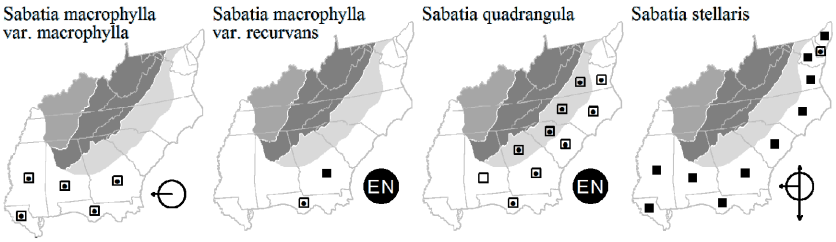


Sabatia macrophylla Hooker *var.* ***macrophylla***, Large-leaf Rose-gentian. Wet savannas. Sw. GA west to e. LA. [= K, Z; < *S. macrophylla* – GW, WH; = *Sabbatia macrophylla* Hooker – S]

Sabatia macrophylla Hooker *var.* ***recurvans*** (Small) Wilbur, Small's Rose-gentian. Wet savannas. E. and c. GA south to ne. FL; it may occur in se. SC. [= K, Z; < *S. macrophylla* – GW, WH; = *Sabbatia recurvans* Small – S]

Sabatia quadrangula Wilbur, Four-angle Sabatia. Sandhills, moist forests, pocosin ecotones. June-September; August-November. E. VA south to n. peninsular FL, west to s. AL. [= RAB, C, GW, K, WH, Z; = *S. paniculata* Michaux – F, misapplied; = *Sabbatia paniculata* – S]

Sabatia stellaris Pursh, Annual Sea-pink. Brackish marshes. July-October; August-November. S. MA south to s. FL, west to LA; Bahama Islands, Cuba, c. Mexico. [= RAB, C, F, GW, K, WH, Z; < *Sabbatia campanulata* – S]



352. LOGANIACEAE R. Brown ex Martius 1827 (Logania Family) [in GENTIANALES]

As here rather narrowly interpreted, Loganiaceae consists of 12 genera and about 420 species, herbs and subshrubs, of tropical, subtropical, and warm temperate areas of the Old and New Worlds. Other genera in our area which have traditionally been considered components of the Loganiaceae now are clearly better placed in the small families Tetrachondraceae *(Polypremum*), Gelsemiaceae (*Gelsemium*), and Scrophulariaceae (*Buddleja*), more closely related to other families (such as Rubiaceae) than to Loganiaceae sensu stricto (Struwe, Albert, & Bremer 1994). The affinities of *Spigelia* appear to be with a small group of tropical and subtropical genera, the largest of which is *Strychnos*. Struwe, Albert, & Bremer (1994) treated this group as the family Strychnaceae, based on a cladistic analysis of data. A later, more thorough analysis suggested that Strychnaceae is best recombined with Loganiaceae (Backlund, Oxelman, & Bremer 2000). References: Rogers (1986). [also see *GELSEMIACEAE*, *SCROPHULARIACEAE*, and *TETRACHONDRACEAE*]

1 Woody vine ..... ***Gelsemium*** *[see GELSEMIACEAE]*
1 Herb.
  2 Corolla funnelform, 0.1-0.2 cm long, white ..... ***Mitreola***
  2 Corolla tubular, 3-6 cm long, red and yellow ..... ***Spigelia***

Mitreola Linnaeus 1758 (Miterwort)

A genus of about 6 species, herbs, tropical, subtropical, and warm temperate. References: Nelson (1980)=Y; Rogers (1986)=Z.

1 Leaves 2-8 cm long petiolate or sessile and tapering to a cuneate base ..... ***M. petiolata***
1 Leaves 1-4 cm long, sessile, the base rounded.
2 Mature seed reticulate; mature capsule smooth to slightly and finely tuberculate; larger leaves ca. 4× as long as wide ..... ***M. angustifolia***
2 Mature seed smooth; mature capsule markedly papillose-warty; larger leaves 1.5-2× as long as wide ..... ***M. sessilifolia***

Mitreola angustifolia (Torrey & A. Gray) J.B. Nelson, Narrow-leaved Miterwort. Clay-based Carolina bays, other Coastal Plain depressional wetlands. June-August. Se. SC south to n. FL, and west to s. AL and se. MS (Sorrie & Leonard 1999). [= GW, WH, Y; < *M. sessilifolia* – K, Z; = *Cynoctonum angustifolium* (Torrey & A. Gray) Small – S]

Mitreola petiolata (J.F. Gmelin) Torrey & A. Gray, Caribbean Miterwort. Swamps, marshes, ditches, other wet habitats. July-September; September-November. Se. VA south to FL and west to AR and c. TX, north in the interior to nw. GA and c. and se. TN; Mexico, the West Indies, and n. South America. [= GW, K, WH, Y; = *Cynoctonum mitreola* (Linnaeus) Britton – RAB, C, F, G, S]

Mitreola sessilifolia (J.F. Gmelin) G. Don, Small-leaved Miterwort. Wet savannas, pocosins, ditches, margins of limesink depressions (dolines). Late June-August; September-October. Se. VA south to FL, west to e. TX, and in the Bahama Islands. [= GW, WH, Y; = *Cynoctonum sessilifolium* J.F. Gmelin – RAB, C, F, G, S; < *M. sessilifolia* – K, Z (also see *M. angustifolia*)]

Spigelia Linnaeus 1753 (Pinkroot)

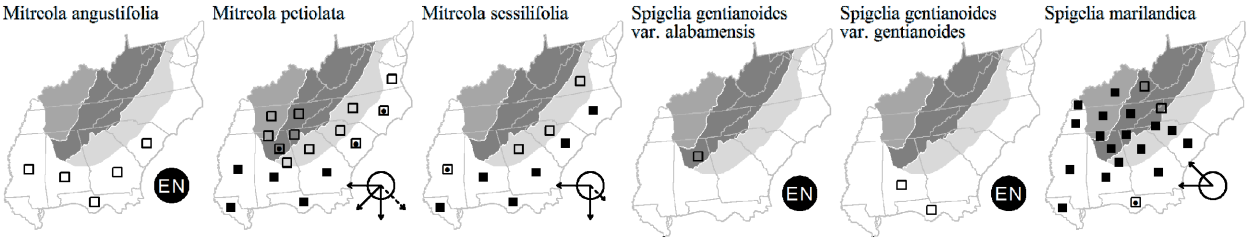
A genus of about 50 species, herbs, of tropical and warm temperate America. References: Gould (1996)=Z; Rogers (1986)=Y.

1 Corolla scarlet on the outer surface, yellow on the inner surface ..... ***S. marilandica***
1 Corolla light pink to white on the outer and inner surfaces.
2 Corolla 36-50 mm long; pistil 24-27 mm long; sepals 8-11 mm long; inflorescence with 2-4 flowers; [of dolomitic glades in Bibb Co. AL] ..... ***S. gentianoides*** *var.* ***alabamensis***
2 Corolla 25-30 mm long; pistil 17-19 mm long; sepals 4-6 mm long; inflorescence with 3-8 flowers; [of pine savannas of Panhandle FL] ..... ***S. gentianoides*** *var.* ***gentianoides***

Spigelia gentianoides Chapman ex Alphonse de Candolle *var.* ***alabamensis*** K. Gould. Dolostone glades. Endemic to Bibb County, AL (Gould 1996, Allison & Stevens 2001). [= K, Z]

Spigelia gentianoides Chapman ex Alphonse de Candolle *var.* ***gentianoides***. Pine savannas. Endemic to FL Panhandle (Calhoun, Jackson, and Washington counties). [= K, Z; = *S. gentianoides* – S, Y (var. *alabamensis* not discovered at the time); < *S. gentianoides* – WH]

Spigelia marilandica (Linnaeus) Linnaeus, Pinkroot, Wormgrass. Woodlands and forests, usually on circumneutral soils. May-June; late June-July. SC, sw. NC (Cherokee Co. and Macon Co.), and TN west to s. IN and OK, south to Panhandle FL and TX; some floras allege its occurrence north to VA, MD, NJ, and PA. *S. marilandica* will likely be found in sw. VA. [= RAB, C, F, G, K, S, W, WH]



353. GELSEMIACEAE (G. Don) Struwe & V. Albert 1995 (Jessamine Family) [in GENTIANALES]

A family of 2 genera and about 10 species, shrubs and vines, of tropical and warm temperate America, Africa, and Asia. There is persuasive evidence that *Gelsemium* and *Mostuea* Didr., traditionally treated as part of a heterogeneous Loganiaceae, should be accorded family status as Gelsemiaceae (Backlund, Oxelman, & Bremer 2000; Struwe, Albert, & Bremer 1994; Sennblad & Bremer 1996). The Gelsemiaceae form a clade most closely related to the Apocynaceae (Backlund, Oxelman, & Bremer 2000). References: Backlund, Oxelman, & Bremer (2000); Struwe, Albert, & Bremer (1994); Sennblad & Bremer (1996); Rogers (1986).

Gelsemium Antoine Laurent de Jussieu (Yellow Jessamine)

A genus of 3 species, vines, our 2 species in se. North America (and also Central America) and 1 species in e. Asia. References: Wyatt et al. (1993); Duncan & Dejong (1964); Godfrey (1988); Rogers (1986)=Z; GW.

1 Sepals acuminate apically, persistent on the fruit; capsule elliptical, 1.0-1.6 cm long, 6-8 mm broad, the tapering tip bearing a definite beak about 3 mm long; seeds wingless; flowers odorless (rarely fragrant), usually golden-yellow ..... ***G. rankinii***

1 Sepals obtuse to broadly acute, not persistent on the fruit; capsule oblong, 1.5-2.5 cm long, 8-12 mm broad, very abruptly narrowed to a beak 1.5-2 mm long; seeds with a prominent membranous wing sharply differentiated from the body of the seed; flowers fragrant, usually lemon-yellow ..... ***G. sempervirens***

Gelsemium rankinii Small, Swamp Jessamine. Swamps of blackwater rivers, restricted in NC to the se. corner of the state, most notably the swamps of the Waccamaw and Black rivers. March-April; September-October. Se. NC south through SC and GA to the FL Panhandle, and west to e. LA. See Wyatt et al. (1993) and Duncan & Dejong (1964) for extensive discussions of morphology, habitat, pollination, genetics, distribution, and evolutionary relationships of our 2 species of *Gelsemium*. [= RAB, GW, K, S, WH, Z]

Gelsemium sempervirens (Linnaeus) St. Hilaire, Carolina Jessamine. In a wide range of habitats, from swamp forests to dry uplands and thickets, also commonly planted as an ornamental. March-early May; September-November. VA, se. TN, and AR south to c. peninsular FL and e. TX; disjunct in Guatemala and Mexico (Chiapas, Oaxaca, Puebla, and Veracruz). Jessamine climbs to the tops of trees. [= RAB, F, G, GW, K, S, W, WH, Z]

354. APOCYNACEAE A.L. de Jussieu 1789 (Dogbane Family) [in GENTIANALES]

As here circumscribed including the Asclepiadaceae, a family of about 480 genera and about 4800 species, lianas, shrubs, herbs, and trees, widespread in tropical and temperate areas. There appears to be overwhelming evidence favoring the combination of the Asclepiadaceae into the Apocynaceae; see, for instance, Rosatti (1989), Sennblad & Bremer (1996), and many others. References: Rosatti (1989); Liede (1997a).

1 Plant a twining herbaceous or woody vine.
- 2 Leaves ovate, cordate at the base, < 2.5× as long as wide.
  - 3 Plants in flower.
    - 4 Petals white; gynostegial corona nearly as long to longer than the corolla lobes ..... ***Cynanchum laeve***
    - 4 Petals brown, yellow, yellow-green, cream, or maroon (white in *Matelea baldwyniana*); gynostegial corona < half the length of the corolla lobes.
      - 5 Corolla lobes glabrous on the outer surface, very stiff in texture; dorsal anther appendages laminar; carpels smooth and angled ..... ***Gonolobus***
      - 5 Corolla lobes glandular-puberulent on the outer surface, herbaceous in texture; dorsal anther appendages absent; carpels muricate. ***Matelea***
  - 3 Plants in fruit.
    - 6 Follicles muricate ***Matelea***
    - 6 Follicles smooth and angled.
      - 7 Leaves deeply cordate, tapering steadily to an acuminate apex ***Cynanchum laeve***
      - 7 Leaves cordate, broadly rounded, tapering abruptly to an acute, obtuse, or apiculate apex ***Gonolobus***
- 2 Leaves ovate, lanceolate, or linear, not cordate at the base, > 1.5× as long as wide
  - 8 Leaves linear, the margins parallel
    - 9 Leaves petiolate; calyx lobes deltoid, obtuse, ca. 1 mm long; leaves petiolate, not reflexed, often caducous; follicle 1-3 mm in diameter; [of se. SC and south] ***Cynanchum scoparium***
    - 9 Leaves sessile; calyx lobes lanceolate, acute, (1.3-) 1.5-2.5 mm long; leaves sessile, reflexed, persistent; follicle 6-7 mm in diameter; [of ne. NC and south] ***Seutera angustifolia***
  - 8 Leaves ovate to lanceolate.
    - 10 Flowers brownish-purple, with a corona of narrow segments; fruit 10-15 cm long, > 5 mm in diameter; leaves obtuse to acute at the tip (rarely slightly acuminate) ***[Periploca]***
    - 10 Flowers white to creamy yellow, lacking a corona; fruit 10-25 cm long, 1-2 mm in diameter; leaves acuminate at the tip ..... ***Trachelospermum***

1 Plant an erect or trailing herb or shrub.
- 11 Plant a woody shrub.
  - 12 Plant rhizomatous, suffrutescent, < 4 dm tall; leaves narrowly to broadly ovate; flowers blue, lavender, or white ***Vinca***
  - 12 Plant erect, > 4 dm tall; leaves either lanceolate or elliptic; flowers yellow, white, pink, or red.
    - 13 Flowers yellow; shrub 4-12 dm tall, with only a few wand-like branches; [very rare waif in our area] ***Angadenia***
    - 13 Flowers white, pink, or red; shrub 10-40 dm tall, much branched from the base; [commonly cultivated in our area (and sometimes persistent), particularly near the coast] ***Nerium***
- 11 Plant an herb.
  - 14 Flowers with conspicuous corona; follicles not paired; seeds with coma present ***Asclepias***
  - 14 Flowers lacking corona; follicles paired (occasionally single by abortion); seeds with coma absent (*Catharanthus, Amsonia*) or present (*Apocynum*).
    - 15 Leaves alternate (rarely a few on a plant subopposite) ***Amsonia***
    - 15 Leaves opposite.
      - 16 Flower < 8 mm across; paired follicles pendent, 10-22 cm long; seeds with coma; mature plants normally > 7 dm tall ... ***Apocynum***
      - 16 Flower > 20 mm across; paired follicles erect, 1.5-2.5 cm long; seeds lacking coma; mature plants 2-6 dm tall ..... ***Catharanthus***

Amsonia Walter 1788 (Blue-stars)

A genus of about 20 species, herbs, of temperate North America and Japan. References: Woodson (1928)=Z.

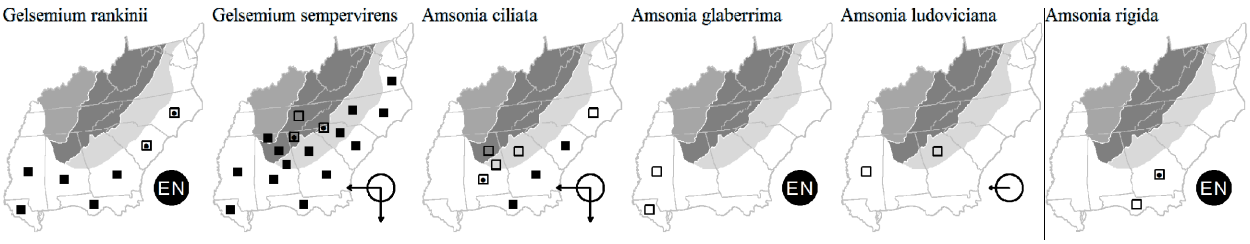
1 Corolla glabrous on the outer surface; stem pubescent (*A. ciliata*) or glabrous (*A. rigida*); [of the Coastal Plain from se. and sc. NC southward].
2 Leaves linear to lanceolate, the lower leaves 4-30× as long as wide, the upper leaves 1mm or less wide; [of dry, sandy habitats, such as sandhills] ..... ***A. ciliata***
2 Leaves elliptic, the lower and upper mostly 3-5× as long as wide, all leaves > 5 mm wide; [of seasonally flooded depression wetlands and moist pinelands] ..... ***A. rigida***
1 Corolla pubescent on the outer surface; stem glabrous; [more widespread in our area].
3 Follicles pubescent ..... ***A. ludoviciana***
3 Follicles glabrous.
4 Leaf blades ovate to oblong-lanceolate, 1-6 cm wide; inflorescence dense, many-flowered; leaves glabrous, glaucous beneath ..... ***A. tabernaemontana*** *var.* ***tabernaemontana***
4 Leaf blades lanceolate to linear-lanceolate, 1-3 cm wide; inflorescence loose, few-flowered; leaves pubescent (glabrate in age) ..... ***A. tabernaemontana*** *var.* ***gattingeri***

Amsonia ciliata Walter, Sandhills Bluestar. Sandhills. April; September-October. Two varieties have been traditionally recognized since the monograph of Woodson (1928), var. *ciliata* (leaves strongly heteromorphic, the lower leaves lanceolate, 4-10 mm wide (mostly 4-15× as long as wide), the upper about 1 mm wide; inflorescence barely held above the foliage) and var. *tenuifolia* (leaves slightly or not at all heteromorphic, the lower leaves linear, 1-3 mm wide (mostly 15-30× as long as wide), the upper < 1 mm wide; inflorescence usually held well above the foliage). They do not seem to be clearly separable morphologically, and their distributions are very largely overlapping, suggesting that they are merely forms. Se. NC south to c. peninsular FL, west to c. and s. AL; disjunct in Ozark-Ouachita highlands of sc. MO, w. AR, and se. OK. [= RAB, WH; > *A. ciliata* Walter var. *ciliata* – K, S, Z; > *A. ciliata* Walter var. *tenuifolia* (Rafinesque) Woodson – K; > *A. ciliata* var. *filifolia* Wood – F, G, S; > *A. ciliata* var. *tenuifolium* – Z, misspelling]

Amsonia glaberrima Woodson. {habitat}. MS, LA. [= Z; < *A. tabernaemontana* var. *tabernaemontana* – K; < A. amsonia – S]

Amsonia ludoviciana Vail, Louisiana Bluestar. Open woodlands around outcrops of Lithonia granitic gneiss, {other habitats}. So far as is known, endemic to LA, MS and GA; not native or naturalized in SC, contrary to Kartesz (1999). [= GW, K, S, Z]

Amsonia rigida Shuttleworth ex Small, Stiff Bluestar, Pond Bluestar. Seasonally flooded depression wetlands and moist pinelands. S. GA to n. peninsular FL, west to s. MS. [= GW, K, S, Z; < *A. tabernaemontana* – WH]



Amsonia tabernaemontana Walter *var.* ***gattingeri*** Woodson. Mt (GA): rich forests, rocky forests, riverside scours; rare. IL, MO, and se. KS south to ne. TX, and apparently disjunct in the Interior Low Plateau of sc. KY, c. TN (Chester, Wofford, & Kral 1997), and in n. GA. [= F, K, Z; < *A. tabernaemontana* – C, GW, W; < *A. salicifolia* Pursh – S]

Amsonia tabernaemontana Walter *var.* ***tabernaemontana***, Wideleaf Blue-stars. Mt (GA, NC, SC), Pd (DE*, GA, NC, SC, VA), Cp (GA, NC, SC, VA): floodplain forests, moist, rich slope forests; common (uncommon in DE and VA, uncommon in Mountains). April; August-September. Se. VA west to s. IL, MO, and KA, south to GA, LA, e. OK, and TX. The varieties *tabernaemontana* and *salicifolia*, while strikingly different in their extreme expressions, have nearly the same distribution and do intergrade; they are probably not worthy of recognition. [= C, G, W; > *A. tabernaemontana* var. *tabernaemontana* – RAB, G, K, Z; > *A. tabernaemontana* var. *salicifolia* (Pursh) Woodson – RAB, G, K, Z; < *A. tabernaemontana* – C, GW, W; < *A. amsonia* (Linnaeus) Britton – S; < *A. salicifolia* Pursh – S (also see var. *gattingeri*)]

Angadenia Miers 1878 (Pineland Allamanda)

A genus of 2 species, of Florida and the West Indies.

* ***Angadenia berteroi*** (Alphonse de Candolle) Miers, Pineland Golden-trumpet, Pineland Allamanda, Lice-root. Cp (NC): disturbed, acid, peaty soil; rare, native of s. FL, the Bahamas, Cuba, and Hispaniola. The only record in our area is from an agricultural experiment station near Wenona, Washington County, NC (Hayes 1946), where presumably introduced via cattle; the species has probably not persisted in our area. [= K; > *Rhabdadenia corallicola* Small – S]

Apocynum Linnaeus 1753 (Dogbane, Indian-hemp)

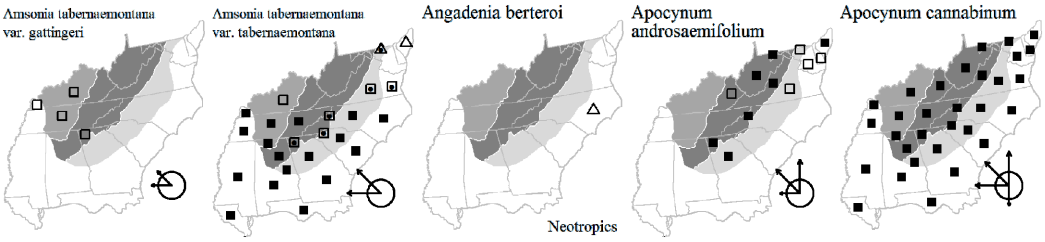
A genus of about 12 species, herbs, of temperate e. and c. Asia and North America. References: Woodson (1930)=Z.

1 Corolla 5-10 mm long, pink or white with pink veins, the lobes spreading or recurved.
2 Leaves drooping; corolla ca. 3× as long as the calyx lobes ..... ***A. androsaemifolium***

2 Leaves spreading; corolla ca. 2× as long as the calyx lobes ..... ***A. ×floribundum***
1 Corolla 3-6 mm long, white, greenish, or yellowish, the lobes erect or slightly outcurved.
3 Leaves of the main stem with petioles 5-10 mm long; leaf base cuneate to rounded; [widespread in our area] ..... ***A. cannabinum***
3 Leaves of the main stem sessile or on petioles to 3 mm long; leaf base rounded or cordate; [of VA and WV northward] ..... ***A. sibiricum***

Apocynum androsaemifolium Linnaeus, Spreading Dogbane. Mt (GA, NC, VA, WV), Pd (DE, GA, VA), Cp (DE): forests, woodlands, roadsides, pastures; common (rare in DE). June-August; September-October. NL (Newfoundland) to BC south to w. NC, c. GA, TX, and AZ. [= RAB, C, F, K, S, W; > *A. androsaemifolium* var. *androsaemifolium* – G, Z; > *A. androsaemifolium* var. *glabrum* Macoun – G; > *A. androsaemifolium* var. *incanum* A. deCandolle – Z]

Apocynum cannabinum Linnaeus, Hemp Dogbane, Indian-hemp. Cp (DE, GA, NC, SC, VA), Pd (DE, GA, NC, SC, VA), Mt (GA, NC, SC, VA, WV): forests, woodlands, roadsides, pastures; common. May-July; September-October. QC, MB, and WA south to FL, TX, CA. [= RAB, C, S, W; > *A. cannabinum* var. *cannabinum* – F, G; > *A. cannabinum* var. *pubescens* (Mitchell) Woodson – F, G, Z; > *A. cannabinum* var. *nemorale* (G.S. Miller) Fernald – F; > *A. cannabinum* var. *glaberrimum* A. de Candolle – G, Z; > *A. cannabinum* var. *greeneanum* (Béguinot & Belosersky) Woodson – Z; < *A. cannabinum* – K]



Apocynum ×floribundum Greene (pro sp.) [***A. androsaemifolium* × *cannabinum***]. Forests, woodlands, roadsides, pastures. June-July; September-October. Sometimes occurring in populations seemingly lacking one or both parents. [= C, K; = *A. medium* Greene – RAB, F, S, W; > *A. medium* var. *medium* – Z]

Apocynum sibiricum Jacquin. Forests, woodlands, riverside scour areas, roadsides, pastures. July-September; September-October. NL (Newfoundland) and BC south to e. VA, w. VA, WV, and MO. *A. sibiricum* var. *cordigerum* has been found in Kent County, MD (Steury, Tyndall, & Cooley 1996). [= C, W; > *A. sibiricum* var. *sibiricum* – F, G; > *A. sibiricum* var. *cordigerum* (Greene) Fernald – F, G; < *A. cannabinum* – K; > *A. hypericifolium* Aiton var. *hypericifolium* – Z; > *A. hypericifolium* Aiton var. *cordigerum* (Greene) Béguinot & Belosersky – Z]

Asclepias Linnaeus 1753 (Milkweed)

A genus of about 100 species, herbs, temperate and tropical, of North and Central America. References: Woodson (1954)=Z; Turner (2009b)=Y; Farmer & Bell (1985)=X.

1 Sap clear; leaves alternate; corolla orange to yellow ..... **Key A**
1 Sap milky (the milkiness often difficult to show in *A. verticillata*, which has numerous, whorled, linear leaves); leaves opposite, subopposite, or whorled; flowers orange, red, white, cream, green, pink, or purple.
2 Leaves linear, > 10× as long as wide ..... **Key B**
2 Leaves lanceolate, ovate, or elliptic, < 1-5 (-10)× as long as wide.
3 Leaves sessile, subsessile, or with petioles to 3 mm long ..... **Key C**
3 Leaves with petioles (3-) 5-20 mm long.
4 Plants in flower ..... **Key D**
4 Plants in fruit (or sterile) ..... **Key E**

Key A – milkweeds with clear sap and alternate leaves

1 Leaves cuneate at the base; leaves usually obovate to oblanceolate (widest beyond the middle); [s. NH west to OH, south to Panhandle FL and e. TX widespread eastward] ..... ***A. tuberosa* var. *tuberosa***
1 Leaves cordate to hastate at the base; leaves usually lanceolate, ovate, or elliptic (widest at or below the middle).
2 Leaf margins flat; leaves widest towards the base; [PA, WV, KY, TN, MS westward] ..... ***A. tuberosa* var. *interior***
2 Leaf margins usually crisped; leaves widest near the middle; [of se. Coastal Plain, se. VA south to s. FL, west to s. MS] ..... ***A. tuberosa* var. *rolfsii***

Key B – milkweeds with milky sap, with linear leaves opposite, subopposite, or whorled

1 Leaves **either** mostly in whorls of 3-6 (sometimes some nodes with merely opposite leaves), **or** subopposite (the leaves more-or-less paired but separated by 0.5-3 mm); corolla whitish or greenish, usually suffused with rose-purple (especially at the tips of the corolla lobes).
2 Leaves mostly in whorls of 3-6 (sometimes some nodes with merely opposite leaves); leaves 1.5-7 cm long, 1-2 mm wide; seeds ca. 5 mm long, the coma ca. 2.5 cm long; milky sap often difficult to show ..... ***A. verticillata***
2 Leaves subopposite (the leaves more-or-less paired but separated by 0.5-3 mm); leaves (3-) 5-18 cm long, (1-) 2-10 mm wide; seeds ca. 7-11 mm long, the coma 3-5 cm long; milky sap obvious and profuse.

3 Umbel 1, terminal; corona 5-7 mm in diameter; horns present, about as long as the hood; hoods ca. 2-4 mm long, surpassing the anther heads; [dry pinelands of the Coastal Plain]..... ***A. michauxii***
3 Umbels 1-4, terminal and from upper nodes; corona 2-3 mm in diameter; horns absent; hoods ca. 2 mm long, surpassed by the anther heads; [**either** wet pinelands of the Coastal Plain **or** dry glades or woodlands].
4 Pedicels with spreading hairs; umbels 2-10, each with up to 30-100 flowers; leaves minutely scabrous; [dry glades or woodlands, known from the Mountains of nw. GA, e. TN, w. WV westward]..... ***A. hirtella***
4 Pedicels with incurved hairs; umbels 1-6, each with 10-30 flowers; leaves glabrous or nearly so; [wet pinelands of the Coastal Plain]. ..... ***A. longifolia***

1 Leaves opposite; corolla as above, or creamy yellow, purple, or orange-red.
5 Leaves 2.5-4.5 cm long, puberulent beneath, sessile; corolla lobes erect, creamy yellow to dull or greenish white, 7-10 mm long; plant 1-4 dm tall; [dryish pinelands of the Coastal Plain] ..... ***A. pedicellata***
5 Leaves 5-20 cm long, glabrous or glabrate beneath (rarely puberulent), sessile to petiolate; corolla lobes reflexed, either orange-red or usually with at least some purple (rarely merely whitish or greenish), 3-7 mm long (except 8-11 mm long in the orange-red *A. lanceolata*); plant 1-15 dm tall; [collectively of various habitats].
6 Leaves with petioles 1-10 mm long; leaves 5-15 mm wide; plants 5-15 dm tall.
7 Petiole 4-10 mm long; corolla pink (rarely white), the lobes 3-5.5 mm long; hoods 1-2 mm long; horns longer than the hoods; [mostly of the Mountains and Piedmont]..... ***A. incarnata*** *var.* ***incarnata***
7 Petiole 1-3 mm long; corolla orange-red, the lobes 8-11 mm long; hoods 5-6 mm long; horns slightly shorter than the hoods; [of the Coastal Plain]..... ***A. lanceolata***
6 Leaves with petioles 0-1 mm long; leaves 1-7 mm wide; plants 1-7 dm tall.
8 Leaves 1-2 mm wide; each hood with 2 erect, acuminate, marginal teeth on the inner side (adjoining the anther heads) ..... ***A. cinerea***
8 Leaves 3-7 mm wide; each hood truncate, lacking prominent marginal teeth.
9 Umbel 1, terminal; corona 5-7 mm in diameter; horns present, about as long as the hood; hoods ca. 2-4 mm long, surpassing the anther heads; [dry pinelands]..... ***A. michauxii***
9 Umbels 1-4, terminal and from upper nodes; corona 2-3 mm in diameter; horns absent; hoods ca. 2 mm long, surpassed by the anther heads; [**either** of wet pinelands of the Coastal Plain **or** dry glades or woodlands].
10 Pedicels with spreading hairs; umbels 2-10, each with up to 30-100 flowers; leaves minutely scabrous; [dry glades or woodlands, east to nw. GA, TN, and WV] ..... ***A. hirtella***
10 Pedicels with incurved hairs; umbels 1-6, each with 10-30 flowers; leaves glabrous or nearly so; [wet pinelands of the Coastal Plain]..... ***A. longifolia***

Key C – milkweeds with milky sap, with sessile, nonlinear leaves

1 Leaves 2-5 cm long, 0.3-1.0 cm wide; corolla lobes erect, creamy yellow to greenish white, 7-10 mm long; plant 1-4 dm tall; [of dryish pinelands of the Coastal Plain of NC and SC]..... ***A. pedicellata***
1 Leaves 3-30 cm long, 0.5-11 cm wide (not simultaneously < 5 cm long and < 1 cm wide); corolla lobes reflexed, either orange-red, purple, pink, or green, 5-15 mm long; plant 2-10 dm tall; [collectively of various habitats, including dryish pinelands of the Coastal Plain].
2 Leaves cordate-clasping at base, 3-10 cm wide, 1-2× as long as wide; stem and leaves glabrous and usually also glaucous.
3 Plant erect, the stems 4-10 dm long, the leaves perpendicular to the stem thus in a plane parallel to the ground; corolla lobes 7-11 mm long; inflorescence solitary, terminal (rarely a second from an upper node); corona 5-8 mm across; [widespread]..... ***A. amplexicaulis***
3 Plant prostrate or decumbent, the stems 2-7 dm long, the leaves perpendicular to the stem and thus perpendicular to the ground as well; corolla lobes 5-6.5 mm long; inflorescences 2-6 from upper nodes; corona 3-5 mm across; [of dry pinelands of the Coastal Plain]..... ..... ***A. humistrata***
2 Leaves cuneate to rounded at base, 1-6 cm wide, (1-) 1.5-6× as long as wide; stem and leaves pubescent to glabrate.
4 Corolla lobes 12-15 mm long, greenish-yellow; flowers 3-6 (-8) per umbel..... ***A. connivens***
4 Corolla lobes 6-9 mm long, reddish-purple or pale green; flowers > 7 per umbel.
5 Leaves lanceolate, acuminate at the apex; corolla reddish purple, the lobes 7-9 mm long; [of Coastal Plain wetlands]..... ***A. rubra***
5 Leaves orbicular to oblong, rounded at the apex; corolla pale green, the lobes 6-7 mm long; [of dry habitats primarily in the Piedmont and Mountains (rarely in the Coastal Plain)] ..... ***A. viridiflora***

Key D – milkweeds with milky sap, with petiolate, nonlinear leaves, in flower

1 Corolla greenish, either pale green or yellowish green.
2 Leaves subopposite; corolla lobes 13-15 mm long ..... ***A. viridis***
2 Leaves opposite; corolla lobes 6-10 mm long.
3 Corona 2-3 mm across; corolla lobes pale green, 6-7 mm long; [of various provinces, primarily of the Piedmont] ..... ***A. viridiflora***
3 Corona 5-9 mm across; corolla lobes yellowish green, 9-10 mm long; [strictly of the Coastal Plain, of NC and SC, and southward].
4 Hoods ca. 6 mm long, about 2× as long as the anther heads; stem and leaves densely tomentulose..... ***A. obovata***
4 Hoods ca. 4 mm long, scarcely exceeding the anther heads; stem and leaves softly puberulent..... ***A. tomentosa***
1 Corolla pink, purple, or white.
5 Hoods about as long as the anther heads; horns 1.5-2× as long as the hood, exserted well beyond the hood.
6 Hood opening truncate, the hood therefore beaker-shaped; corolla lobes 8-12 mm long; [primarily of mesic forests of the Mountains] .... ***A. exaltata***
6 Hood opening very oblique, the hood therefore scoop-shaped; corolla lobes 2.5-6 mm long; [primarily of wetlands of various provinces].
7 Plants 3-5 dm tall; corolla lobes usually white (rarely slightly pink); leaves glabrous beneath; [of the Coastal Plain of SC] .... ***A. perennis***
7 Plants 5-15 dm tall; corolla lobes rose to purple (rarely white); leaves pubescent to glabrate beneath; [collectively widespread].

8 Stems and leaves sparsely pubescent to glabrescent; leaves narrow, the base obtuse to truncate, the apex long-acuminate; plants usually much branched.....***A. incarnata*** *var.* ***incarnata***
8 Stems and leaves moderately to densely pubescent; leaves broader, the base rounded to subcordate, the apex acute to short-acuminate; plants usually relatively strict.....***A. incarnata*** *var.* ***pulchra***
5 Hoods distinctly longer than the anther heads; horns 0.5-1× as long as the hood, not conspicuously exserted beyond the hood.
9 Lower leaf surface pubescent over the surface.
10 Hood margin irregular but not with a sharp tooth; corolla purplish-rose; plants 4-10 dm tall.....***A. purpurascens***
10 Hood margin with a single, ascending, triangular tooth; corolla rose or greenish-white; plants (5-) 8-20 dm tall .....***A. syriaca***
9 Lower leaf surface glabrous to sparsely pubescent along the midvein only.
11 Hood opening very oblique, the hood therefore scoop-shaped, and also with 2 prominent lateral teeth; corolla pink to greenish (rarely white); plants 2-5 dm tall.....***A. quadrifolia***
11 Hood opening truncate and constricted, and lacking prominent teeth; corolla white (often pink at the "waist"); plants 3-12 dm tall .....
.....***A. variegata***

Key E – milkweeds with milky sap, with petiolate, nonlinear leaves, in fruit (or sterile)

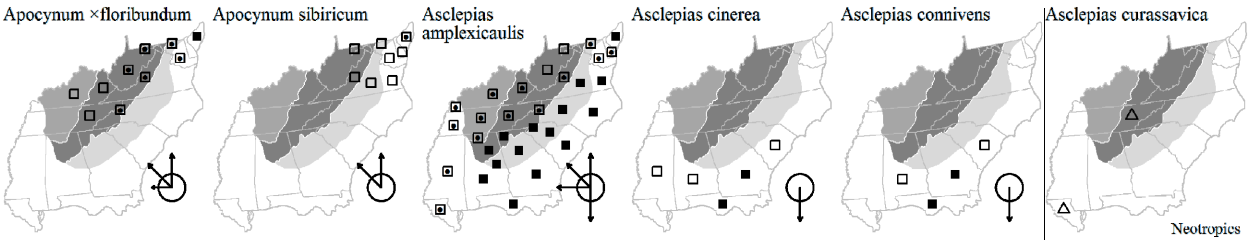
1 Leaves subopposite.....***A. viridis***
1 Leaves opposite (or apparently whorled in *A. quadrifolia*).
2 Follicle pendant; seeds without a coma; [of swamp forests of SC and southward] .....***A. perennis***
2 Follicle erect; seeds with a coma; [collectively widespread].
3 Leaf-bearing nodes 3-4, the upper and lower opposite, the middle with a whorl of 4 leaves .....***A. quadrifolia***
3 Leaf-bearing nodes 3-many, all opposite.
4 Follicle slightly to strongly muricate.....***A. syriaca***
4 Follicle smooth.
5 Lower leaf surface glabrous, or pubescent on the midrib only .....***A. exaltata***
5 Lower leaf surface pubescent.
6 Leaves lanceolate, 4-10× as long as wide.
7 Leaves coriaceous, 3-10 cm long, 1.5-4.5 cm wide; corolla pale green; [of dry upland situations] .....***A. viridiflora***
7 Leaves herbaceous, 6-15 cm long, 2-7 cm wide; corolla rose; [of moist to wetland situations].
8 Stems and leaves sparsely pubescent to glabrescent; leaves narrow, the base obtuse to truncate, the apex long-acuminate; plants usually much branched .....***A. incarnata*** *var.* ***incarnata***
8 Stems and leaves moderately to densely pubescent; leaves broader, the base rounded to subcordate, the apex acute to short-acuminate; plants usually relatively strict.....***A. incarnata*** *var.* ***pulchra***
6 Leaves ovate to elliptic, 1.5-4× as long as wide.
9 Stem moderately to densely pubescent; plants 1.5-5 (-7) dm tall; [of xeric pinelands of the Coastal Plain of NC, SC, and southward].
10 Stem and leaves densely tomentulose; leaves mucronate.....***A. obovata***
10 Stem and leaves softly puberulent; leaves apiculate.....***A. tomentosa***
9 Stem glabrous to pubescent in lines only; plants 2-12 dm tall; [collectively of various habitats throughout our area].
11 Lower leaf surface densely puberulent; [primarily of moist to wet habitats].....***A. purpurascens***
11 Lower leaf surface slightly pubescent; [primarily of moist to dry habitats].
12 Leaves 4-9 cm wide, acuminate at the apex .....***A. variegata***
12 Leaves 1-6 cm wide, mostly obtuse at the apex .....***A. viridiflora***

Asclepias amplexicaulis J.E. Smith, Clasping Milkweed. Sandhills, other dry woodlands of various types. May-July; June-August. NH and NY west to MN, IA, and KS, south to c. peninsular. FL, west to e. TX. The flowers have a fragrance or cloves and roses. [= RAB, C, F, G, K, S, W, WH, Z]

Asclepias cinerea Walter, Carolina Milkweed. Pine savannas. June-July; August-September. Se. SC south to n. peninsular FL, west to Panhandle FL. [= RAB, K, S, WH, Z]

Asclepias connivens Baldwin, Largeflower Milkweed. Wet pine flatwoods. July-August. Se. SC (McMillan et al. 2002) south to s. FL, west to Santa Rosa County, FL. [= GW, K, WH, Z; = *Anantherix connivens* (Baldwin) Feay – S]

* ***Asclepias curassavica*** Linnaeus, Scarlet Milkweed. Disturbed areas; native of tropical America, cultivated as an ornamental and sometimes slightly persistent. Kartesz (1999) reports it for TN. [= K, WH, Z] {not yet keyed}



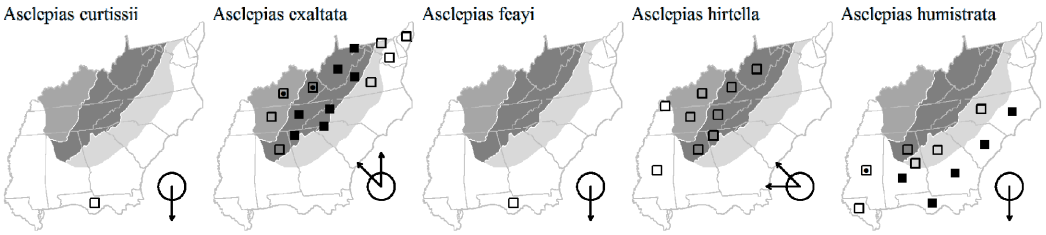
Asclepias curtissii A. Gray, Curtiss's Milkweed. Scrub. Endemic to FL, from Clay County south to s. peninsular FL. [= K, WH, Z; = *Oxypteryx curtissii* (A. Gray) Small – S] {not yet keyed}

Asclepias exaltata Linnaeus, Tall Milkweed. Moist forests, slopes, and forest margins. June-July; August-September. ME and s. ON west to MN and IA, south to n. GA, n. AL (Schotz 2009). e. and c. TN (Chester, Wofford, & Kral 1997), KY, and IL. [= RAB, C, F, G, K, S, W, Z]

Asclepias feayi Chapman ex A. Gray, Feay's Milkweed. Sandhills, scrubby pine flatwoods. Endemic to FL, from Clay County south to s. peninsular FL. [= K, WH, Z; = *Asclepiodella feayi* (Chapman ex A. Gray) Small – S] {not yet keyed}

Asclepias hirtella (Pennell) Woodson, Barrens Milkweed. Limestone glades, prairies. MI, WI, and MN south to w. WV (Mason County), KY, e. TN (Bradley County) (Chester, Wofford, & Kral 1997), nw. GA (Jones & Coile 1988), AR, w. LA, and e. TX. This species of midwestern prairies and barrens that closely resembles *A. longifolia*. The two taxa have sometimes been treated as distinct only at the rank of subspecies (see synonymy) or as "very distinct varieties" (Turner 2009). [= C, F, K, Z; = *Acerates hirtella* Pennell – S; = *Asclepias longifolia* Michaux ssp. *hirtella* (Pennell) J. Farmer & C.R. Bell – X; = *Asclepias longifolia* var. *hirtella* (Pennell) B.L. Turner – Y]

Asclepias humistrata Walter, Fleshy Milkweed. Sandhills. May-June; June-July. E. NC south to s. FL, west to e. LA. [= RAB, K, S, WH, Z]



Asclepias incarnata Linnaeus *var.* ***incarnata***, Western Swamp Milkweed. Swamps, marshes, especially over limestone or calcareous shale. July-September; August-October. ME and s. QC west to MB, south to VA, s. TN (Chester, Wofford, & Kral 1997), AR, TX, and CO; disjunct from n. FL south to s. FL; disjunct in TX, NM, and UT. The distribution is peculiar. [= C, F, G, GW; = *Asclepias incarnata* ssp. *incarnata* – RAB, K, W, Z; = *Asclepias incarnata* – S; < *Asclepias incarnata* – WH]

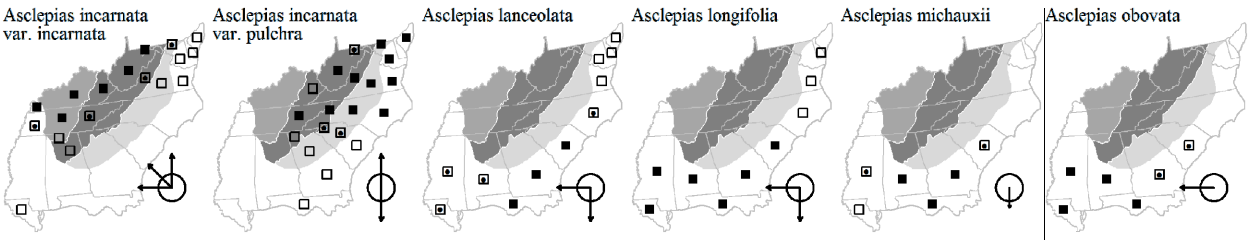
Asclepias incarnata Linnaeus *var.* ***pulchra*** (Ehrhart ex Willdenow) Persoon, Eastern Swamp Milkweed. Marshes, bogs, swamps. July-September; August-October. NS and ME south to e. NC, w. SC, GA, and e. TN (Chester, Wofford, & Kral 1997). [= C, F, G, GW; = *Asclepias incarnata* ssp. *pulchra* (Ehrhart ex Willdenow) Woodson – RAB, K, W, Z; = *Asclepias pulchra* Ehrhart ex Willdenow – S]

Asclepias lanceolata Walter, Few-flower Milkweed. Swamps, fresh to slightly brackish marshes, wet pine savannas. June-August; August-September. NJ south to s. FL, west to e. TX. [= RAB, C, GW, K, S, WH, Z; > *Asclepias lanceolata* var. *lanceolata* – F, G; > *Asclepias lanceolata* var. *paupercula* (Michaux) Fernald – F, G]

Asclepias longifolia Michaux, Longleaf Milkweed, Savanna Milkweed. Wet pine savannas. May-June; June-July. DE (formerly) south to s. FL, west to e. TX. *A. longifolia* and *A. hirtella* are closely related; the two taxa have sometimes been treated as distinct only at the rank of subspecies (see synonymy) or as "very distinct varieties" (Turner 2009). [= RAB, C, F, GW, K, WH, Z; = *Acerates longifolia* (Michaux) Elliott – G; ? *Acerates floridana* (Lamarck) A.S. Hitchcock – S; = *Asclepias longifolia* var. *longifolia* – Y; = *Asclepias longifolia* ssp. *longifolia* – X]

Asclepias michauxii Decaisne, Michaux's Milkweed. Pine savannas. May. S. SC south to peninsular FL, west to e. LA. [= RAB, K, S, WH, Z]

Asclepias obovata Elliott, Pineland Milkweed. Sandhills. June-September. Se. SC south to Panhandle FL, west to AR and TX. [= RAB, K, S, WH, Z]



Asclepias pedicellata Walter, Stalked Milkweed, Savanna Milkweed. Dry pine savannas. July-August. Se. NC south to s. FL and Panhandle FL. This species generally occurs in small populations of widely scattered individuals; populations of more than 50 individuals are rare. [= RAB, GW, K, WH, Z; = *Podostigma pedicellata* (Walter) Vail – S]

Asclepias perennis Walter, Smoothseed Milkweed, Swampforest Milkweed. Swamp forests. June-August; August-September. E. SC south to c. peninsular FL, west to e. TX, north in the interior to s. IN and s. IL. [= RAB, C, F, G, GW, K, S, WH, Z]

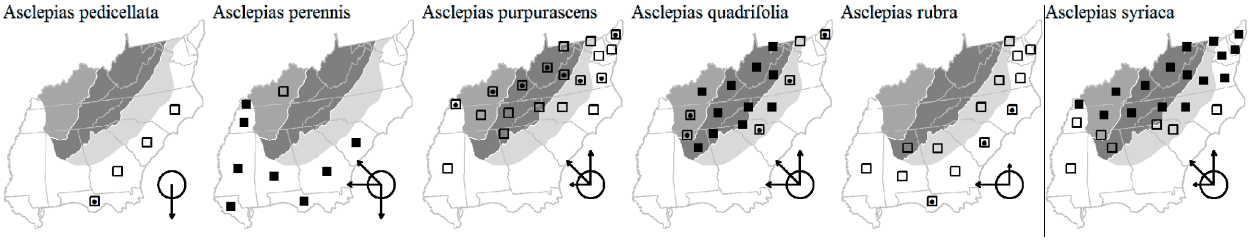
Asclepias purpurascens Linnaeus, Purple Milkweed. Openings in moist bottomlands and swamp forests, perhaps mostly on soils derived from mafic or calcareous rocks. June. NH and s. ON west to WI, IA, and KS, south to NC, nw. TN (Chester, Wofford, & Kral 1997), KY, AR, and OK. [= RAB, C, F, G, K, S, W, Z]

Asclepias quadrifolia Jacquin, Fourleaf Milkweed. Moist to dryish forests and forest margins, most common on mafic and calcareous substrates; common (rare in DE). May-June; August-September. NH and NY west to IN, south to NC, n. GA, n. AL, and c. TN; also from w. IL west to MO, south to AR and OK. [= RAB, C, F, G, K, S, W, Z]

Asclepias rubra Linnaeus, Purple Savanna Milkweed, "Red Milkweed." Pocosin ecotones, wet pine savannas, sandhill seeps, seepage swamps. June-July; July-September. Se. NY (Long Island), se. PA, and NJ south to wc. GA and w. Panhandle FL, west to e. TX. *A. laurifolia* is alleged to differ in sessile, cordate-clasping leaf bases (vs. petioled and rounded), and other

characters (see Small 1933); it may warrant recognition and needs additional study. [= RAB, C, F, G, GW, K, WH, Z; > *A. rubra* – S; > *A. laurifolia* Michaux – S; > *A. rubra* var. *rubra*; > *A. rubra* var. *laurifolia* (Michaux) Harper]

Asclepias syriaca Linnaeus, Common Milkweed. Pastures, roadsides, disturbed areas. June-August; July-September. NB and ME west to s. MB and ND, south to SC, GA, c. TN (Chester, Wofford, & Kral 1997), AR, OK, and KS. This species is apparently expanding its range southward; see Wyatt et al. (1993) and Wyatt (1996) for discussion. [= RAB, C, K, S, W, Z; > *Asclepias syriaca* var. *syriaca* – F, G]



Asclepias tomentosa Elliott, Sandhills Milkweed. Sandhills. June; July. Sc. NC south to s. FL, west to c. TX. [= RAB, K, Z; ? *Asclepias aceratoides* M.A. Curtis – S]

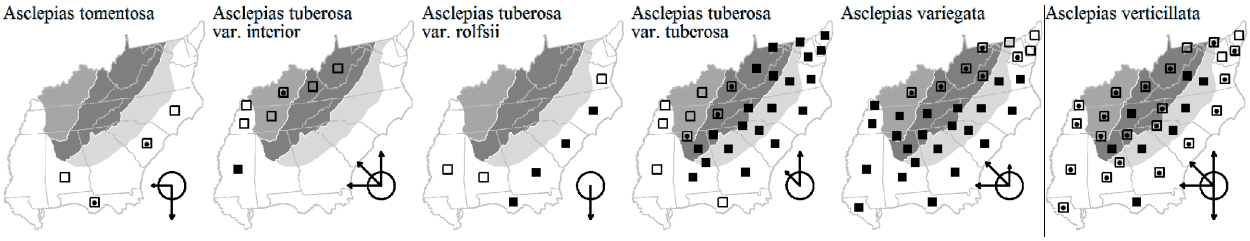
Asclepias tuberosa Linnaeus *var.* ***interior*** (Woodson) Shinners, Midwestern Butterfly-weed. Dry forests, roadbanks. QC, ON, MN, SD, CO, UT, and CA south to PA, WV, KY, TN, and MS (Kartesz 1999). [= C; < *A. tuberosa* – F, S; = *A. tuberosa* Linnaeus ssp. *interior* Woodson – G, K, Z]

Asclepias tuberosa Linnaeus *var.* ***rolfsii*** (Britton ex Vail) Shinners, Sandhills Butterfly-weed. Sandhills. May-August; August-September. Se. VA south to s. FL, west to s. MS. The flowers are typically lighter in color than those of var. *tuberosa*, yellow or yellowish-orange rather than deep orange to reddish. The first occurrence in Virginia is discussed by Belden et al. (2004). [= *Asclepias tuberosa* ssp. *rolfsii* (Britton ex Vail) Woodson – RAB, K, Z; = *Asclepias rolfsii* Britton ex Vail – S; < *Asclepias tuberosa* – WH]

Asclepias tuberosa Linnaeus *var.* ***tuberosa***, Common Butterfly-weed. Woodland margins, roadsides, pastures. May-August; August-September. S. NH west to OH, south to Panhandle FL and e. TX. [= C; = *Asclepias tuberosa* ssp. *tuberosa* – RAB, G, K, Z; < *Asclepias tuberosa* – F, S, W, WH; >< *Asclepias tuberosa* – S; > *Asclepias decumbens* Linnaeus - S]

Asclepias variegata Linnaeus, White Milkweed. Upland forests and woodlands. May-June; July-September. CT west to OH, s. IN, s. IL, se. MO, and se. OK, south to Panhandle FL, LA, and e. TX. [= RAB, C, F, G, K, W, WH, Z; = *Biventraria variegata* (Linnaeus) Small – S]

Asclepias verticillata Linnaeus, Whorled Milkweed. Barrens, thin soils of rock outcrops (especially mafic rocks), thin woodlands, sandhills. June-September; September-October. E. MA west to ND and MB, south to s. FL, TX, NM, and AZ. [= RAB, C, F, G, K, S, W, Z]



Asclepias viridiflora Rafinesque, Green Milkweed. Open woodlands, woodland edges, barrens, glades, especially over mafic or calcareous rocks, and also in disturbed areas. June-August; August-September. CT west to s. ON, MB, ND, and MT, south to NC, SC, GA, Panhandle FL, AL, LA, TX, n. Mexico, NM, and AZ. [= RAB, C, K, W, WH, Z; > *Asclepias viridiflora* var. *viridiflora* – F; > *Asclepias viridiflora* var. *lanceolata* (Ives) Torrey – F; = *Acerates viridiflora* (Rafinesque) Pursh ex Eaton – G, S]

Asclepias viridis Walter, Green Antelope-horn. Prairies, dry woodlands, calcareous hammocks. S. SC south to s. FL, west to TX; and from OH, w. WV, and KY west to NE, south to se. TN, c. TN (Chester, Wofford, & Kral 1997), nw. GA, c. AL, c. MS, AR, TX, and OK. [= K, WH, Z; = *Asclepiodora viridis* (Walter) A. Gray – S]

Asclepias viridula Chapman, Southern Milkweed. Wet longleaf pine savannas and flatwoods, seepage slopes, pitcherplant bogs. April-July. GA and AL south to ne. FL and Panhandle FL. See Chafin (2000) for additional information. [= GW, K, S, Z] {not yet keyed}

Catharanthus G. Don 1836 (Rosy-periwinkle)

A genus of about 8 species, herbs, 7 endemic to Madagascar and 1 endemic to India. References: van Bergen (1996)=Z; Snoeijer (1996).

* ***Catharanthus roseus*** (Linnaeus) G. Don, Rosy-periwinkle, Madagascar Periwinkle, Cayenne Jasmine. Disturbed areas, persistent after cultivation or as a waif or "throwout" after cultivation; native of Madagascar, now a pantropical weed. May-October. *C. roseus* is the source of a powerful anti-leukemia drug. [= K, S, WH, Z; = *Vinca rosea* Linnaeus – RAB]

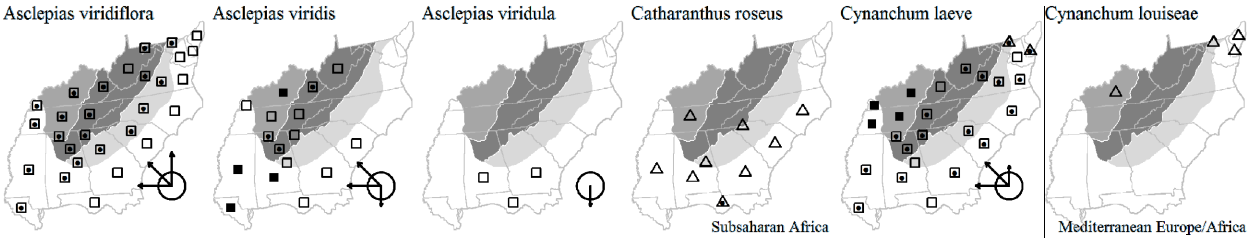
Cynanchum Linnaeus 1753 (Swallow-wort)

A genus of about 400 species, vines and lianas, primarily of tropical and warm temperate portions of the New World and Old World. *Ampelamus* was retained as a genus by Liede (1997a), but later results suggest that it is not distinct from some other portions of *Cynanchum* (Liede & Täuber 2002). However, *Cynanchum* itself is strongly polyphyletic and will be broken up; further taxonomic and nomenclatural changes are likely. *C. laeve* will probably remain in *Cynanchum* s.s. (which is primarily Old World in distribution), while *C. scoparium* will likely shift to *Orthosia*. References: Liede (1997b); Liede & Meve (1997); Liede (1997a); Krings (2001)=Z; Liede & Täuber (2002).

1 Leaves oblong or ovate.
  2 Leaves broadly cordate, deeply cordate at base; corona of 5 erect, petaloid segments, each divided into 2 slender lobes..... ***C. laeve***
  2 Leaves oblong or vate, rounded or subcordate at base; corona a fleshy, lobed cup ..... ***C. louiseae***
1 Leaves linear.
  3 Calyx lobes lanceolate, acute, (1.3-) 1.5-2.5 mm long; leaves sessile, reflexed, persistent; follicle 6-7 mm in diameter; [of ne. NC and south]..... ***[see Seutera angustifolia]***
  3 Calyx lobes deltoid, obtuse, ca. 1 mm long; leaves petiolate, not reflexed, often caducous; follicle 1-3 mm in diameter; [of se. SC and south]..... ***C. scoparium***

Cynanchum laeve (Michaux) Persoon, Sandvine, Honeyvine, Bluevine. Bottomlands and disturbed areas. July-September; August-October. Se. PA and KS south to sw. GA, Panhandle FL, and c. TX. [= RAB, GW, K, W, WV; = *Ampelamus laevis* (Michaux) Krings – WH, Z; = *Ampelamus albidus* (Nuttall) Britton – C, F, G; = *Gonolobus laevis* Michaux – S]

* ***Cynanchum louiseae*** J.T.Kartesz & Gandhi, Black Swallow-wort. Disturbed areas; native of Mediterranean Europe. Reported for many states in ne. United States, south to MD, KY, TN. [= K; = *Vincetoxicum nigrum* (Linnaeus) Moench – C; = *Cynanchum nigrum* (Linnaeus) Persoon – F, G]



Cynanchum scoparium Nuttall, Leafless Swallow-wort. Coastal hammocks. Se. SC south to s. FL, west to s. MS. Liede (1997b) indicates that this species will likely be transferred to *Orthosia* Decaisne in de Candolle, a large group primarily of the Caribbean, Central America and n. South America, but she refrains from the new combination pending further studies. [= RAB, K, WH; = *Amphistelma scoparia* (Nuttall) Small – S; ***Orthosia sp.***]

Gonolobus Michaux 1803 (Anglepod)

A genus of about 100 species, vines, primarily tropical. Liede (1997a), Lipow & Wyatt (1998), and others recognize *Gonolobus* as separate from *Matelea*. References: Krings (in prep.)=U; Rosatti (1989)=Z; Lipow & Wyatt (1998)=Y; Drapalik (1969)=X; Krings & Xiang (2005)=V; Reveal & Barrie (1992); Krings & Xiang (2004).

1 Upper surface of corolla lobes uniformly colored, olive green on anthesis, glabrous; laminar dorsal anther appendage yellow, apex rounded or truncate; [of c. KY, e. TN, nw. AL westward] ..... ***[G. suberosus*** *var.* ***granulatus]***
1 Upper surface of corolla lobes multi-colored, generally dark maroon to brownish near the base and green to yellowish near the tips on anthesis (or uniformly yellowish-green to neon green in rare mutants), pubescent or glabrous; laminar dorsal anther appendage darkly purplish or maroonish tinted, apex bilobed to emarginate; [of se. VA south to c. peninsular FL, west to s. MS and inland to nw. GA]..... ..... ***G. suberosus*** *var.* ***suberosus***

Gonolobus suberosus (Linnaeus) R. Brown *var.* ***granulatus*** (Scheele) Krings & Q.-Y. Xiang, Western Anglepod. C. KY, e. TN, nw. AL, and MS west to c. OK and c. TX. [= U, V; > *Gonolobus suberosus* (Linnaeus) R. Brown – Y; < *Matelea gonocarpos* (Walter) Shinners – K; >< *Vincetoxicum gonocarpos* Walter – S; >< *Vincetoxicum suberosum* (Linnaeus) Britton – S; >< *Matelea gonocarpa* – X; >< *Gonolobus gonocarpus* – Z]

Gonolobus suberosus (Linnaeus) R. Brown *var.* ***suberosus***, Eastern Anglepod. Mesic to wet forests and thickets. June-August; September-November. Se. VA south to s. peninsular FL, west to s. MS, inland to nw. GA and c. KY. Rosatti (1989) and Drapalik (1969) have expressed considerable doubt about whether two species should be recognized; their view, supporting the recognition of a single species in our area, is followed here for now. However, studies by Krings & Xiang (2004, 2005) suggest that 2 entities should be circumscribed at the varietal level. Drapalik (1969) considered the basionym "*suberosa*" as not applicable to *Matelea* of North America; Reveal & Barrie (1992) lectotypified the name, resulting in it applying to our material. It has priority over "*gonocarpus*." [= U, V; > *Matelea gonocarpa* (Walter) Shinners – RAB, C, W; > *Matelea suberosa* (Linnaeus) Shinners – RAB, C, W; > *Gonolobus gonocarpus* (Walter) Perry – F, G; > *Gonolobus suberosus* (Linnaeus) R. Brown – F, Y; < *Matelea gonocarpos* (Walter) Shinners – K, WH; < *Vincetoxicum gonocarpos* Walter – S; > *Vincetoxicum suberosum* (Linnaeus) Britton – S; = *Matelea gonocarpa* – X; = *Gonolobus gonocarpus* – Z]

Matelea Aublet 1775 (Spinypod)

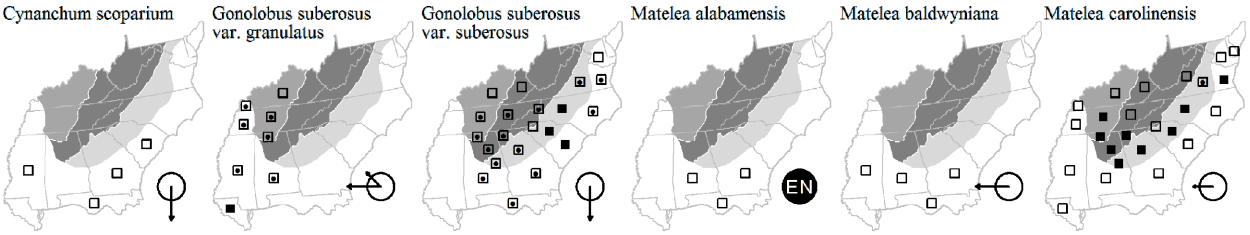
A genus of about 180 species, vines, primarily tropical and restricted to the New World. References: Drapalik (1969)=Z.

1 Plant a prostrate herb, usually not twining, with stems 0.2-0.6 (-1.1 m) long at maturity; leaf blades 2-4 (-6) cm long; cymes sessile; flowers (2-) 3-4 (-5) per inflorescence; upper (inner) surface of the petals pubescent; [of xeric sandhills, from e. GA southward] ..... ***M. pubiflora***
1 Plant a twining herbaceous vine, with stems 1-2 m long at maturity; leaf blades 7-27 cm long; cymes borne on peduncles; flowers (2-) 9-19 (-53) per inflorescence, except *M. alabamensis*, with (1-) 4-5) (-12) flowers per inflorescence; upper (inner) surface of the petals glabrous; [of various habitats, but more mesic, collectively widespread in our area].
2 Inflorescence with 1-12 flowers, averaging 4-5; corolla light green, reticulated with darker green; corona disc-shaped, lacking 5 pairs of appendages; [of mesic slopes of s. GA southward and westward] ..... ***M. alabamensis***
2 Inflorescence with 2-53 flowers, averaging 9-19; corolla white, yellow, rose, or maroon (or greenish and reticulate in *M. flavidula*); corona cup-shaped, with 5 pairs of upright appendages alternating with 5 corona lobes; [collectively widespread].
3 [endemic to FL] ..... ***M. floridana***
3 [collectively widespread].
4 Corolla lobes in a horizontal plane or slightly reflexed; flower buds ovoid, < 1.5× as long as wide; corolla lobes 1.5-2.6× as long as wide.
5 Corolla dark maroon (rarely maroon-yellow or yellow), not reticulate with darker veins; paired corona appendages always higher than the alternating corona lobes ..... ***M. carolinensis***
5 Corolla green, green-yellow, or yellow (rarely rosy or olive-maroon), reticulate with darker green veins; paired corona appendages about as high as the alternating corona lobes ..... ***M. flavidula***
4 Corolla lobes ascending; flower buds conical, > 2× as long as wide; corolla lobes 2.4-6.2× as long as wide.
6 Corolla white (or fading or drying cream); corona 2.2-2.7 mm in diameter, cream or creamy-yellow; [of sw. GA westward] ..... ***M. baldwyniana***
6 Corolla rose or maroon (rarely cream); corona 2.6-4.0 mm in diameter, rose to dark maroon (rarely green, cream, or orange); [primarily of the Mountains and Piedmont].
7 Corolla lobes 2.4-3.6 (-4.0)× as long as wide, the widest part above the sinus; corolla dark maroon ..... ***M. decipiens***
7 Corolla lobes (3.2-) 4.0-6.2× as long as wide, the widest part at the sinus; corolla rose to light maroon (rarely dark maroon, green, or cream) ..... ***M. obliqua***

Matelea alabamensis (Vail) Woodson, Alabama Milkvine, Alabama Spinypod. Open forests on river bluffs, mesic margins of sandridges. April-June. Sw. and apparently se. GA, Panhandle FL, and s. AL. [= K, WH, Z; = *Cyclodon alabamense* (Vail) Small – S]

Matelea baldwyniana (Sweet) Woodson, White Spinypod. Dry to mesic bluffs over calcareous rocks. Panhandle FL and sw. GA west to MO, AR, and OK. Drapalik (1969) discusses the probability that the name *M. baldwyniana* is based on material of *M. flavidula*. [= K, WH, Z; = *Odontostephana baldwiniana* (Sweet) Alexander – S]

Matelea carolinensis (Jacquin) Woodson, Carolina Spinypod. Moist to dry, nutrient-rich forests. April-June; July-October. DE, MD, KY, and s. MO south to GA and MS. [= RAB, C, K, W; = *Gonolobus carolinensis* (Jacquin) R. Brown ex J.A. Schultes – F, G; = *Odontostephana carolinensis* (Jacquin) Alexander – S]



Matelea decipiens (Alexander) Woodson, Deceptive Spinypod. Woodlands and thickets, generally over mafic (in the Piedmont) or calcareous rocks (in the Coastal Plain). April-June; August-October. VA south to nc. GA, AL, and e. TX, north in the interior to s. IL and MO. [= RAB, C, K; = *Gonolobus decipiens* (Alexander) Perry – F, G; = *Odontostephana decipiens* Alexander – S]

Matelea flavidula (Chapman) Woodson, Yellow Spinypod. Moist, nutrient-rich forests. May-June; August-October. E. NC (?) and e. SC south to Panhandle FL, apparently rare throughout its range. [= RAB, K, WH, Z; = *Odontostephana flavidula* (Chapman) Alexander – S]

Matelea floridana (Vail) Woodson, Florida Milkvine. Hammocks. Ne. FL and e. Panhandle FL south to s. FL. [= K, WH, Z; = *Odontostephana floridana* (Vail) Alexander – S]

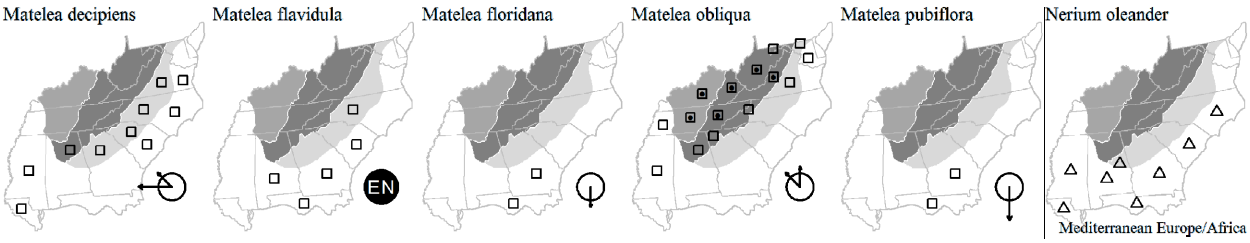
Matelea obliqua (Jacquin) Woodson, Northern Spinypod, Limerock Milkvine. In forests, woodlands, or thickets over calcareous rocks. June-July; August-November. PA west to OH, IN, and MO, south to w. NC, nw. GA (Jones & Coile 1988), and TN. [= RAB, C, K, W; = *Gonolobus obliquus* (Jacquin) R. Brown ex J.A. Schultes – G; > *G. obliquus* – F; > *G. shortii* A. Gray – F; > *Odontostephana obliqua* (Jacquin) Alexander – S; > *O. shortii* (A. Gray) Alexander – S; = *Matelea caroliniensis* – WV, misapplied]

Matelea pubiflora (Decaisne) Woodson, Trailing Milkvine. Sand ridges, sandhills. Late May-early August; mid-June-late September. E. GA (Jones & Coile 1988) south to ne. FL (Wunderlin 1998). [= K, WH, Z; = *Edisonia pubiflora* (Decaisne) Small – S]

Nerium Linnaeus 1753 (Oleander)

A monotypic genus, a shrub, of Mediterranean Europe.

* ***Nerium oleander*** Linnaeus, Oleander. Frequently cultivated, especially on barrier islands (because of its salt resistance), sometimes persistent; native of Mediterranean Europe. [= K, S, WH]



Periploca Linnaeus 1753 (Silkvine)

* ***Periploca graeca*** Linnaeus, Silkvine. Disturbed areas; native of Mediterranean Europe. July-August. Sometimes cultivated and escaped or persistent; it is reported for various states in e. North America, as in Knox County, TN (Chester, Wofford, & Kral 1997). [= RAB, C, K]

Seutera Reichenbach 1828 (Swallow-wort)

A genus of 2-3 species (as newly circumscribed by Fishbein & Stevens 2005), of tropical and subtropical se. United States, West Indies, and Baja California. Liede & Meve (2003) follow a broader circumscription, including *Seutera* in *Funastrum*, but Fishbein & Stevens (2005) argue that *Seutera* is discordant as a component of *Funastrum*. References: Fishbein & Stevens (2005)=Y; Liede & Meve (2003)=Z; Liede & Meve (1997).

Seutera angustifolia (Persoon) Fishbein & W.D. Stevens, Swallow-wort. Coastal hammocks, edges of marshes, generally or always on barrier islands. June-July; July-October. E. NC (Dare County) south to s. FL, west to TX; Bahamas and West Indies. See Krings (2005) for a discussion of typification. [= Y; = *Cynanchum angustifolium* Persoon – GW, K, WH; = *C. palustre* (Pursh) Heller – RAB; = *Lyonia palustris* (Pursh) Small – S; = *Funastrum angustifolium* (Persoon) Liede & Meve – Z]

Trachelospermum Lemaire 1851 (Climbing Dogbane)

A genus of about 20 species, vines, of se. Asia (India to Japan), except the single species of se. United States.

Identification notes: *Trachelospermum difforme* is sometimes mistaken at a glance for *Gelsemium* (both woody vines with opposite lanceolate leaves), but in the field the milky sap of *Trachelospermum* provides an immediate identifying characteristic.

1 Corolla lobes 3-4 mm long, acute, reflexed, pale yellow; leaves subcoriaceous; [native, common] ..... ***T. difforme***
1 Corolla lobes 8-12 mm long, rounded, spreading, white; leaves coriaceous; [alien, commonly planted, rarely persistent or spreading] ..... ***T. jasminoides***

Trachelospermum difforme (Walter) A. Gray, Climbing Dogbane. Bottomlands, swamp forests, marshes. May-July; July-September. DE south to n. peninsular FL, west to e. TX, north in the interior to MO and IN. See Krings (2003) for a discussion of nomenclature. [= RAB, C, F, G, GW, K, S, WH]

* ***Trachelospermum jasminoides*** (Lindley) Lemaire, Confederate Jasmine, Star Jasmine. Disturbed areas; native of se. Asia. April-May. Cultivated and sometimes persistent or spreading. Also reported for e. LA and to be expected along the Gulf coast in AL and MS. [= K, WH]

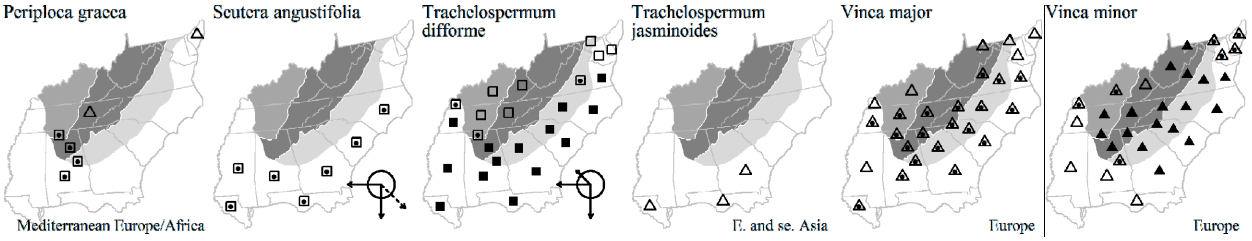
Vinca Linnaeus 1753 (Vinca, Periwinkle)

A genus of 7 species of Europe, n. Africa, and c. Asia.

1 Leaves ovate, broadest near the base, cordate or subcordate-rounded at the base, 2-4 cm wide, thin in texture and deciduous to semi-evergreen; leaf margins ciliate; flowers 3-5 cm across..... ***V. major***
1 Leaves lanceolate or elliptic, broadest near the middle, rounded to cuneate at the base, 1-1.5 cm wide, thick in texture and evergreen; leaf margins not ciliate; flowers 2-3 cm across..... ***V. minor***

* ***Vinca major*** Linnaeus, Greater Periwinkle. Disturbed areas, suburban woodlands, around old house sites, persistent and spreading from cultivation; native of Europe. Late February-May; June-July. [= RAB, C, F, G, K, S, W]

* ***Vinca minor*** Linnaeus, Common Periwinkle, Myrtle. Disturbed areas, around old house sites and especially old cemeteries, persistent and spreading from cultivation; native of Europe. April-May; June-July. [= RAB, C, F, G, K, S, W, WH, WV]



356. BORAGINACEAE A.L. de Jussieu 1789 (Borage Family) [order assignment uncertain]

A family of about 155 genera and ca. 3200 species, herbs, shrubs, and trees, nearly cosmopolitan (Al-Shehbaz 1991). References: Ferguson 1998; Diane, Förther, & Hilger 2002; Hilger & Diane 2003); Al-Shehbaz (1991)=Z throughout the family; Wilson (1960a); Constance (1963). Key to genera based on RAB, C, and Z. [including *HELIOTROPIACEAE* and *HYDROPHYLLACEAE*]

1 Leaves dissected, lobed, or toothed (sometimes the basalmost leaves simple); style fused for a portion of its length, 2-cleft toward the tip; ovary with 1 locule; [subfamily *Hydrophylloideae*].
2 Flowers solitary opposite the leaves on the upper portion of the stem (sometimes also terminal in a lax, (1-) 2-6-flowered cyme).
3 Leaves opposite below, alternate above; petals 5-8 mm long; leaves elliptical in outline, pinnatifid into 7-13 lanceolate segments; calyx lobes to 10 mm long in fruit; capsule 4-seeded ..... ***16. Ellisia***
3 Leaves all alternate; petals 2-4 mm long; leaves broadly triangular in outline, divided into 3-5 obovate segments; calyx lobes 1-3 mm long; capsule 1-2 (-3)-seeded ..... ***17. Nemophila***
2 Flowers all terminal in 3-many-flowered cymes.
4 Inflorescence repeatedly branched subdichotomously; larger leaf blades > 8 cm wide; stamens well exserted from the corolla (3 mm or more beyond the corolla); plants perennial from fibrous roots ..... ***18. Hydrophyllum***
4 Inflorescence with a strong central axis (some secondary branching in *P. bipinnatifida*, but not as above); larger leaf blades < 5 cm wide (except *P. bipinnatifida*); stamens slightly exserted from the corolla (< 3 mm beyond the corolla) (except well-exserted in *P. bipinnatifida*, included in *P. covillei*); plants annual (biennial in *P. bipinnatifida*) from a taproot..... ***19. Phacelia***
1 Leaves entire, simple; style various.
5 Styles 2, distinct to the summit of the ovary
6 Flowers in axillary cymes; capsule subglobose; leaves 2-12 cm long ..... ***[see Hydrolea in HYDROLEACEAE]***
6 Flowers solitary or paired in the leaf axils; capsule cylindrical; leaves 0.8-1.5 (-3.5) cm long; [subgenus *Hydrophylloideae*] .... ***15. Nama***
5 Styles absent (the stigma sessile and terminal), single, or with 2 branches.
7 Ovary slightly 2-4-lobed, or not at all lobed; style terminal or reduced to a sessile terminal stigma; [subfamily *Heliotropioideae*] ..... ***21. Heliotropium***
7 Ovary deeply 4-parted; style gynobasic; [subfamily *Boraginoideae*].
8 Mericarps with glochidiate prickles (like grappling hooks), these visible early in development.
9 Mericarps spreading or divergent, attached to the gynobase on the upper third of the mericarp; [tribe *Cynoglosseae*] ..... ***1. Cynoglossum***
9 Mericarps erect, attached to the gynobase near the middle of the mericarp; [tribe *Eritrichieae*]
10 Fruiting pedicels deflexed; plant perennial or biennial ..... ***2. Hackelia***
10 Fruiting pedicels erect-ascending; plant annual ..... ***3. Lappula***
9 Mericarps smooth, rugose, or pitted, lacking glochidiate prickles.
11 Corolla rotate, lacking a well-developed tube, blue; [tribe *Boragineae*] ..... ***6. Borago***
11 Corolla with a well-developed tube at least 3 mm long, of various colors (including blue).
12 Corolla lobes distinctly unequal, pink to blue.
13 Stamens equal in length, entirely included within the corolla tube..... ***5. Anchusa***
13 Stamens unequal in length, the longer conspicuously exserted ..... ***8. Echium***
12 Corolla lobes equal, of various colors (including pink to blue).
14 Plant a scrambling climber with retrorsely prickly-hispid stems ..... ***20. Asperugo***
14 Plant not climbing.
15 Mericarps attached laterally to a pyramidal gynobase.
16 Corolla yellow, the tube 4-5 mm long; corolla throat lacking appendages..... ***4. Amsinckia***
16 Corolla white (with a yellow eye), or pink to blue, the tube 6-20 mm long; corolla throat with appendages.
17 Corolla pink to blue (rarely white), 18-25 mm long; leaves elliptic or ovate; [plant a native, of moist, nutrient-rich habitats, and sometimes grown as an ornamental]..... ***10. Mertensia***
17 Corolla white with a yellow eye; leaves linear; [plant a rare alien, of disturbed habitats] ..... ***13. Plagiobothrys***
15 Mericarps attached basally to a flat or broadly convex gynobase.
18 Mericarps laterally compressed, with an evident raised margin ..... ***11. Myosotis***
18 Mericarps neither laterally compressed nor with an evident thickened margin.
19 Mericarps with a prominent, toothed, basal rim ..... ***14. Symphytum***
19 Mericarps lacking a prominent, toothed, basal rim.
20 Corolla lobes erect or slightly spreading, acute to acuminate; style exserted..... ***12. Onosmodium***
20 Corolla lobes spreading, rounded; style included.

21 Corolla whitish or bluish white; plant annual from a slender taproot; leaves without evident lateral veins; mericarps brown, dull, wrinkled and pitted; [plant a weedy alien] ..... ***7. Buglossoides***
21 Corolla bright yellow-orange, or greenish-white; plant perennial from a thickened, woody rhizome; mericarps white, shining, smooth or pitted; [plant a native] ..... ***9. Lithospermum***

1. Cynoglossum Linnaeus (Comfrey)

A genus of about 75 species, herbs, of temperate regions. References: Al-Shehbaz (1991)=Z; Haines (2010)=Y.

1 Flowering stem with leaves above the first inflorescence branch; corolla reddish-purple; [plant a biennial alien, weedy] ..... ***C. officinale***
1 Flowering stem leafless above the first branch; corolla blue or white; [plant a perennial native, not weedy].
2 Nutlets 3.5-5 mm; calyx at anthesis 2-2.5 mm long; corolla 6-8 mm wide, the lobes oblong and not overlapping..... ***[C. virginianum*** *var.* ***boreale]***
2 Nutlets 5.5-9 mm; calyx at anthesis (3.0-) 3.5-4.5 mm long; corolla (8-) 10-12 mm wide, the lobes broadly rounded and more or less overlapping ..... ***C. virginianum*** *var.* ***virginianum***

* ***Cynoglossum officinale*** Linnaeus, Garden Comfrey, Hound's-tongue. Mt (NC, VA, WV), Pd (DE, VA), Cp (DE): disturbed areas, roadsides, pastures, calcareous shale barrens; common (uncommon in DE and WV, rare in NC), native of Eurasia. May-July. [= RAB, C, F, G, K, S, W, WV, Z]

Cynoglossum virginianum Linnaeus *var.* ***virginianum***, Wild Comfrey. Mt (GA, NC, SC, VA, WV), Pd (DE, GA, NC, SC, VA), Cp (DE, GA, NC, SC, VA): moist deciduous forests; common (uncommon in DE Piedmont, rare in Coastal Plain). April-June. Var. *virginianum* ranges from CT west to OK, south to FL and LA. [= C, K; < *C. virginianum* – RAB, W, WV; = *C. virginianum* – F, G, Z; = *C. virginicum* – S, orthographic error; = *C. virginianum* ssp. *virginianum* – Y]

Cynoglossum virginianum Linnaeus var. *boreale* (Fernald) Cooperrider, Northern Hound's-tongue, ranges from NB west to BC, south to CT, NY, c. PA, n. OH, MI, and MN. Cooperrider (1995) prefers varietal status for this taxon, stating that in OH there are numerous intermediates, while Voss (1996) and Rhoads & Klein (1993) maintain *C. boreale* at the species level. [= C, K; = *C. boreale* – F, G, Z; = *C. virginianum* ssp. *boreale* (Fernald) A. Haines – Y]

2. Hackelia Opiz (Stickseed)

A genus of ca. 45 species, of north temperate regions, Central America, and South America, especially diverse in w. North America. References: Al-Shehbaz (1991)=Z.

Hackelia virginiana (Linnaeus) I.M. Johnston, Virginia Stickseed. Mt (GA, NC, SC, VA, WV), Pd (DE, GA, NC, SC, VA), Cp (DE, VA): rich forests and woodlands; common (rare in GA, NC, and SC). June-September. S. QC west to ND, south to ne. GA (Jones & Coile 1988), LA, and TX. [= RAB, C, F, G, K, W, WV, Z; = *Lappula virginiana* (Linnaeus) Greene – S]

3. Lappula Moench (Sheepbur)

A genus of about 40 species, of Eurasia, w. North America. References: Al-Shehbaz (1991)=Z.

1 Nutlets with 1 row of marginal prickles..... ***L. occidentalis*** *var.* ***occidentalis***
1 Nutlets with 2-3 rows of marginal prickles..... ***L. squarrosa***

* ***Lappula occidentalis*** (S. Watson) Greene *var.* ***occidentalis***. Cp (SC): waste areas near wool-combing mill; rare, perhaps only a waif, native of w. North America. April-June. [= K; = *L. redowskii* var. *redowskii* – C, Z; = *L. redowskii* (Hornemann) Greene var. *occidentalis* (S. Watson) Rydberg – F, G]

* ***Lappula squarrosa*** (Retzius) Dumortier. Mt (WV): disturbed areas; rare, native of Europe. May-September. Introduced south to MD, WV, KY, and TN. [= C, Z; = *L. echinata* Gilibert – F, G, WV; = *L. lappula* (Linnaeus) Karst. – S]

4. Amsinckia Lehmann (Fiddleneck)

A genus of about 15 species, herbs, of western North America and western South America. References: Al-Shehbaz (1991)=Z.

* ***Amsinckia menziesii*** (Lehmann) A. Nelson & Macbride. Pd (NC), Cp (SC): disturbed areas, waste areas near wool-combing mill; rare, native of w. United States. May-September. [= Z; >< *A. hispida* (Ruiz & Pavón) I.M. Johnston – RAB, misidentification; > *A. menziesii* var. *menziesii* – K; >< *A. parviflora* Heller – S, misidentification; >< *Amsinckia lycopsoides* Lehmann, misidentification]

5. Anchusa Linnaeus (Bugloss, Alkanet)

A genus of about 35 species, herbs, of Europe, n. Africa, and w. Asia. References: Al-Shehbaz (1991)=Z.

* ***Anchusa arvensis*** (Linnaeus) M. Bieberstein, Small Bugloss, Alkanet. Pd (NC, VA), Mt (WV): disturbed areas, rare, native of Europe. [= C, K; = *Lycopsis arvensis* Linnaeus – F, G, S]

6. Borago Linnaeus (Borage)

A genus of 3 species, herbs, of Mediterranean Europe and Asia. References: Al-Shehbaz (1991)=Z.

* ***Borago officinalis*** Linnaeus, Borage. Pd (VA), Mt (WV): disturbed areas; rare, native of s. Europe. [= C, F, G, K, Z]

7. Buglossoides Moench (Corn-gromwell)

A genus of about 7 species, herbs or shrubs, of temperate Eurasia. References: Al-Shehbaz (1991)=Z.

* ***Buglossoides arvensis*** (Linnaeus) I.M. Johnston *ssp.* ***arvensis***, Corn-gromwell. Mt (NC, SC, VA, WV), Pd (DE, GA, NC, SC, VA), Cp (DE, GA, NC, SC, VA): roadsides, dry disturbed areas, sandy fields; common (uncommon in DE Piedmont, rare in DE Coastal Plain), native of Eurasia. March-June. Other subspecies are not known to be naturalized in our area. [= Z; < *B. arvensis* – K; < *Lithospermum arvense* Linnaeus – RAB, C, F, G, S, W]

8. Echium Linnaeus (Viper's-bugloss, Blueweed)

A genus of about 60 species, herbs, widespread in the Old World. The common name is pronounced "bew-gloss," not "bug-loss," as it refers to an ox's tongue rather than to the departure of insects. References: Al-Shehbaz (1991)=Z.

1 Hairs of the stem pustular-based ..... ***[E. pustulatum]***
1 Hairs of the stem not pustular-based ..... ***E. vulgare***

* ***Echium vulgare*** Linnaeus, Viper's-bugloss, Blueweed. Mt (NC, SC, VA, WV), Pd (DE, NC, SC, VA), Cp (DE, GA, VA): roadsides, dry pastures, disturbed areas; common (uncommon in DE Piedmont, rare in DE Coastal Plain), native of Mediterranean Europe. June-September. Reported for Cook County, GA (Carter, Baker, & Morris 2009). [= RAB, C, K, W, WV; = *E. vulgare* var. *vulgare* – F, G; < *E. vulgare* – Z (also see *E. pustulatum*)]

* ***Echium pustulatum*** Sibthorp & Smith, Blue-devil, is reported by F for "N.J. to W.Va.," and by G and K as south to VA. It differs in having pustular-based hairs on the foliage. [= K; = *E. vulgare* var. *pustulatum* (Sibthorp & Smith) Coincy – F, G; < *E. vulgare* – Z]

9. Lithospermum Linnaeus (Gromwell, Puccoon, Stoneseed)

A genus of about 45 species, herbs (mostly perennials), nearly cosmopolitan. References: Cusick (1985)=Y; Al-Shehbaz (1991)=Z.

1 Corolla white or yellowish-white, the tube 4-8 mm long.
  2 Plant with basal rosette; lower cauline leaves about equal in size to the upper cauline leaves; leaves acute to obtuse ..... ***L. tuberosum***
  2 Plant lacking basal rosette; lower cauline leaves smaller than the upper cauline leaves; leaves acuminate or acute.
    3 Upper stem internodes mostly 3-6 cm long; leaves mostly >2 cm wide, acuminate ..... ***L. latifolium***
    3 Upper stem internodes mostly 1-2 cm long; leaves mostly <2 cm wide, acute ..... ***[L. officinale]***
1 Corolla yellow-orange, the tube 7-30 mm long.
  4 Corolla tube 13-30 mm long; corolla lobes denticulate oto lacerate; nutlets pitted ..... ***L. incisum***
  4 Corolla tube 7-14 mm long; corolla lobes entire; nutlets smooth.
    5 Plant with dense, soft, appressed pubescence, the hairs usually without pustular bases; calyx lobes 6-8 mm long at maturity; nutlets 2-3 mm long; [mostly of rocky or clayey circumneutral soils of the Piedmont and Mountains] ..... ***L. canescens***
    5 Plant with scattered, stiff, spreading pubescence, the hairs with or without pustular bases; calyx lobes 10-15 mm long at maturity; nutlets 3.5-4.5 mm long; [variously of sandy acidic soils of the Coastal Plain or inland].
      6 Pubescence with slender bases; mature calyx lobes flat; plants with 15-25 well-developed leaves below the inflorescence; [of sandy Coastal Plain habitats from se. VA southward] ..... ***L. caroliniense***
      6 Pubescence with pustular bases; mature calyx lobes strongly keeled; plants with (30-) 35-45 well-developed leaves below the inflorescence; [inland, known from west and north of our area] ..... ***[L. croceum]***

Lithospermum canescens (Michaux) Lehmann, Hoary Puccoon, Indian-paint. Pd (NC, SC, VA), Mt (GA, VA, WV), Cp? (VA): dry woodlands and glades over calcareous rocks (such as limestone, dolostone) or mafic rocks (such as diabase); uncommon (rare in NC). April-May. ON west to SK, south to c. NC, nw. GA, AL, and TX. [= RAB, C, F, G, K, W, WV, Y, Z; = *Batschia canescens* Michaux – S]

Lithospermum caroliniense (Walter ex J.F. Gmelin) MacMillan, Coastal Plain Puccoon. Cp (FL, GA, SC, VA): sandhills, dry sandy soils; common (rare north of s. SC). April-June. A Southeastern Coastal Plain endemic: se. SC south to Panhandle FL, and west to TX. The disjunction from SC to se. VA, skipping over large amounts of apparently suitable sandhill habitat in

NC, is surprising. The sibling taxa *L. caroliniense* and *L. croceum* have been variously treated as distinct species, subspecies, or varieties, or as mere forms (see synonymy). They appear to be as clearly separable as *L. caroliniense* is from *L. canescens*; I regard them as allopatric species. [= F; < *L. caroliniense* – RAB, G, WH, Z; = *L. caroliniense* var. *caroliniense* – C, K; = *Batschia caroliniensis* Walter ex J.F. Gmelin – S; = *L. carolinense* ssp. *carolinense* – Y]

Lithospermum incisum Lehmann, Narrowleaf Gromwell. Cp (FL): disturbed areas; rare. April-July. S. ON west to BC, south to IN, LA, TX, and CA; disjunct from FL Panhandle south to c. peninsular FL. [= C, F, G, K, WH; = *Batschia linearifolia* (Goldie) Small – S]

Lithospermum latifolium Michaux, American Gromwell, Broadleaf Gromwell. Mt (GA, VA, WV): dry to moist woodlands over calcareous rocks; uncommon (rare in GA and VA). May-June. NY west to MN, south to nw. GA, s. TN and MO. [= C, F, G, K, S, W, WV, Y, Z]

Lithospermum tuberosum Rugel ex A.P. de Candolle, Southern Stoneseed. Mt (GA, VA, WV), Pd (GA, SC), Cp (FL, GA): nutrient-rich forests, especially over calcareous rocks; rare. March-June. Sw. VA, s. WV, KY, and TN, south to n. peninsular FL, FL Panhandle, and LA. [= RAB, C, F, G, K, S, WH, Z]

Lithospermum croceum Fernald. ON west to MT, south to w. PA, n. OH, AR, OK, and CO. Reports by Kartesz (1999) for WV, KY, and TN have not been verified. [= F; = *L. caroliniense* (Walter ex J.F. Gmelin) MacMillan var. *croceum* (Fernald) Cronquist – C, K; < *L. caroliniense* – G, Z; = *L. caroliniense* ssp. *croceum* A.W. Cusick – Y]

* *Lithospermum officinale* Linnaeus, European Gromwell. Native of Europe and occuring at scattered localities in ne. North America, south to PA and NJ (Kartesz 1999). [= C, F, G, K, Y, Z]

10. Mertensia Roth (Bluebell)

A genus of about 45 species, north temperate. References: Al-Shehbaz (1991)=Z.

Mertensia virginica (Linnaeus) Persoon ex Link, Virginia Bluebells, Virginia Cowslip. Mt (GA, NC, VA, WV), Pd (DE, NC, VA), Cp (DE, VA): nutrient-rich, moist, alluvial soils of floodplain forests and thickets; common (rare in DE, rare south of VA). March-June. NY west to WI, and IA, south to n. NC, nw. GA, AL, and n. AR. Pringle (2004) discusses the nomenclatural reasons for retaining the name *M. virginica*. [= RAB, C, F, G, K, S, W, WV, Z; = *M. pulmonarioides* Roth]

11. Myosotis Linnaeus (Forget-me-not, Scorpion-grass)

A genus of about 100 species, temperate and montane tropical. References: Al-Shehbaz (1991)=Z. Key based closely on RAB and C.

1 Calyx strigose, the hairs neither spreading nor uncinate; [mostly of moist to wet habitats].
  2 Corolla limb 2-5 mm wide; mericarps distinctly surpassing the style ..... ***M. laxa ssp. laxa***
  2 Corolla limb 5-10 mm wide; mericarps not surpassing the style ..... ***M. scorpioides***
1 Calyx with some loose or spreading, uncinate hairs; [of various habitats, mostly dry].
  3 Corolla limb 5-8 mm wide; perennial ..... ***M. sylvatica***
  3 Corolla limb 1-4 mm wide; annual or biennial.
    4 Calyx lobes unequal, 3 lobes shorter than the other 2; corolla white; [native, of dry or moist habitats].
      5 Fruiting pedicels divergent; fruiting calyx deciduous, 3-10 mm long; inflorescence internodes usually longer than 10 mm; mericarps 1.4-2.2 mm long ..... ***M. macrosperma***
      5 Fruiting pedicels more-or-less erect; fruiting calyx persistent, 3-5.5 mm long; inflorescence internodes usually shorter than 10 mm; mericarps 1.2-1.5 mm long ..... ***M. verna***
    4 Calyx lobes equal, all 5 the same size; corolla blue (occasionally yellow or white); [alien, mostly of dry disturbed habitats].
      6 Fruiting pedicels equaling or generally longer than the calyx ..... ***M. arvensis***
      6 Fruiting pedicels distinctly shorter than the calyx.
        7 Plants floriferous from about the middle upward; style surpassing the mericarps ..... ***M. discolor***
        7 Plants floriferous nearly to the base; style shorter than the mericarps ..... ***M. stricta***

* ***Myosotis arvensis*** (Linnaeus) Hill, Field Forget-me-not, Field Scorpion-grass. Pd (DE, NC, SC, VA), Cp (VA), Mt (NC, WV): roadsides, fields, disturbed areas; uncommon (rare south of DE), native of Eurasia. May-August. [= RAB, C, F, G, K, S, W, WV, Z]

* ***Myosotis discolor*** Persoon, Yellow-and-blue Scorpion-grass, Changing Forget-me-not. Pd (DE, GA, NC, SC, VA), Cp (VA): fields, disturbed areas, roadsides; uncommon, native of Europe. May-August. [= RAB, C, GW, K, Z; *? M. versicolor* (Persoon) Sm. – F, G]

Myosotis laxa Lehmann *ssp.* ***laxa***, Smaller Forget-me-not, Tufted Forget-me-not. Mt (NC, VA, WV), Pd (DE, NC, VA), Cp (DE, NC, VA): marshes, streambanks; common (uncommon in DE). May-October. The species is circumboreal, represented nearly throughout North America by ssp. *laxa*. The other subspecies are Eurasian. [= Z; < *M. laxa* – RAB, C, F, G, GW, K, S, W, WV]

Myosotis macrosperma Engelmann, Bigseed Forget-me-not. Cp (GA, NC, SC, VA), Pd (GA, NC, SC, VA), Mt (GA, NC, SC, VA, WV), {DE}: bottomland forests and alluvial fields, probably associated with nutrient-rich soils; uncommon. April-May. MD west to MO, south to FL and TX. [= RAB, C, F, G, GW, K, S, W, WV, Z]

* ***Myosotis scorpioides*** Linnaeus, Water Scorpion-grass. Mt (NC, VA, WV), Pd (DE, VA), Cp (DE, VA): wet meadows, streambanks; common (uncommon in DE Piedmont, rare in DE Coastal Plain), native of Europe. May-August. [= RAB, C, F, G, GW, K, W, WV, Z; *? M. palustris* (Linnaeus) Hill – S]

* ***Myosotis stricta*** Link ex Roemer & J.A. Schultes, Blue Scorpion-grass. Pd (NC, VA), Cp (DE, VA), Mt (NC, WV): disturbed areas; uncommon (rare in DE and WV), native of Eurasia. April-June. [= F, K, Z; *? M. micrantha* Pallas – RAB, C, G, apparently misapplied]

* ***Myosotis sylvatica*** Ehrhart ex Hoffman, Garden Forget-me-not. Pd (NC): gardens, rarely persistent or found as a waif; rare, native of Eurasia. April-September. [= RAB, C, F, G, K, Z]

Myosotis verna Nuttall, Early Forget-me-not. Cp (DE, GA, NC, SC, VA), Pd (DE, GA, NC, SC, VA), Mt (GA, NC, SC, VA, WV): dry woodlands, roadsides, disturbed areas, dry fields; common (rare in DE). March-July. ME west to SD, south to GA and TX; also from ID and BC south to OR. [= RAB, C, F, G, K, W, WV, Z; = *M. virginica* – S, misapplied]

12. Onosmodium Linnaeus (Marbleseed, False-gromwell)

A genus of about 7 species (or fewer species and the same number of taxa in some interpretations), perennial herbs, of North America. Recent studies strongly suggest that *Onosmodium* is better included in a broadened *Lithospermum* (Cohen & Davis 2009; Weigend et al. 2009). References: Cohen & Davis (2009); Cochrane (1976)=X; Turner (1995a)=Y; Al-Shehbaz (1991)=Z. Key based in part on X and Y.

1 Corolla lobes yellow to orange; nutlet 2.0-2.8 mm long; corolla lobes **either** 2.5-4× as long as wide and acuminate (*O. virginianum*) **or** 1.5-2× as long as wide, acute (*O. decipiens*).
  2 Stem hairs 2.5-5.0 mm long; corolla lobes 1.5-2× as long as wide, acute; tips of the anthers reaching the base of the corolla sinuses; [endemic to Ketona dolomite glades, Bibb County, c. AL] ..... ***O. decipiens***
  2 Stem hairs < 2.0 mm long; corolla lobes 2.5-4× as long as wide and acuminate; tips of the anthers below the corolla sinuses; [widespread in our area] ..... ***O. virginianum***
1 Corolla lobes dull greenish-white; nutlet 2.5-3.0 mm long; corolla lobes 1.5-2× as long as wide, acute.
  3 Leaf vestiture solely of dense appressed hairs on both surfaces (the plant appearing ashy-white) ..... ***[O. molle]***
  3 Leaf vestiture at least in part of spreading or ascending hairs.
    4 Stems mostly glabrous below the inflorescence branches ..... ***[O. subsetosum]***
    4 Stems persistently and obviously pubescent below the inflorescence branches.
      5 Upper leaf surface with hairs of two lengths, these spreading; corolla 6-10 mm long; nutlets flared at the base, forming a collar; longest stem hairs near midstem > 2.3 mm long ..... ***O. hispidissimum***
      5 Upper leaf surface with hairs of similar length, these appressed to ascending; corolla 11-20 mm long; nutlets tapered to the base, lacking a collar; longest stem hairs near midstem < 2.2 mm long ..... ***O. occidentale***

Onosmodium decipiens J. Allison, Deceptive Marbleseed. Dolomitic Ketona glades. April-early May; June-August. Endemic to c. AL (Bibb County) (Allison & Stevens 2001). [= ***Lithospermum species 3***]

Onosmodium hispidissimum Mackenzie, Eastern Prairie Marbleseed, Shaggy Marbleseed. Mt (VA, WV): calcareous woodlands, barrens, and glades, and nearby in disturbed areas, such as older pasture edges; rare. May-July. W. NY and ON west to MN, south to sc. PA (Rhoads & Klein 1993), w. VA, e. TN (Chester, Wofford, & Kral 1997), LA, and TX. This species was attributed to NC by F and S; the documentation of these reports is not known. [= G, S, W, WV; = *O. molle* Michaux var. *hispidissimum* (Mackenzie) Cronquist – C; > *O. hispidissimum* var. *hispidissimum* – F; > *O. hispidissimum* var. *macrospermum* Mackenzie & Bush – F; = *O. molle* Michaux ssp. *hispidissimum* (Mackenzie) Boivin – K, X, Z; = *O. bejariense* Alphonse de Candolle ssp. *hispidissimum* (Mackenzie) B.L. Turner – Y; = ***Lithospermum species 1***]

Onosmodium molle Michaux. Limestone barrens. C. KY, c. TN (Chester, Wofford, & Kral 1997), nw. AL, and disjunct in the Ozarkian Highlands of MO. *O. molle* has been attributed to Durham County, NC (RAB); Baskin *et al.* (1983) determined that this report was based on a misidentification of a specimen of *O. virginianum*. [= F, G, Y; = *O. molle* var. *molle* – C; = *O. molle* ssp. *molle* – K, X, Z; < *O. molle* – S; = ***Lithospermum species 4***]

Onosmodium occidentale Mackenzie. Mt (GA): open woodlands over limestone; rare. Ranges east to e. TN (Chester, Wofford, & Kral 1997) and nw. GA (Jones & Coile 1988). [= F, G; = *O. molle* Michaux var. *occidentale* (Mackenzie) I.M. Johnston – C; = *O. molle* Michaux ssp. *occidentale* (Mackenzie) T.S. Cochrane – K, X, Z; < *O. molle* – S; = *O. bejariense* Alphonse de Candolle var. *occidentale* (Mackenzie) B.L. Turner – Y; = ***Lithospermum species 2***]

Onosmodium subsetosum Mackenzie & Bush. Calcareous glades. MO south to AR and OK; disjunct in c. TN (Chester, Wofford, & Kral 1997). [= F, G; = *O. molle* Michaux ssp. *subsetosum* (Mackenzie & Bush) T.S. Cochrane – K, X, Z; < *O. molle* – S; = *O. bejariense* Alphonse de Candolle var. *subsetosum* (Mackenzie & Bush) B.L. Turner – Y; = ***Lithospermum species 5***]

Onosmodium virginianum (Linnaeus) Alphonse de Candolle, Virginia Marbleseed. Cp (DE, GA, NC, SC, VA), Pd (DE, GA, NC, SC, VA), Mt (GA, NC, SC, VA): sandhill woodlands, shell middens in the outer Coastal Plain, woodlands and barrens over diabase and other mafic rocks in the Piedmont and low Mountains, barrens, glades, or woodlands over calcareous rocks in the Mountains; uncommon (rare in DE, NC, and VA). April-September. LA to FL, north to NY and MA, primarily on the Coastal Plain; the species has become very rare north of NC. It is peculiarly distributed in our area, occurring on highly acidic sands in the fall-line sandhills, but seemingly restricted to circumneutral soils derived from mafic rocks (Piedmont), calcareous rocks (Mountains), or calcareous shell (Coastal Plain) in the rest of our area. The unifying ecological factor determining its distribution may be an open, woodland condition maintained by fire. The species seems characteristically to occur in very small populations, consisting often of fewer than five plants. [= RAB, C, F, G, K, S, W, Y, Z; = ***Lithospermum virginianum*** Linnaeus]

13. Plagiobothrys Fischer & C.A. Meyer (Popcorn-flower)

A genus of about 70 species, of w. North America, w. South America, e. Asia, and Australia. References: Al-Shehbaz (1991)=Z; Chambers (1989)=Y.

* ***Plagiobothrys figuratus*** (Piper) I.M. Johnston ex M.E. Peck *ssp.* ***figuratus***, Popcorn-flower. Pd (NC): fields and roadsides; rare, native of nw. North America. April-May. [= K, Y; = *P. hirtus* (Greene) I.M. Johnston var. *figuratus* (Piper) I.M. Johnston – RAB, Z; < *P. hirtus* – F, G]

14. Symphytum Linnaeus (Comfrey)

A genus of ca. 25 species, herbs, of Europe. References: Al-Shehbaz (1991)=Z.

1 Upper leaves not decurrent, or decurrent < 1 cm below the leaf attachment; pubescence of stem in part of strong, recurved prickles (resembling miniature rose thorns) ..... ***[S. asperum]***
1 Upper leaves decurrent on the stem; pubescence of the stem not of prickles ..... ***S. officinale***

* ***Symphytum officinale*** Linnaeus, Common Comfrey. Mt (GA, VA, WV), Pd (DE, VA), Cp (DE): disturbed areas; uncommon, native of Europe. *Symphytum* is a traditional "medicinal herb," but recent evidence suggests that it can cause dangerous (even fatal) liver damage. [= C, F, G, K, S, WV, Z]

* *Symphytum asperum* Lepechin, Prickly Comfrey, another Eurasian species, is reported by F as occurring south to MD. It may occur in our area. [= C, F, G, K, Z]

15. Nama Linnaeus 1753 (Fiddleleaf)

A genus of about 45 species, herbs, of sw. North America, tropical America, and Hawaii. [also see *Hydrolea* in *HYDROLEACEAE*]

* ***Nama jamaicense*** Linnaeus, Jamaica Weed. Cp (FL, SC): lawns; rare, native of tropical America (including s. FL and TX). May. [= K; = *N. jamaicensis* – RAB, WH, orthographic variant; = *Marilaunidium jamaicense* (Linnaeus) Kuntze – S]

16. Ellisia Linnaeus 1763 (Waterpod)

Ellisia is considered to be a monotypic genus, an herb of c. and e. North America, but generic limits in the Hydrophyllaceae are badly in need of critical reassessment. References: Constance (1940)=Z.

Ellisia nyctelea (Linnaeus) Linnaeus, Waterpod, Aunt Lucy. Pd (VA), Mt (VA, WV): moist shaded forests, especially bottomlands; uncommon (rare in WV). April-July. IN and MI west to AB, south to AR and OK; disjunct in e. North America from s. NY and NJ south to sc. VA. Likely to occur in nc. NC. [= C, F, G, GW, K, W, WV, Z; = *Nyctelea nyctelea* (Linnaeus) Britton – S]

17. Nemophila Nuttall 1822 (Baby Blue-eyes)

A genus of 11 species, herbs, of North America (mostly w. North America). References: Constance (1941).

Identification notes: *Nemophila* is superficially similar to *Phacelia covillei* and *P. ranunculacea*, with which it often co-occurs. They can be distinguished with the following key.

1 Flowers solitary, on pedicels opposite the leaves, the pedicels mostly > 12 mm long; corolla white (sometimes aging to pale lavender), 2.5-3.5 mm long; fruits ovoid, longer than thick, turning purple at maturity, exceeding the 2-4 mm long calyx lobes ..... ***Nemophila aphylla***
1 Flowers borne in 2-6-flowered terminal cymes, the pedicels mostly < 12 mm long; corolla pale blue or lavender, 4-5 mm long; fruits depressed globular and weakly 4-lobed, the apex depressed, remaining green at maturity, shorter than the calyx, the lobes of which expand to 5-8 mm long.
  2 Pubescence of the middle stem (from 2nd to 5th node from the base) consisting of appressed to ascending, stiff, pointed hairs, sometimes also with a few gland-tipped hairs < 2 mm long; terminal leaflet of leaves directly subtending an inflorescence with acute to cuneate bases; [of rivers in the Atlantic drainage, very rarely disjunct west of the Appalachians] ..... ***Phacelia covillei***
  2 Pubescence of the middle stem spreading or even retrorse, most of the hairs weak and twisted, and many of them glandular-tipped and > 2 mm long; terminal leaflet of leaves directly subtending an inflorescence with obtuse to rounded or truncate bases; [of rivers in the Mississippi drainage] ..... ***[Phacelia ranunculacea]***

Nemophila aphylla (Linnaeus) Brummitt. Cp (FL, GA, NC, SC, VA), Pd (GA, NC, SC, VA): moist, nutrient-rich floodplain forests; uncommon, though often locally abundant (rare in FL). March-April. MD south to Panhandle FL and west to

TX, north in the interior to e. TN, w. KY, and se. MO. [= GW, K; = *N. microcalyx* (Nuttall) Fischer & Meyer – RAB, F, G, S; = *N. triloba* (Rafinesque) Thieret – C]

18. Hydrophyllum Linnaeus 1753 (Waterleaf)

A genus of 8 species, herbs, of e. and w. North America. References: Constance (1942)=Z; Beckmann (1979)=Y; Alexander (1941)=X.

1 Principal cauline leaves palmately lobed, maple-like, differing from the pinnately divided basal leaves.
  2 Sepals with small reflexed appendages exserted at each sinus of the calyx; plant biennial from a taproot; stamens exserted 1-3 mm beyond the corolla; leaf lobing relatively shallow and irregular ..... ***H. appendiculatum***
  2 Sepals with appendages absent or rudimentary; plant perennial from fibrous roots; stamens exserted 3-6 mm beyond the corolla; leaf lobing relatively deep and regular ..... ***H. canadense***
1 Principal cauline leaves pinnately divided, similar to the basal leaves.
  3 Inflorescence and upper stem densely hirsute with spreading hairs 1-2 mm long; leaves pinnatifid with (7-) 9-13 segments, these toothed but not lobed ..... ***H. macrophyllum***
  3 Inflorescence and upper stem glabrate to strigose with appressed to ascending hairs < 0.5 mm long; leaves with 5-7 (-9) segments, some of them sometimes deeply 2-lobed.
    4 Corolla deep purple to maroon; lower stem glabrous to slightly (rarely moderately) pubescent with retrorse hairs; [of low to high elevations in the Mountains] ..... ***H. virginianum*** *var.* ***atranthum***
    4 Corolla white to lavender or pale purple; lower stem slightly to densely pubescent with retrorse to spreading hairs; [of low elevations of the Piedmont, Mountains, and Coastal Plain] ..... ***H. virginianum*** *var.* ***virginianum***

Hydrophyllum appendiculatum Michaux, Biennial Waterleaf. Mt (WV): rich forests; rare. May-June. S. ON and MN, south to sw. PA, a. and sc. WV, e. TN, n. AL (Jackson Co.), MO, and e. KS. It was attributed to NC by Small (1933) on unknown grounds. [= C, F, G, K, WV, Y, Z; = *Decemium appendiculatum* (Michaux) Small – S]

Hydrophyllum canadense Linnaeus, Mapleleaf Waterleaf, Canada Waterleaf, Broadleaf Waterleaf. Mt (GA, NC, SC, VA, WV), Pd (NC, VA), Cp (VA): cove forests, rocky streambanks, other moist and nutrient-rich forests; common (rare in VA Coastal Plain, rare in NC Piedmont, rare in SC Mountains). May-August; August-September. VT and s. ON west to MI and WI, south to n. GA, AL, AR, and MO. [= RAB, C, F, G, K, S, W, WV, Y, Z]

Hydrophyllum macrophyllum Nuttall, Hairy Waterleaf. Mt (GA, NC, VA, WV): cove forests and other moist rocky forests, especially over calcareous or mafic rocks; uncommon (rare in GA, NC, and VA). May-June; July-August. WV west to OH, and IL, south to sw. VA, w. NC, n. GA, and n. AL; reports from AR are erroneous, and are based on material of *Hydrophyllum brownei* Kral & Bates (Peck 2003). The w. North American *H. occidentale* (S. Watson) A. Gray is rather closely related. [= RAB, C, F, G, K, S, W, WV, Y, Z]

Hydrophyllum virginianum Linnaeus *var.* ***atranthum*** (E.J. Alexander) Constance, Appalachian Waterleaf. Mt (NC, VA): cove forests and other moist rocky forests; common (uncommon in WV). May-June; July-August. N. WV south through w. and sw. VA and e. KY to w. NC and e. TN. Since its naming as a species (Alexander 1941) and subsequent reduction to a variety (Constance 1942) there has been little consensus about this taxon, some regarding it as merely a color form. Alexander lists numerous characters additional to that of flower color; they need further investigation. "*H. atranthum* differs from *H. virginianum* in the dark-violet flowers, the brown hairs on the appendages, brown filaments, corolla-lobes longer than the tube, stamens shorter [11.5 mm] and more slender, and the more numerous leaf-lobes. *H. virginianum* has flowers white to pale lavender or pinkish, white hairs on the appendages, white filaments, corolla-lobes and tube equal in length, filaments longer (13.5 mm) and stouter, and 5-7 leaf-segments." Beckmann (1979) did not accept the variety, stating that "this pigment combination appears sporadically in other sectors of the species range." Based on herbarium material, I have seen darker than usual flowers that are found outside of the Southern Appalachians; they do not, however, approach in darkness the flowers of Southern Appalachian material, and the somewhat darker-flowered plants outside the Southern Appalachians do not share the stem pubescence character stated in the key above. The general correlation of flower color and lower stem pubescence and the tight geographical range of var. *atranthum* incline me to accept it provisionally as a variety. It is not, however, limited to high elevations, as stated or implied by some authors. The two varieties provisionally accepted here need more careful study, including either statistical studies of morphology, or electrophoretic or molecular studies. [= C, F, G, WV, Z; < *H. virginianum* – RAB, K, W, Y; < *H. virginicum* – S, orthographic error; = *H. atranthum* E.J. Alexander – X]

Hydrophyllum virginianum Linnaeus *var.* ***virginianum***, Eastern Waterleaf, Virginia Waterleaf. Mt (NC, VA, WV), Pd (DE, NC, VA), Cp (DE, VA): cove forests, moist rocky forests, alluvial forests; common (rare in DE Coastal Plain). April-June; July-August. NH and QC west to ND, south to e. VA, c. NC, KY, s. IN, s. IL, nc. AR, and ne. OK. As discussed by Beckmann (1979) and Constance (1941), *H. virginianum* is a closely related vicariant of *H. tenuipes* Heller of BC south to CA. See *Phacelia bipinnatifida* for additional suggestions on distinguishing it from this species. [= C, F, G, WV, Z; < *H. virginianum* – RAB, K, W, Y; < *H. virginicum* – S, orthographic error; = *H. virginianum* – X]

19. Phacelia A.L. de Jussieu 1789 (Phacelia)

A genus of about 100-150 species, of North America and South America, concentrated in w. North America. References: Constance (1949)=Z; Levy (1991)=Y; Sewell & Vincent (2006)=X; Murdy (1966); Gillett (1968, 1964).

Identification notes: 1. *Phacelia bipinnatifida* and *Hydrophyllum virginianum* are sometimes confused. *P. bipinnatifida* has the larger and more basal leaves distinctly bipinnatifid, the lower pinnae often stalked (vs. pinnatifid, the basal or terminal pinnae sometimes 2-lobed, all the pinnae more-or-less sessile), pubescence of the upper stem and inflorescence in part glandular (pubescence nonglandular), and seeds 4 per capsule, black (vs. 2 per capsule, light brown). **2.** *Phacelia covillei* and *P. ranunculacea* are superficially similar to and sometimes confused with *Nemophylla aphylla*, which see for discussion.

1 Corolla lobes fimbriate; seeds 4 per capsule.
  2 Corolla white (rarely slightly lavender); pubescence of the stem spreading; lobes of cauline leaves mostly obtuse; seeds 3.0-3.5 mm long... ***P. fimbriata***
  2 Corolla lavender to blue; pubescence of the stem appressed; lobes of cauline leaves mostly acute; seeds 1.5-3.0 mm long..... ***P. purshii***
1 Corolla lobes entire; seeds 4-15 per capsule.
  3 Stamens 1.5-2 mm long; style 1.5-2 mm long; corolla tubular; seeds globose-ovoid, nearly spherical, 4 per capsule.
    4 Pubescence of the middle stem (from 2nd to 5th node from the base) consisting of appressed to ascending, stiff, pointed hairs, sometimes also with a few gland-tipped hairs < 2 mm long; terminal leaflet of leaves directly subtending an inflorescence with acute to cuneate bases; [of rivers in the Atlantic drainage, very rarely disjunct west of the Appalachians]..... ***P. covillei***
    4 Pubescence of the middle stem spreading or even retrorse, most of the hairs weak and twisted, and many of them glandular-tipped and > 2 mm long; terminal leaflet of leaves directly subtending an inflorescence with obtuse to rounded or truncate bases; [of rivers in the Mississippi drainage]..... ***[P. ranunculacea]***
  3 Stamens 3-10 mm long; style 3-15 mm long; corolla rotate to broadly campanulate; seeds ovoid-angled, 4-15 per capsule.
    5 Corolla 10-15 mm across, blue; plant 10-60 cm tall; seeds 2.5-4 mm long, black; ultimate segments of the leaf 15-45 mm long, 10-25 mm wide; pedicels recurved in fruit; [of moist forests of the Mountains and (very rarely) Piedmont] ..... ***P. bipinnatifida***
    5 Corolla 5-11 mm across, white to blue; plant 5-40 cm tall; seeds 1.5-2.2 mm long, brown; ultimate segments of the leaf 5-15 mm long, 5-9 mm wide; pedicels ascending to spreading in fruit; [of alluvial forests, granitic flatrocks, and other habitats, of the Piedmont, Coastal Plain, and Mountains].
      6 Sepals 4-8 mm long, linear or oblanceolate; marginal bristles of sepals spreading, 1.0-1.5 mm long; plants mostly erect ..... ***P. maculata***
      6 Sepals 2-4 mm long, narrowly ovate; marginal bristles of sepals appressed, 0.3-1.0 mm long; plants mostly decumbent, branched from the base.
        7 Sepals 2.6-4.0 mm long; petals 4-6 mm long; marginal bristles of sepals 0.6-0.9 mm long; basal leaves with 1-3 pairs of lateral leaflets. the terminal leaflet larger and usually 3-lobed; cauline leaves with 1-3 pairs of rather broad lobes; [of various habitats (including granitic flatrocks and domes) in SC, NC, and VA]..... ***P. dubia** var. **dubia***
        7 Sepals 2.0-3.0 mm long; petals 3.5-5 mm long; marginal bristles of sepals 0.4-0.7 mm long; basal leaves with 4-5 pairs of lateral leaflets, the terminal leaflet about the same size and unlobed; cauline leaves with 2-4 pairs of narrow lobes; [of granitic flatrocks and domes of the Piedmont of SC and southwestward] ..... ***P. dubia** var. **georgiana***

Phacelia bipinnatifida Michaux, Fernleaf Phacelia, Forest Phacelia. Mt (GA, NC, SC, VA, WV): cove forests, especially where rocky; common (uncommon in VA and WV, rare in SC). April-May; June. W. VA west to s. OH, n. IN, n. IL, and c. MO, south to w. NC, nw. SC, n. GA, c. AL, and n. AR. *P. bipinnatifida* var. *plummeri* (= *P. brevistyla*) is "based on a variation with sparser pubescence, larger and less divided leaf segments, smaller flowers, and sub-included stamens and style. These variations are not concomitant, and the distribution of forms showing a complete or partial combination of them is sporadic" (Constance 1949). The matter deserves additional study. [= RAB, C, G, K, W, Z; > *P. bipinnatifida* var. *bipinnatifida* – F; > *P. bipinnatifida* var. *plummeri* Wood – F; > *P. brevistyla* Buckley – S; > *P. bipinnatifida* – S]

Phacelia covillei S. Watson ex A. Gray, Eastern Buttercup Phacelia. Pd (NC, VA), Mt? (WV?): rich soils of floodplains, and contiguous terraces and slopes; rare. April; May. Ranging in three disjunct areas – c. NC and sc. VA (in the drainages of the Cape Fear, Tar, and Roanoke rivers), DC, n. VA, and sc. MD (in the drainage of the Potomac River), and disjunct in Texas County, MO. Most recent authors have included this taxon within the closely similar *P. ranunculacea*; as thus broadly defined, *P. ranunculacea* was considered to occur in three peculiarly disjunct areas; one centered around St. Louis, MO (w. KY, w. TN, e. MO, ne. AR, se. MO, s. IL, and s. IN), one near Washington, DC (DC, n. VA, and sc. MD), and a third in c. NC and sc. VA. Sewell & Vincent (2006) have clarified the status of *P. covillei* and *P. ranunculacea*. Chuang & Constance (1977) felt that *P. covillei* and *P. ranunculacea* (sensu stricto) have numerous characteristics that rendered their inclusion in *Phacelia* uncomfortable (also see discussion in Constance 1949 and Gillett 1968), but Sewell & Vincent (2006) countered this idea. See *Nemophila aphylla* for suggestions on distinguishing these two superficially similar species. [= K, X; < *P. ranunculacea* (Nuttall) Constance – RAB, C, F, G, Z]

Phacelia dubia (Linnaeus) Trelease *var.* ***dubia***, Appalachian Phacelia. Mt (GA, NC, SC, VA, WV), Pd (GA, NC, SC, VA), Cp (DE, NC, SC, VA): floodplain forests, rocky forests, fields, roadsides, granitic flatrocks; common (rare in DE). April-May; June. Var. *dubia* ranges from NY and PA west to WV, south to nc. SC, sw. NC, and se. TN. The *Phacelia dubia* complex has been under detailed biosystematic study by Foster Levy and associates (Levy 1991a, 199b, 1997; Levy et al. 1996; Levy & Malone 2001; Levy & Neal 2001; Taylor & Levy 2002; del Castillo 1994, 1998). Male sterile cytotypic variants are common in some populations but formal taxonomic recognition ius not warranted (Levy 1991a, 1991b; del Castillo 1994, 1998). Additionally, an incipient variety, informally termed "imitator", occurs in c. SC (Levy 1991a; Levy & Malone 2001). These populations are morphologically variable, some more similar to var. *georgiana*, others more similar to var. *dubia*; see Levy (1991a) for further discussion. They may warrant taxonomic recognition, as they are allopatric from each of the 3 named varieties, and show degrees of sterility when bred with each of the three, but morphologic differences have not evolved (Levy & Malone 2001). [= K, Y; < *P. dubia* – RAB, C, F, S, W, WV; > *P. dubia* var. *dubia* – G; > *P. dubia* var. *fallax* (Fernald) Gleason – G; > *P. dubia* var. *dubia* – Z (also including var. *interior*)]

Phacelia dubia (Linnaeus) Trelease *var.* ***georgiana*** McVaugh, Georgia Phacelia. Pd (GA): granitic flatrocks; rare. April-May; June. Var. *georgiana* ranges from GA west to ec. AL, in the Piedmont. It has sometimes been attributed to SC, and Levy

found plants in SC which morphologically resemble var. *georgiana*, but he concluded that this "imitator" genotype was largely sterile when bred with var. *georgiana*. See var. *dubia* for additional discussion. [= K, Y, Z; < *P. dubia* – RAB, C, F, S, W; *? P. dubia* var. *dubia* – G]

Phacelia fimbriata Michaux, Fringed Phacelia, Blue Ridge Phacelia. Mt (GA, NC, VA): moist forests on slopes and floodplains, at low to high elevations, perhaps mainly over circumneutral soils; uncommon, but locally abundant (rare in GA and VA). April-May. Sw. VA south to w. NC, e. TN, and n. GA (Jones & Coile 1988), a Southern Appalachian endemic. [= RAB, C, F, G, K, S, W, Z]

Phacelia maculata Wood, Flatrock Phacelia. Pd (GA, NC, SC): bottomlands, granitic flatrocks; uncommon (rare in NC). April; May. Sc. NC south to GA and west to ec. AL. [= RAB, K, W, Y, Z; *? P. hirsuta* – S, misapplied]

Phacelia purshii Buckley, Miami-mist. Mt (GA, NC, SC, VA, WV), Pd (VA): moist forests on floodplains and slopes; uncommon (rare in GA, NC, SC, and VA). May-June. S. PA west to s. ON, OH and MO, south to nw. SC, nw. GA, and c. AL. Plants "with smaller flowers, shorter pedicels, and smaller capsules and seeds" are the basis of *P. boykinii* and *P. bicknellii* (Constance 1949). A study of the matter was initiated and specimens annotated as "*P. purshii* ssp. *boykinii*," but the research was not completed and the name was never published; further study is warranted. [= RAB, C, F, G, K, W, WV, Z; > *P. purshii* – S; > *P. boykinii* (A. Gray) Small – S; > *P. bicknellii* Small – S]

Phacelia dubia (Linnaeus) Trelease var. *interior* Fernald, endemic in c. TN. [= K; < *P. dubia* – C, F, G, S; < *P. dubia* var. *dubia* – Z] {not yet keyed}

Phacelia ranunculacea (Nuttall) Constance, Western Buttercup Phacelia. In the Mississippi and Ohio river drainages, centered around St. Louis, MO (w. KY, w. TN, e. MO, ne. AR, se. MO, s. IL, and s. IN). See Sewell & Vincent (2006). [= K, X; < *P. ranunculacea* – RAB, C, F, G, Z]

Phacelia strictiflora (Engelmann & Gray) Gray var. *robbinsii* Constance. East to AL. [= K, Z] {not yet keyed}

20. Asperugo Linnaeus (Madwort, Catchweed)

A monotypic genus, an annual scrambling herb, of Eurasia.

* ***Asperugo procumbens*** Linnaeus, Madwort, Catchweed. Cp (DE), Pd (DE): disturbed areas; rare, native of Eurasia. [= C, F, G, K] {not yet keyed}

21. Heliotropium Linnaeus (Heliotrope, Turnsole)

A genus of ca. 250 species, widespread in tropical and temperate regions. Either treated as part of a broadly defined Boraginaceae, or else better placed in the family Heliotropiaceae, as it is apparently more closely related to Hydrophyllaceae than to Boraginaceae. Currently under study and additional taxonomic changes may be forthcoming (Hilger & Diane 2003). References: Al-Shehbaz (1991)=Z; Hilger & Diane (2003).

1 Flowers solitary at the ends of short branches; [of limestone habitats from nw. GA westward]; [section *Orthostachys*, subsection *Bracteata*]... ..... ***H. tenellum***
1 Flowers in secund, helicoid cymes.
  2 Leaves glabrous, succulent, < 7 mm wide; [of saline coastal situations]; [section *Halmyrophila*] .....***H. curassavicum* *var.* *curassavicum***
  2 Leaves pubescent, not succulent, > 10 mm wide; [of a variety of mostly disturbed, inland situations].
    3 Mericarps separating at maturity; fruit 4-lobed prior to maturation; leaves petiolate, ca. 2× as long as wide; [section *Heliotropium*]..... ..... ***H. europaeum***
    3 Mericarps cohering in pairs at maturity; fruit 2-lobed prior to maturation; leaves petiolate or sessile to subsessile, ca. 2-5× as long as wide.
      4 Fruit tuberculate, 4-seeded; leaves sessile to subsessile, ca. 4-5× as long as wide; corolla throat and tube densely villous within; [section *Heliophytum*].....***H. amplexicaule***
      4 Fruit longitudinally ribbed, 2-seeded; leaves petiolate, ca. 2× as long as wide; corolla throat and tube glabrous within; [section *Tiaridium*] ..... ***H. indicum***

* ***Heliotropium amplexicaule*** M. Vahl, Wild Heliotrope. Cp (FL, GA, NC, SC, VA), Pd (GA, NC, SC, VA): disturbed areas, roadsides, fields; uncommon (rare north of SC), native of South America. April-September. [= RAB, C, F, G, K, Z]

Heliotropium curassavicum Linnaeus *var.* ***curassavicum***, Seaside Heliotrope. Cp (DE, FL, GA, NC, SC, VA): edges of brackish and salt marshes, estuarine shores; rare. June-September. Var. *curassavicum* ranges from DE (and farther north as an introduction) south to the New World tropics. Considered by some authors to be introduced and naturalized in our area. Other varieties occur inland in the mw. and w. United States. [= C, K, Z; < *H. curassavicum* – RAB, GW; = *H. curassavicum* – F, G; = *Heliotropium curassavicum* ssp. *curassavicum*]

* ***Heliotropium europaeum*** Linnaeus, European Heliotrope. Cp (DE, FL, GA, NC, SC, VA), Pd (DE, NC, VA), Mt (WV): roadsides, disturbed areas; rare, native of s. Europe. June-September. [= RAB, C, F, G, K, Z]

* ***Heliotropium indicum*** Linnaeus, Turnsole. Cp (FL, GA, NC, SC, VA), Pd (GA, NC, SC, VA), Mt (WV): roadsides, woodland borders, swamps, ditches; uncommon (rare in WV), native of South America. July-November. [= RAB, C, F, G, GW, K, WV, Z; = *Tiaridium indicum* (Linnaeus) Lehmann – S]

Heliotropium tenellum (Nuttall) Torrey, Delicate Heliotrope. Mt (GA, WV): limestone glades and barrens; rare. WV, KY, IN, IL, IA, and KS south to nw. GA, AL, MS, LA, and TX. [= C, F, G, K, Z; = *Lithococca tenella* (Nuttall) Small – S]

Heliotropium polyphyllum Lehmann, Pineland Heliotrope. Cp (FL): pine flatwoods, pond margins; common. FL. [= K] {add synonymy; not yet keyed}

357. CONVOLVULACEAE A.L. de Jussieu 1789 (Morning Glory Family) [in SOLANALES]

A family of about 56 genera and 1600 species, nearly cosmopolitan, especially in tropical and subtropical areas. Tribes follow the classification of Stefanović, Austin, & Olmstead (2003). References: Wilson (1960b); Austin (1979), Stefanović, Krueger, & Olmstead (2002); Stefanović, Austin, & Olmstead (2003). [including *CUSCUTACEAE*]

1 Plant parasitic; stems orange; [tribe *Cuscuteae*) ..... ***Cuscuta***
1 Plant photosynthetic; stems green.
2 Corolla 0.1-0.2 cm long; capsule deeply 2-lobed; leaves orbicular-reniform, 1-3 cm long and wide, not fleshy; [tribe *Dichondreae*] ..... ***Dichondra***
2 Corolla 1-10 cm long; capsule entire; leaves various, but not as above (most similar vegetatively are *Calystegia soldanella, Ipomoea pes-caprae* var. *emarginata,* and *I. imperati,* all beach plants with fleshy, emarginate, and usually larger leaves).
3 Styles 2, free nearly to the ovary or fused most of their length (at least the terminal 1-2 mm free); corolla 1-2.5 cm long; leaves cuneate or rounded at the base, and narrowly ovate, lanceolate, or linear; [tribe *Cresseae*].
4 Styles free, each 2-cleft, the stigmas therefore 4, linear-filiform ..... ***Evolvulus***
4 Styles free or fused at the base, the stigmas 2, globose-peltate ..... ***Stylisma***
3 Styles 1 (sometimes with 2 stigmas, or a bilobed stigma); stigmas capitate, elongate, flattened, or filiform; corolla > 2.5 cm long (except *Jacquemontia*, *Convolvulus*, and a few *Ipomoea* spp.); leaves cordate, sagittate, or truncate at the base, and (mostly) ovate in outline.
5 Flowers in a dense head with numerous interspersed bracts; [tribe *Jacquemontieae*] ..... ***Jacquemontia***
5 Flowers solitary or in an open, few-flowered inflorescence.
6 Calyx concealed by 2 large bracts; [tribe *Convolvuleae*] ..... ***Calystegia***
6 Calyx not concealed by bracts.
7 Stigmas 2, elongate; leaves 2-4 cm long, truncate or weakly hastate at base; corolla white or pink; [tribe *Convolvuleae*] ..... ***Convolvulus***
7 Stigma 1, capitate (sometimes lobed); leaves 3-15 cm long, mostly strongly hastate or cordate at base; corolla white, pink, lavender, blue, orange, or red.
8 Anthers straight after dehiscence; fruits valvate-dehiscent; [tribe *Ipomoeeae*] ..... ***Ipomoea***
8 Anthers twisted after dehiscence; fruits longitudinally or irregularly dehiscent; [tribe *Merremieae*] ..... ***Merremia***

Calystegia R. Brown 1810 (Bindweed)

A genus of about 25 species, vines, cosmopolitan. Stefanović, Krueger, & Olmstead (2002) conclude (based on molecular phylogeny) that *Calystegia* should be combined with *Convolvulus*. References: Wilson (1960b)=Z; Lewis & Oliver (1965); Brummitt (1965, 1980); Austin, Diggs, & Lipscomb (1997)=Y.

1 Leaves about as wide as long, rounded at the tip ..... ***C. soldanella***
1 Leaves longer than wide, abtuse , acute, or acuminate at the tip.
2 Flowers double, the corolla deeply divided into many parts (garden escape occasionally naturalised) ..... ***C. pubescens***
2 Flowers not double, corolla entire
3 Leaves densely white-tomentose beneath ..... ***C. catesbeiana*** *ssp.* ***sericata***
3 Leaves not densely white-tomentose beneath
4 Stems mostly less than 1.5 m, erect at least in the lower part, but sometimes twining towards the apex, flowers mostly borne in lower leaf axils.
5 Stems twining in the upper part; mostly 0.8-1.4 m high; leaves overtopping stem apex less than 1 cm long ..... ***C. catesbeiana*** *ssp.* ***catesbeiana***
5 Stems not twining, up to 0.6 m high; leaves overtopping the stem apex 1.5-6 cm long.
6 Stem and leaves glabrous to pubescent; leaves more or less flat at maturity, with basal lobes 0-5 mm long ..... ***C. spithamaea*** *ssp.* ***spithamaea***
6 Stem and leaves tomentose; leaves tending to be folded along midrib at maturity, with basal lobes 1-11mm long ..... ***C. spithamaea*** *ssp.* ***stans***
4 Stems strongly twining, up to4 m or more long; flowers borne along middle and upper stems
7 Corolla pink.
8 Bracteoles forming a continuous spiral series with sepals, the flower appearing to have 3 bracteoles when seen from side; leaves with almost closed sinus, the lobes posteriorly truncate ..... ***C. sepium*** *ssp.* ***erratica***
8 Bracteoles clearly distinct from sepals, obviously only 2; leaves with a wide or v-shaped sinus.
9 Leaves with basal lobes rounded or with a single angle, or if with 2 angles then not speading; plant glabrous or commonly pubescent to tomentose onstem and ..... ***C. sepium*** *ssp.* ***americana***
9 Leaves with lobes with 2 angles, spreading; plant glabrous ..... ***C. sepium*** *ssp.* ***appalachiana***
7 Corolla white.
10 Bracteoles saccate at base, obtuse to truncate at apex, strongly overlapping each other; leaf sinus with more or less parallel sides; often with 2 peduncles in the same leaf axil ..... ***C. silvatica*** *ssp.* ***fraterniflora***
10 Bracteoles flat to weakly saccate at base, more or less acute, not or scarcely overlapping each other; leaf sinus not parallel sided; peduncles solitary in leaf axils.

11 Leaves with spreading basal lobes, each lobe more or less 2-angled, sinus broadly rounded; plant glabrous ..... ***C. sepium*** *ssp.* ***angulata***

11 Leaves with posteriorly directed lobes, the blade often conspicuously narrowly triangular to linear; stems and leaves often strongly pubescent..... ***C. sepium*** *ssp.* ***limnophila***

Calystegia catesbeiana Pursh, Catesby's Bindweed. Mt (WV), Cp (VA), {GA, NC, SC): longleaf pine savannas, marsh edges, openings in dry to dry-mesic montane forests; {abundance} (rare in GA, VA, and WV). [= K; < *Calystegia spithamaea* – C; < *Convolvulus spithamaeus* Linnaeus var. *pubescens* (Gray) Fernald – F; = *Calystegia sericata* (House) Bell – RAB, W; **= *Convolvulus sericatus*** House – S, Z]

* ***Calystegia pubescens*** Lindley. Mt (WV), {NC, VA}. rare in WV, native of e. Asia. [? *Calystegia pellita* (Ledebour) G. Don – K; *? Convolvulus pellitus* Ledebour – F, Z; *? Convolvulus japonicus* Thunberg – G; *? Calystegia hederacea* Wallroth – C]

Calystegia sepium (Linnaeus) R. Brown *ssp.* ***americana*** (Sims) Brummitt. Mt (WV), {GA, NC, VA}; uncommon in WV. [= K; < *Calystegia sepium* – RAB, C, GW, W; < *Convolvulus sepium* Linnaeus var. *repens* (Linnaeus) A. Gray – F, WV, Z; > *Convolvulus sepium* Linnaeus var. *repens* (Linnaeus) A. Gray – G; > *Convolvulus sepium* var. *americanus* Sims – G; > *Convolvulus americanus* (Sims) Greene – S; > *Convolvulus repens* Linnaeus – S]

Calystegia sepium (Linnaeus) R. Brown *ssp.* ***angulata*** (Sims) Brummitt. Mt (WV), {GA, NC, SC, VA}: {habitats}; (uncommon in WV). NB to BC, south to SC, TX, NM, and OR. [= K, Y; < *Calystegia sepium* – RAB, C, GW, W; < *Convolvulus sepium* Linnaeus var. *sepium* – F, G, Z]

Calystegia sepium (Linnaeus) R. Brown *ssp.* ***appalachiana*** Brummitt. Mt (WV), {NC, VA}: {habitats}; common in WV. [= K; < *Calystegia sepium* – RAB, C, GW, W; < *Convolvulus sepium* Linnaeus var. *sepium* – F, G, Z]

Calystegia sepium (Linnaeus) R. Brown *ssp.* ***limnophila*** (Greene) Brummitt. Mt (WV), {GA, NC, SC, VA}: {habitats}; rare in WV. [= K, Y; < *Calystegia sepium* – RAB, C, GW, W; < *Convolvulus sepium* Linnaeus var. *sepium* – F, G, Z; = *Convolvulus limnophilus* Greene]

Calystegia sepium (Linnaeus) R. Brown *ssp.* ***sepium***. Mt (WV), {DE, GA, NC, SC, VA}: {habitats}; common in WV. [= K; < *Calystegia sepium* – RAB, C, GW, W; < *Convolvulus sepium* Linnaeus var. *sepium* – F, WV, Z; > *Convolvulus sepium* var. *sepium* – G; > *Convolvulus sepium* var. *communis* R. Tryon – G; < *Convolvulus sepium* – S]

Calystegia silvatica Grisebach *ssp.* ***fraterniflora*** (Mackenzie & Bush) Brummitt. Mt (VA, WV), Pd (VA), Cp (VA), {GA, NC, SC}: {habitats}; uncommon in VA, rare in WV. Ssp. *silvatica* and ssp. *disjuncta* are European. [= K, Y; < *Calystegia sepium* – C; = *Convolvulus sepium* Linnaeus var. *fraterniflorus* Mackenzie & Bush – F, G, WV, Z; = *Calystegia sepium* (Linnaeus) R. Brown var. *fraterniflora* (Mackenzie & Bush) Shinners]

* ***Calystegia soldanella*** (Linnaeus) R. Brown ex Roemer & J.A. Schultes. Cp (NC, VA): beaches, dunes; rare, native of {}. [= RAB, K; **= *Convolvulus soldanella*** Linnaeus]

Calystegia spithamaea (Linnaeus) Pursh *ssp.* ***spithamaea***, Low Bindweed. Pd (DE, VA), Mt (VA, WV): dry limestone areas; uncommon in VA and WV. [= K; < *Calystegia spithamaea* – RAB, C, W; = *Calystegia spithamaea* var. *spithamaea*; = *Convolvulus spithamaeus* var. *spithamaeus* – F; > ***Convolvulus spithamaeus*** Linnaeus – G, S; < *Convolvulus spithamaeus* – Z]

Calystegia spithamaea (Linnaeus) Pursh *ssp.* ***stans*** (Michaux) Brummitt, Shale Bindweed. Mt (GA, NC, SC, VA, WV): shale barrens and woodlands, less typically on limestone; uncommon. [> *Calystegia spithamaea* (Linnaeus) Pursh ssp. *purshiana* (Wherry) Brummitt – K; > *Calystegia spithamaea* ssp. *stans* (Michaux) Brummitt – K; < *Calystegia spithamaea* – RAB, C, W; > *Calystegia spithamaea* var. *pubescens*; > *Convolvulus spithamaeus* Linnaeus var. *pubescens* (A. Gray) Fernald – F; > *Convolvulus purshianus* Wherry – G; > *Convolvulus spithamaeus* – G; < *Convolvulus spithamaeus* – Z]

Calystegia macounii (Greene) Brummitt. Reported for NC and VA; Brummitt says this species does not occur east of the Mississippi River. Rejected pending convincing documentation. [= K, Y; **=** *Convolvulus macounii* Greene] {not keyed}

Convolvulus Linnaeus 1753 (Field-bindweed)

A genus of about 100 species, vines, cosmopolitan, especially in temperate areas. [also see *Calystegia*]

* ***Convolvulus arvensis*** Linnaeus, Field-bindweed, Creeping Jenny. Mt (NC, SC, VA), Pd (DE, GA, NC, VA), Cp (DE, FL, NC, VA): fields, roadsides, disturbed areas; common (uncommon in GA, NC, SC, and WV, uncommon in Coastal Plain of VA, rare in FL), native of Europe. June-November. [= RAB, C, F, G, K, W, WH, WV; = *Strophocaulos arvensis* (Linnaeus) Small – S]

Cuscuta Linnaeus 1753 (Dodder)

A genus of about 100 species, parasitic, achlorophyllose herbs, nearly cosmopolitan. Variously treated as a monogeneric family, or as a component of the Convolvulaceae; Neyland (2001) and Stefanović, Krueger, & Olmstead (2002) provide molecular evidence for the treatment of *Cuscuta* as a derived member of Convolvulaceae. References: Yuncker (1921); Yuncker (1965)=Z; Musselman (1986)=Y; Gandhi, Thomas, & Hatch (1987)=X; Costea, Nesom, & Stefanović (2006a, 2006b, 2006c)=V; Neyland (2001); Stefanović, Krueger, & Olmstead (2002). Key based on Yuncker (1965).

Identification notes: corolla measurements are from the base to the sinuses of the corolla. The **infrastaminal scales** are transparent structures at the base of the stamens.

1 Styles more-or-less united; capsule circumscissile; [subgenus *Monogynella*]

2 Stigmas flattened-depressed; flowers 2.5-4 mm long ..... ***C. cassytoides***
2 Stigmas oval or conical; flowers ca. 2 mm long ..... ***C. japonica***
1 Styles separate and distinct from the base; capsule not circumscissile (except the rare aliens *C. epilinum* and *C. epithymum*).
3 Stigmas elongated, terete or conical; capsule circumscissile; [subgenus *Cuscuta*].
4 Style about equaling the ovary, included in the corolla; fruit 2.0-2.5 mm long..... ***C. epilinum***
4 Style (including the stigma) much longer than the ovary, exserted from the corolla; fruit ca. 1.5 mm long ..... ***C. epithymum***
3 Stigmas capitate, about as wide as long; capsule not circumscissile, either indehiscent or rupturing irregularly; [subgenus *Grammica*].
5 Each flower subtended by 1-10 imbricate bracts; sepals distinct nearly to the base.
6 Bract apex reflexed or spreading..... ***[C. glomerata]***
6 Bract apex erect.
7 Pedicels absent, the flowers in compact clusters sessile on the stem..... ***C. compacta***
7 Pedicels 0.5-3 mm long, the flowers in loose panicles..... ***[C. cuspidata]***
5 Flowers not bracteate; sepals various.
8 Perianth surface granular; fresh flowers fleshy; corolla lobes acute, tips typically curved inwards.
9 Corolla tubular; calyx > ½ as long as the corolla; flowers 4 (-5)-merous; infrastaminal scales reduced, merely bifid or shallowly toothed..... ***C. coryli***
9 Corolla campanulate; calyx ca. ½ as long as the corolla; flowers 5-merous; infrastaminal scales profusely fringed ..... ***C. indecora***
8 Perianth surface not granular; fresh flowers not especially fleshy; corolla lobes various.
10 Stylopodium (a thickened ridge at the base of the style) present; flowers 5-merous.
11 Ovary blunt to pointed, but not beaked; corolla 2.2-3.5 mm long, 2-3 mm wide; seeds ca. 1.5 mm long; [widespread] ..... ***C. gronovii***
11 Ovary with a long, beak-like projection at the top; corolla 4-6 mm long, 4-6 mm wide; seeds 2-3 mm long; [of the Mountains] ..... ***C. rostrata***
10 Stylopodium absent; flowers 3-4-merous or 5-merous.
12 Flowers subsessile, therefore in globular inflorescences.
13 Flowers 5-merous..... ***C. obtusiflora*** *var.* ***glandulosa***
13 Flowers mostly 3-4-merous.
14 Corolla lobes rounded or obtuse..... ***C. cephalanthi***
14 Corolla lobes acute ..... ***C. polygonorum***
12 Flowers on pedicels slightly shorter than to longer than the flowers, therefore in loose inflorescences.
15 Flowers mostly longer than wide..... ***[C. suaveolens]***
15 Flowers mostly as wide as long.
16 Flowers 1.5-3.0 mm long, at least some exceeding 2.5 mm long; calyx lobes not overlapping at the base in older flowers, and therefore the flowers not pronouncedly 5-angled ..... ***C. campestris***
16 Flowers 0.9-2.5 mm long; calyx lobes strongly overlapping and forming definite angles at the sinuses, thus the flower strongly 4-5-angled.
17 Flowers 4-merous; flowers 0.9-1.4 mm long; stems very slender; [on granite and sandstone outcrops] ..... ***C. harperi***
17 Flowers 5-merous; flowers 1.5-2.5 mm long; stems not especially slender; [widespread]..... ***C. pentagona***

Cuscuta campestris Yuncker, Field Dodder. Cp, Pd (GA, NC, SC, VA), Mt (NC, SC, VA): roadsides and old fields, often on Fabaceae; common. June-November. Nearly cosmopolitan because of its common association with cultivated legumes, its original distribution unclear. [= RAB, F, GW, V, W, Y, Z; < *C. pentagona* Engelmann – C, G; < *C. pentagona* var. *pentagona* – K, X; = *Grammica campestris* (Yuncker) Hadac & Chrtek]

* ***Cuscuta cassytoides*** Nees ex Engelmann, African Dodder. Cp (NC): on *Quercus phellos*; rare, native of s. Africa. June. [= RAB, K, Z]

Cuscuta cephalanthi Engelmann, Buttonbush Dodder. Cp (GA, VA), Pd (NC, SC), Mt (NC, VA): primarily on woody hosts; rare. August-September. NB west to BC, south to GA, TX, CA, and Mexico. See Nelson (1993) for the first SC record. [= C, F, G, GW, K, S, X, Z; = *C. cephalanthii* – RAB, Y, orthographic error; = *Grammica cephalanthii* (Engelmann) Hadac & Chrtek]

Cuscuta compacta Antoine Laurent de Jussieu ex Choisy, Compact Dodder. Cp (DE, GA, NC, SC, VA), Pd (DE, GA, NC, SC, VA), Mt (GA, NC, SC, VA): wet habitats, on herbaceous and especially on woody hosts; common. August-November. VT, QC, and NE south to s. FL and TX. [= RAB, C, F, G, GW, S, WH, X; > *C. compacta* var. *compacta* – K, W, Y, Z; > *C. compacta* var. *efimbriata* Yuncker – K, Y, Z]

Cuscuta coryli Engelmann, Hazel Dodder. Cp (DE, NC, SC), Mt (NC, VA, WV), Pd (VA): on a wide variety of woody and herbaceous hosts; rare. July-November. MA, NY, and SK south to SC, AL, TX, and AZ. [= C, F, G, GW, K, S, V, WV, X, Z; = *C. corylii* – RAB, W, orthographic variant; = *Grammica coryli* (Engelmann) Hadac & Chrtek]

* ***Cuscuta epilinum*** Weihe, Flax Dodder. Cp (DE), Pd (DE): primarily on *Linum*, rare, native of Europe. South to DE, MD, and PA (Kartesz 1999). [= C, F.G, K, Z]

* ***Cuscuta epithymum*** Linnaeus, Clover Dodder. Mt (WV): primarily on *Trifolium*; rare, , native of Europe. june-October. Also known from scattered localities in PA (Rhoads & Klein 1993)l reported for VA by Kartesz (1999), based on Massey (1961). [= C, F, G, K, WV, Z]

Cuscuta gronovii Willdenow ex J.A. Schultes, Common Dodder. Cp (DE, FL, GA, NC, SC, VA), Pd (DE, GA, NC, SC, VA), Mt (GA, NC, SC, VA, WV): on a very wide variety of herbaceous and woody plants; common. August-October. QC west to BC, south to s. FL and AZ. [= RAB, C, F, G, GW, S, W, WH, WV, Y; > *C. gronovii* var. *gronovii* – K, V, X, Z; > *C. gronovii* var. *latiflora* Engelmann – K, V, Z; = *Grammica gronovii* (Willdenow ex J.A. Schultes) Hadac & Chrtek]

Cuscuta harperi Small, Harper's Dodder. Cp (GA), Pd (GA): outcrops of granite (Piedmont) and Altamaha grit (Coastal Plain), typically on plants such as *Liatris microcephala, Bigelowia nuttallii, Hypericum gentianoides*, and *Croton willdenowii*; rare. September-November. C. and wc. GA west to nw. AL. [= K, S, V, Z]

Cuscuta indecora Choisy, Bigseed Alfalfa Dodder. Cp (FL, GA, NC, SC, VA), Pd (GA, NC, VA), Mt (VA, WV): salt marshes (on *Iva frutescens*), roadsides, disturbed areas; rare. July-August. NJ, MN, and ID, south to s. FL, TX, CA, Mexico, Central America, and South America. See Nelson (1993) for the first SC record. Silberhorn (1998) describes an occurrence of this species in VA. [= C, GW, S, WH, WV, X, Y; > *C. indecora* var. *indecora* – F, K, V, Z; > *C. indecora* var. *neuropetala* (Engelmann) A.S. Hitchcock – F, K, Z; = *Grammica indecora* (Choisy) W.A. Weber]

* ***Cuscuta japonica*** Choisy, Japanese Dodder. Mt (SC), Cp (FL): disturbed area; rare, native of e. Asia. Apparently eradicated in Pickens County, SC. [= K, WH, Z]

Cuscuta obtusiflora Kunth *var.* ***glandulosa*** Engelmann, Glandular Dodder. Cp (FL, GA): on herbs in calcareous glades and other habitats; rare. GA and OK south to FL, TX, Mexico; West Indies. See Anderson (2007) for FL Panhandle record. [= G, GW, K, V, WH, X; = *C. glandulosa* Small – S]

Cuscuta pentagona Engelmann. Cp (DE, FL, GA, NC, SC, VA), Pd (DE, GA, NC, SC, VA), Mt (NC, SC, VA, WV): on a wide variety of hosts; common. May-November. Throughout the United States and s. Canada. [= RAB, C, G, GW, S, V, W, WH, Y, Z; >< *C. pentagona* var. *pentagona* – K, X; = *Grammica pentagona* (Engelmann) W.A. Weber; > *C. campestris* Yuncker – F, WV; > *C. pentagona* – F, WV]

Cuscuta polygonorum Engelmann, Smartweed Dodder. Cp (DE), Pd (DE, VA), Mt (VA, WV): on *Polygonum* and other hosts; rare. NY and ON west to ND, south to FL and TX. [= C, F, G, K, S, W, V, X, Y, Z]

Cuscuta rostrata Shuttleworth, Appalachian Dodder, Beaked Dodder. Mt (GA, NC, SC, VA, WV): high elevation hardwood forests and thickets; common (uncommon in WV, rare in GA). July-September. A Southern Appalachian endemic: WV and MD south through w. VA, e. KY, e. TN, w. NC to n. GA. [= RAB, C, F, G, K, S, W, WV, Y, Z; = *Grammica rostrata* (Shuttleworth) Hadac & Chrtek]

Cuscuta cuspidata Engelmann. IN, ND, and UT south to KY, MS, TX, and NM. [= C, F, K, X, Z]

Cuscuta glomerata Choisy. OH, MI, MN, and ND south to KY, TN, MS, and TX. [= C, F, G, GW, K, S, X, Z]

* *Cuscuta suaveolens* Seringe, Fringed Dodder. Scattered sites in eastern North America, including AL, MD, and OH. [= C, G, K, Z]

Dichondra J.R. Forster & G. Forster 1775 (Ponyfoot, Dichondra)

A genus of about 9 species, of tropical subtropical and warm temperate areas. References: Tharp & Johnston (1961)=Z.

1 Calyx lobes > 2× as long as wide, exceeding the fruit; pedicels straight or nearly so ..... ***D. carolinensis***
1 Calyx lobes < 2× as long as wide, shorter than the fruit; pedicel strongly recurved just below the calyx ..... ***D. micrantha***

Dichondra carolinensis Michaux, Carolina Ponyfoot. Cp (FL, GA, NC, SC, VA), Pd (GA, NC, SC), Mt*, (VA*, WV*): lawns, roadsides, moist pinelands; common (uncommon in VA, rare in Mountains of VA and WV). March-May. Se. VA south to s. FL, west to AR and TX; also in Bermuda and reported for the Bahamas; sometimes adventive beyond that range. This plant is rarely seen in a "natural" habitat, but is often seen in lawns and other mowed grassy areas. [= RAB, C, GW, K, S, WH, Z; = *D. repens* J.R. Forster var. *carolinensis* (Michaux) Choisy – F, G]

* ***Dichondra micrantha*** Urban, Kidneyweed, Small-flowered Ponyfoot. Cp (FL, GA): disturbed areas; rare, native of Australia and New Zealand. Reported for Camden County, GA (Carter, Baker, & Morris 2009). [= K, WH, Z]

Evolvulus Linnaeus 1762 (Dwarf Morning-glory)

A genus of about 90-100 species, almost all of tropical, subtropical, and warm temperate America. References: Ward (1968); Wilson (1960b)=Z.

1 Leaves densely pilose on both surfaces with spreading to loosely appressed hairs; internodes short, generally < 1 cm long; [calcareous glades and barrens of c. TN] ..... ***[E. nuttallianus]***
1 Leaves densely pilose with appressed (sericeous) hairs below, the upper surface glabrous or loosely pubescent; internodes long, many over 1.5 cm long; [wet flatwoods, seepages, bogs, Altamaha Grit outcrops in the the Coastal Plain] ..... ***E. sericeus*** *var.* ***sericeus***

Evolvulus sericeus Swartz *var.* ***sericeus***, Silky Dwarf Morning-glory. Cp (FL, GA): wet flatwoods, seepages, bogs, Altamaha Grit outcrops; uncommon (rare in GA). Coastal Plain of ec. GA (Appling, Jeff Davis, and Coffee counties) (Bridges & Orzell 1989; Patrick, Allison, & Krakow 1995) south to s. FL; AR and LA west to AZ, south into Mexico; West Indies. [= K; < *E. sericeus* – S, WH, Z]

Evolvulus nuttallianus J.A. Schultes, Shaggy Dwarf Morning-glory, in c. TN (Chester, Wofford, & Kral 1997), disjunct from the Great Plains. [= F, K, Z; = *E. nuttalianus* – C, orthographic variant; = *E. pilosus* Nuttall – G]

Ipomoea Linnaeus 1753 (Morning-glory)

A genus of about 650 species, herbs, vines, and shrubs, of tropical, subtropical, and warm temperate areas. References: Austin (1984)=Z; Austin & Huáman (1996)=Y; Austin & Bianchini (1998). Key adapted closely from Z.

1 Erect woody shrub with hollow stems to 2 m tall; [subgenus *Eriospermum*, section *Eriospermum,* series *Jalapae*] .....***I. carnea ssp. fistulosa***
1 Trailing or twining vine.
2 Corolla salverform, the long narrow tube cylindrical (with sides more-or-less parallel) for most of its length, the limb abruptly flaring at the summit of the tube.
3 Corolla 2-4 cm long, scarlet, orange or yellow; flowers open from early morning to late morning or late afternoon; [subgenus *Quamoclit,* section *Mina*].
4 Leaf blade pinnately divided into 11-31 (or more) linear segments .....***I. quamoclit***
4 Leaf blade entire, or angled or lobed into 3-7 lanceolate or ovate segments.
5 Calyx (5-) 6-8 (-9) mm long; fruit reflexed .....***I. coccinea***
5 Calyx 4-4.5 mm long; fruits erect .....***I. hederifolia***
3 Corolla 3-14 cm long, lavender to white; flowers open from evening until early morning.
6 Leaves tomentose beneath; corolla mostly white on the outer surface, lavender to purple on the inner surface, thus bicolored in-and-out; [of outer Coastal Plain hammocks and shell middens in se. NC and SC]; [subgenus *Eriospermum*, section *Eriospermum,* series *Jalapae*].....***I. macrorhiza***
6 Leaves glabrous beneath; corolla either white on both surfaces or lavender on both surfaces, not bicolored in-and-out; [weedy, of disturbed habitats]; [subgenus *Quamoclit*, section *Calonyction*]
7 Corolla 10-14 cm long, white .....***I. alba***
7 Corolla 3-7 cm long, violet or lavender.....***I. muricata***
2 Corolla funnelform to campanulate, the short to long tube expanding from below the middle, the limb gradually to abruptly flaring at the summit of the tube.
8 Pedicels and peduncles with spreading, ascending, or reflexed trichomes; gynoecium 3-parted; [subgenus *Ipomoea,* section *Pharbitis*].
9 Sepals soft-pilose on the outer surface with slender trichomes .....***I. indica** var. **acuminata***
9 Sepals hispid-pilose on the outer surface, with swollen-based trichomes.
10 Sepals with slightly narrowed green tips shorter than to slightly longer than the body of the sepal; [series *Pharbitis*].....***I. purpurea***
10 Sepals with very narrow elongate green tips much longer than the body of the sepal; [series *Heterophyllae*].
11 Sepals abruptly narrowed, the long subacute tips strongly spreading or curved.....***I. hederacea***
11 Sepals gradually narrowed, the long acute tips suberect, straight, scarcely spreading .....***[I. nil]***
8 Pedicels and peduncles glabrous or with short, appressed trichomes; gynoecium 2-parted; [subgenus *Eriospermum*].
12 Stems trailing, rooting at the nodes; leaf apex emarginate, truncate, or obtuse; [of beaches from se. NC southward]; [subgenus *Eriospermum*, section *Erpipomoea*].
13 Corolla white with a yellowish or purple eye; larger leaves 3-7-lobed.....***I. imperati***
13 Corolla lavender; larger leaves not lobed (though notched at the apex) .....***I. pes-caprae** var. **emarginata***
12 Stems erect or twining, not rooting at the nodes (except sometimes in *I. batatas*); leaf apex acute to acuminate; [collectively of various habitats, not beaches, widespread]; [subgenus *Eriospermum*, section *Eriospermum*].
14 Leaves palmately dissected.
15 Axillary buds developing stipule-like leaves .....***I. cairica***
15 Axillary buds not developing leaves .....***I. wrightii***
14 Leaves entire or pinnately lobed.
16 Leaf base sagittate; [series *Jalapae*].....***I. sagittata***
16 Leaf base cuneate to cordate.
17 Corolla 1.5-2.5 cm long, white or lavender
18 Corolla white; anthers purple; sepals lanceolate; [series *Batatas*].....***I. lacunosa***
18 Corolla lavender; anthers white; sepals oblong .....***I. triloba***
17 Corolla 3-8 cm long, at least partly pink to lavender (sometimes entirely white in *I. batatas*).
19 Sepals ovate to oblong-elliptic; corolla usually white on the limb, the throat purple; anthers 5-7 mm long; [series *Jalapae*] .....***I. pandurata***
19 Sepals oblong-ovate to oblong-lanceolate; corolla usually pink to lavender on the limb, the throat lavender to purple; anthers 1.5-3.2 mm long; [series *Batatas*].
20 Sepals unequal in length, oblong-ovate, with acute to caudate apices; leaves mostly 10-15 cm wide .....***I. batatas***
20 Sepals more-or-less equal in length, oblong-lanceolate, with acuminate apices; leaves 2-5 cm wide.....
.....***I. cordatotriloba** var. **cordatotriloba***

Ipomoea alba Linnaeus, Moonflowers, Tropical Morning-glory. Cp (FL): hammocks, marsh edges; rare. Ne. FL south to s. FL. [= WH; ? *Calonyction aculeatum* (Linnaeus) House]

* ***Ipomoea batatas*** (Linnaeus) Lamarck, Sweet Potato. Cp (FL, GA?, NC, SC, VA?): persistent in fields after cultivation, disturbed areas; rare, apparently native of tropical America. [= RAB, K, S, Y, Z]

* ***Ipomoea cairica*** (Linnaeus) Sweet. Cp (FL): disturbed areas; rare, native of Africa. AL, FL. [= K, S, WH] {synonymy incomplete}

* ***Ipomoea carnea*** Jacquin *ssp.* ***fistulosa*** (Martius ex Choisy) D. Austin, Bush Morning-glory. Cp (GA, SC): persistent from cultivation in suburban gardens, sandy soils of barrier island; rare, native of w. Brazil and e. Bolivia. [= K, Y, Z; = *I. fistulosa* Martius ex Choisy – RAB, S]

Ipomoea coccinea Linnaeus, Scarlet Creeper, Red Morning-glory. Cp (DE, GA, NC, SC, VA), Pd (DE, GA, NC, SC, VA), Mt (GA, NC, SC, VA, WV*): fields, roadsides, thickets, streambanks; common (uncommon in Mountains of VA and WV). August-December. Native distribution uncertain, but apparently native to se. United States. [= RAB, C, F, GW, K, W, WV, Y, Z; = *Quamoclit coccinea* (Linnaeus) Moench – G, S]

Ipomoea cordatotriloba Dennstedt *var.* ***cordatotriloba***, Coastal Morning-glory, Tie-vine. Cp (FL, GA, NC, SC): dunes, sandy areas on barrier islands, other sandy habitats; common (uncommon north of FL). September-October. Se. NC south to s. FL, west to e. TX and AR. The correct nomenclature is discussed by Manitz (1983). [= K; *? I. trichocarpa* Elliott – RAB, GW, S, Z; *? I. trifida* – S, misapplied; < *I. cordatotriloba* – WH; *? I. cordatotriloba* – Y]

Ipomoea hederacea Jacquin, Ivyleaf Morning-glory. Cp (DE, FL, GA, NC, SC, VA), Pd (DE, GA, NC, SC, VA), Mt (GA, NC, SC, VA, WV): fields, disturbed areas; common. July-December. Native distribution obscure, apparently native to temperate North America, including our area. [= C, GW, K, W, WH, WV, Y, Z; > *I. hederacea* var. *hederacea* – RAB, F, G; > *I. hederacea* var. *integriuscula* A. Gray – RAB, F, G; > *Pharbitis hederacea* (Linnaeus) Choisy – S; > *Pharbitis barbigera* (Sweet) G. Don – S]

* ***Ipomoea hederifolia*** Linnaeus, Scarlet Creeper. Cp (FL, GA): disturbed areas; uncommon. {Distribution in our area uncertain, native of tropical America – Kartesz (1999) says GA only} [= GW, K, WH, Y, Z; = *I. coccinea* Linnaeus var. *hederifolia* (Linnaeus) A. Gray]

Ipomoea imperati (Vahl) Grisebach, Beach Morning-glory. Cp (FL, GA, NC, SC): beaches, dune blowouts, fore-dunes; common (rare in NC and SC). August-October. Se. NC south to s. FL, west to TX, and extensively distributed in the tropics. [= K, WH, Y; = *I. stolonifera* (Cirillo) J.F. Gmelin – RAB, GW, S, Z]

Ipomoea indica (Burmann) Merr. *var.* ***acuminata*** (Vahl) Fosberg. Cp (FL): hammocks, coastal areas, disturbed areas; uncommon. Also AL, MS, LA. [= K, WH; ? *Pharbitis cathartica* (Poiret) Choisy – S] {add to synonymy}

Ipomoea lacunosa Linnaeus, White Morning-glory, Whitestar. Cp (DE, FL, GA, NC, SC, VA), Pd (DE, GA, NC, SC, VA), Mt (GA, NC, SC, VA): riverbanks, fields, roadsides, disturbed areas; common (rare in Mountain sof VA and WV). July-December. NJ west to OH, IL, and KS, south to FL and e. TX. [= RAB, C, F, G, GW, K, S, W, WH, WV, Y, Z]

Ipomoea macrorhiza Michaux, Indian-midden Morning-glory, Manroot. Cp (FL, GA, NC, SC): hammocks, shell middens, dry sands, disturbed maritime areas; uncommon (rare north of FL). June-July. Se. NC south to s. FL, west to s. AL. [= RAB, K, S, WH, Y, Z]

* ***Ipomoea muricata*** (Linnaeus) Jacquin, Lilacbell, Purple Moonflower. Cp (FL, GA, NC, SC): fields, disturbed areas; rare, native (apparently) of Mexico. Austin & Jansson (1988) discuss the species' spread in se. United States, apparently as a contaminent in soybean seeds. Staples et al. (2005) reinstate the name *I. muricata*. [= WH; = *Ipomoea turbinata* Lagasca y Segura – K, Y, Z]

Ipomoea pandurata (Linnaeus) G.F.W. Meyer, Wild Sweet Potato, Manroot, Man-of-the-earth. Cp (DE, FL, GA, NC, SC, VA), Pd (DE, GA, NC, SC, VA), Mt (GA, NC, SC, VA, WV): disturbed areas; common. May-September; July-October. CT, NY, and s. ON west to OH, s. MI, and KS, south to c. peninsular FL and e. TX. [= RAB, C, F, G, GW, K, S, W, WH, WV, Y, Z; > *I. pandurata* var. *pandurata* – G; > *I. pandurata* var. *rubescens* Choisy – G]

Ipomoea pes-caprae (Linnaeus) R. Brown *var.* ***emarginata*** Hallier f., Railroad Vine, Goat's-foot, Bay Hops, Bay Winders. Cp (FL, GA, NC, SC): ocean beaches; uncommon (rare north of FL). E. NC (Carteret County), SC (Beaufort, Horry, Charleston, Colleton, and Georgetown counties), south to FL, west to TX, and widespread on tropical shores of the the New World and Old World. The records in the Carolinas may reflect the periodic arrival of sea-borne seeds. [< *I. pes-caprae* – GW, S, Z; *? I. pes-caprae* ssp. *brasiliensis* (Linnaeus) van Ooststroom – K, WH, Y]

* ***Ipomoea purpurea*** (Linnaeus) Roth, Common Morning-glory. Cp (DE, FL, GA, NC, SC, VA), Pd (DE, GA, NC, SC, VA), Mt (GA, NC, SC, VA, WV): fields, disturbed areas; common (rare in FL), native of tropical America. July-September. [= RAB, C, F, G, GW, K, W, WH, WV, Y, Z; = *Pharbitis purpurea* (Linnaeus) Voigt – S]

* ***Ipomoea quamoclit*** Linnaeus, Cypress-vine. Cp (FL, GA, NC, SC, VA), Pd (NC, SC, VA): fields, hedgerows, disturbed areas; common (rare in VA), native of tropical America. September-December. [= RAB, C, F, GW, K, WH, Y, Z; = *Quamoclit vulgaris* Choisy – G; = *Quamoclit quamoclit* (Linnaeus) Britton – S]

Ipomoea sagittata Poiret. Cp (FL, GA, NC, SC): edges of brackish marshes, moist thickets on barrier islands, hammocks; common. July-September. E. NC south to s. FL, west to TX; also in the West Indies. [= RAB, GW, K, S, WH, Y, Z]

* ***Ipomoea triloba*** Linnaeus, Little-bell. Cp (FL): hammocks, sand dunes; uncommon. N. FL south to s. FL; West Indies; New World and Old World tropics. [= S, WH] {add to synonymy}

* ***Ipomoea wrightii*** A. Gray. Cp (FL, GA): disturbed areas; rare, native of India. Reported as likely naturalized in central TN, "spreading northward from the Gulf Coastal Plain" (Kral 1981). It also is known from GA (Kartesz 1999). [= K, WH; ? *I. heptaphylla* Voigt – S] {synonymy incomplete}

* *Ipomoea* ×*multifida* (Rafinesque) Shinners [*I. coccinea* × *quamoclit*], Cardinal Climber, is cultivated and may escape. [= K] {not keyed}

* *Ipomoea nil* (Linnaeus) Roth occurs in scattered states, such as MD and MS, as a rare introduction from tropical America (Kartesz 1999). [= K, Y, Z; = *Pharbitis nil* (Linnaeus) Choisy – S]

* *Ipomoea tricolor* Cavanilles is reported for several locations in se. PA (Rhoads & Klein 1993). [= K] {not yet keyed; synonymy incomplete}

Jacquemontia Choisy 1834 (Jacquemontia)

A genus of about 90 species, tropical, subtropical, and warm temperate areas, especially America. References: Wilson (1960b)=Z.

* ***Jacquemontia tamnifolia*** (Linnaeus) Grisebach, Jacquemontia. Cp (FL, GA, NC, SC, VA), Pd (GA, SC): fields, roadsides, other disturbed areas; common (uncommon in CA, NC, SC, rare in VA). August-September. Se. VA south to FL, west to AR and TX; also widespread in West Indies, Central America, and South America, its original range difficult to determine. In our area, it is probably adventive. Fox, Godfrey, & Blomquist (1952) report the first collections of the species in NC, in 1938 and 1950, from obviously disturbed situations. [= RAB, C, F, G, GW, K, WH, Z; = *Thyella tamnifolia* (Linnaeus) Rafinesque – S]

Merremia Dennstedt ex Endlicher 1838

References: Wilson (1960b)=Z.

* ***Merremia dissecta*** (Jacquin) Hallier f., Noyau Vine. Cp (FL, GA): disturbed areas; common (rare in GA), native of South America. Ranges as far north as e. and sw. GA. [= K, WH, Z; =? *Ipomoea sinuata* Ortega; = *Operculina dissecta* (Jacquin) House]

Stylisma Rafinesque 1825 (Dawnflower)

A genus of about 6 species (and about 8 taxa), vining to trailing herbs, endemic to se. North America. References: Myint (1966)=Z; Shinners (1962d)=Y; Wilson (1960b)=X.

1 Corolla < 2× as long as the calyx; leaves < 2 cm long; [of FL] ..... ***S. abdita***
1 Corolla > 2× as long as the calyx; leaves (at least the larger on a plant) > 2 cm long; [collectively widespread].
2 Corolla pink or purple; filaments glabrous, or nearly so; leaves densely and conspicuously silvery-sericeous; [of seasonally wet habitats] ..... ***S. aquatica***
2 Corolla white; filaments villous, at least near the base; leaves puberulent or pubescent, but not consopicuously silky-sericeous; [of dry habitats].
3 Larger leaves (7-) 12-30 mm wide; peduncles with (1-) 3-7 (-12) flowers; stems with a tendency to twine, at least near growing tip.
4 Sepals glabrous; [widespread in the Coastal Plain and Piedmont of our area] ..... ***S. humistrata***
4 Sepals densely villous; [of s. GA southward and westward] ..... ***S. villosa***
3 Larger leaves 2-10 mm wide; peduncles with 1 (-5) flowers; stems without a tendency to twine.
5 Bracteoles (2-) 10-20 mm long; stylar branches usually fused more than 5/6 of the total length (occasionally fused less than ½ of length), the free portion of the stylar branches usually less than 3 mm long; sepals villous, 4-6 (-7) mm long, ovate-elliptic with obtuse to acute apices; leaves 1-3 mm wide.
6 Stylar branches 1-1.5 mm long, usually unequal in length, the longer nearly 2× as long as the shorter; sepals mostly acute; [of MS westward] ..... ***[S. pickeringii*** *var.* ***pattersonii]***
6 Stylar branches 2-3 mm long, nearly equal, the longer 1.0-1.3× as long as the shorter; sepals mostly obtuse; [of NC south and west to AL; disjunct in NJ] ..... ***S. pickeringii*** *var.* ***pickeringii***
5 Bracteoles 1-3 (-5) mm long; stylar branches free nearly to base, the free portion more than 5 mm long; sepals villous or glabrous, 6-9 mm long, ovate-lanceolate with acuminate apices; leaves 2-10 mm wide.
7 Sepals glabrous (-glabrate), though the margins ciliate; leaves 2-3 (-5) mm wide, mostly 7-15 × as long as wide ..... ***S. patens*** *var.* ***angustifolia***
7 Sepals moderately to densely villous; leaves 3-10 mm wide, mostly 4-6 × as long as wide ..... ***S. patens*** *var.* ***patens***

Stylisma abdita Myint. Cp (FL): scrub; rare. Ne. FL (Clay County) south to s. FL. [= K, WH, Z; = *Bonamia abdita* (Myint) R.W. Long]

Stylisma aquatica (Walter) Rafinesque, Water Dawnflower. Cp (AL, FL, GA, LA, MS, NC, SC): clay-based Carolina bays and wet savannas; uncommon (rare in NC and SC). June-July. Se. NC south to c. and w. FL Panhandle, west to se. AR and e. TX. *S. aquatica*, as the epithet implies, occurs in wetter habitats than our other species. [= GW, K, S, WH, Z; = *Bonamia aquatica* (Walter) A. Gray – RAB, Y; = *Breweria michauxii* Fernald & Schubert – F; = *Bonamia michauxii* (Fernald & Schubert) K.A. Wilson – X]

Stylisma humistrata (Walter) Chapman, Southern Dawnflower. Cp (FL, GA, NC, SC, VA), Pd (GA, NC, SC, VA): sandhills and other dry woodlands, especially on dryish stream terraces; common (uncommon in FL and rare in VA). June-August. Se. VA south to Panhandle FL, west to AR and e. TX, north in the interior to n. AL and w. TN. [= C, K, S, WH, Z; = *Bonamia humistrata* (Walter) A. Gray – RAB, X, Y; = *Breweria humistrata* (Walter) A. Gray – F, G]

Stylisma patens (Desrousseaux) Myint *var.* ***angustifolia*** (Nash) Shinners, Narrowleaf Dawnflower. Cp (FL, GA, NC, SC): sandhills; uncommon (rare in NC and SC). May-August. SE. NC south to c. peninsular FL, west to w. Panhandle FL. [= *Stylisma patens* (Desrousseaux) Myint ssp. *angustifolia* (Nash) Myint – K, Z; = *Bonamia patens* (Desrousseaux) Shinners var. *angustifolia* (Nash) Shinners – RAB, Y; = *S. angustifolia* (Nash) House – S; < *S. patens* – WH; = *Bonamia angustifolia* (Nash) K.A. Wilson – X]

Stylisma patens (Desrousseaux) Myint *var.* ***patens***, Common Dawnflower. Cp (GA, NC, SC): sandhills and other relatively dry sandy areas; common. June-August. Overall, the most common and widespread taxon of the genus in our area, regularly encountered in its habitat. E. NC south to n. FL, and west to s. MS. [= *Stylisma patens* (Desrousseaux) Myint ssp. *patens* – K, Z; = *Bonamia patens* (Desrousseaux) Shinners var. *patens* – RAB, Y; = *S. trichosanthes* (Michaux) House – S, misapplied; < *S. patens* – WH; = *Bonamia aquatica* (Walter) A. Gray – X, misapplied]

Stylisma pickeringii (Torrey ex M.A. Curtis) A. Gray *var.* ***pickeringii***, Pickering's Dawnflower. Cp (AL, GA, MS, NC, NJ, SC): sandhills, usually in the driest, most barren, deep-sand areas, occasionally colonizing dry, disturbed areas in sandhills, such as sandy roadbanks, known from the Fall-line Sandhills, aeolian rims of Carolina bays, and sandhills on relict riverine dunes along Coastal Plain rivers; rare. June-August (-September); July-September. Var. *pickeringii* ranges from s. NC south through SC, GA, AL, and e. MS, with a disjunct area in the Pine Barrens of s. NJ, sometimes treated as a separate variety "*caesariensis"* (see synonymy). This rare species is easily recognizable by its growth form, with numerous stems arching from a central point, then trailing radially away, forming a mound 1-2 meters in diameter. The narrowly linear leaves are borne vertically. Fernald and Schubert (1949) named four varieties in this widely but disjunctly distributed species; Myint (1966) reduced this to two varieties, one eastern and one western. [= C, K, Z; < *Bonamia pickeringii* (Torrey ex M.A. Curtis) A. Gray – RAB, X, Y; > *Breweria pickeringii* (Torrey ex M.A. Curtis) A. Gray var. *pickeringii* – F; > *Breweria pickeringii* var. *caesariensis* Fernald & Schubert – F; < *Breweria pickeringii* – G; < *Stylisma pickeringii* (Torrey ex M.A. Curtis) A. Gray – S]

Stylisma villosa (Nash) House, Hairy Dawnflower. Cp (FL, GA): sandhills, scrub; uncommon (rare in GA). Late April-July. S. GA south to s. FL, west to e. TX. [= K, S, WH, Z; = *Bonamia villosa* (Nash) K.A. Wilson – X, Y; = *Breweria villosa* Nash]

Stylisma pickeringii (Torrey ex M.A. Curtis) A. Gray var. *pattersonii* (Fernald & Schubert) Myint. Cp (MS): sandhills; rare. IL and IA south through KS and OK to w. LA and e. TX; disjunct east of the Mississippi River in w. MS (the material somewhat ambiguous as to varietal affinity). [= K, Z; < *Bonamia pickeringii* (Torrey ex M.A. Curtis) A. Gray – X, Y; < *Stylisma pickeringii* (Torrey ex M.A. Curtis) A. Gray – S]

358. SOLANACEAE A.L. Jussieu 1789 (Nightshade Family) [in SOLANALES]

A family of about 94 genera and nearly 3000 species, shrubs, trees, vines, and herbs, nearly cosmopolitan but especially diverse in South America. References: Hunziker (2001).

Subfamily Browallioideae: *Cestrum*
Subfamily Nicotanioideae: *Calibrachoa, Nicotiana, Nierembergia, Petunia*
Subfamily Solanoideae, tribe Solaneae: *Alkekengi, Capsicum, Physalis, Salpichroa, Solanum*
Subfamily Solanoideae, tribe Datureae: *Datura*
Subfamily Solanoideae, tribe Lycieae: *Lycium*
Subfamily Solanoideae, tribe Nicandreae: *Nicandra*
Subfamily Solanoideae, tribe Hyoscyameae: *Hyoscyamus*

2 Fruiting calyx bright red (fresh or dry); corolla white; [cultivated and weakly naturalized near gardens]..... ***Alkekengi***
2 Fruiting calyx green, yellow, or orange, drying brown or tan; corolla yellow, often marked with 5 large spots in the throat; [collectively widespread] ..... ***Physalis***

Alkekengi P. Miller 1754 (Chinese-lantern Plant)

A monotypic genus, a perennial herb, native of e. Asia. I here separate *Alkekengi* from *Physalis* as generically distinct, on the presumption that the re-typification of *Physalis* proposed by Whitson (2011) will be accepted. References: Mione et al. (1994); Whitson & Manos (2005); Whitson (2011).

* ***Alkekengi officinarum*** Moench, Chinese-lantern Plant. Pd (DE), Mt (WV), {VA?}: disturbed suburban areas; uncommon (rare in VA), native of Japan, Korea, and n. China. Commonly cultivated as an ornamental and occasionally naturalized in e. North America, as at scattered locations in TN (Chester, Wofford, & Kral 1997). It is perennial, readily recognized by its mature calyces red-orange and up to 5 cm long. [= *Physalis alkekengi* Linnaeus – C, F, G, K, WV, Z]

Bouchetia Augustin de Candolle ex Dunal 1852 (Bouchetia)

A genus of about 3-4 species, tropical American.

Bouchetia erecta A.P. de Candolle. {MS}. Reported for MS and TX. [= K; = *Salpiglossis erecta* (A.P. de Candolle) D'Arcy] {synonymy incomplete}

Calibrachoa Cervantes 1825 (Seaside Petunia)

References: Hunziker (2001)=Z.

* ***Calibrachoa parviflora*** (Antoine Laurent de Jussieu) D'Arcy, Wild Petunia, Seaside Petunia. Cp (AL, FL, LA, MS, NC, VA): upper edges of salt marshes, waste areas, garbage dumps; rare, native of tropical America. Tatnall (1946) documents its occurrence in Virginia: "upper edge of salt marsh, Wachapreague," Accomack County (Fernald & Long 4169, 26 July 1934). [= K; = *Petunia parviflora* Antoine Laurent de Jussieu – RAB, C, F, G, S, Z]

Capsicum Linnaeus 1753 (Red Pepper, Chile)

A genus of about 25 species, herbs and shrubs, of tropical America. References: D'Arcy & Eshbaugh (1974)=Z; Bosland & Votava (2000)=Y; De (2003)=X; Andrews (1995)=V; Heiser & Pickersgill (1975). Key based on V and Z.

1 Flowers usually only one per node after the first flowering node (rarely more); corolla bright to milky white (rarely bluish or violet) ..... ***C. annuum***
1 Flowers 2-5 per node above the first flowering node; corolla greenish-white
2 Pedicel of mature fruit with constriction (waist) at junction with calyx; pedicels declining or erect at anthesis; corolla lobes planar; [habanero, scotch bonnet] ..... ***[C. chinense]***
2 Pedicel of mature fruit broadening evenly into the calyx, without constriction; pedicels erect at anthesis, the flower itself nodding; corolla lobes usually slightly revolute; [tabasco] ..... ***C. frutescens***

* ***Capsicum annuum*** Linnaeus, Bell Pepper, Chile, Pimiento, Paprika, Chile Piquin, Ancho, Cayenne, Pepperoncini, Jalapeño, Serrano, Chiltepin, and others. Cp (GA, NC, SC, VA), Pd (GA, NC, SC, VA): naturalized or persistent from gardens; commonly cultivated, rare as a naturalized species, native of Mexico (but early spread through Central America by native Americans, and since nearly worldwide in distribution at least in cultivation). June-frost. A very influential food crop introduced from the New World to the Old World, now important in various (especially tropical or subtropical) cuisines, including Hunan, Szechuan, Indian, Thai, various African, Mexican, and others. The great majority of our cultivated forms are of this species. The wild form, var. *glabriusculum*, was certainly present at one time in the Southeast and may still be represented in our area as reverted forms; it probably cannot be reliably distinguished from cultivars of *C. annuum*, and the two are not here distinguished taxonomically. [= RAB, S; > *C. annuum* var. *annuum* – K, V, X, Y, Z; > *Capsicum annuum* Linnaeus var. *glabriusculum* (Dunal) Heiser & Pickersgill – K, V, X; > *C. annuum* var. *aviculare* (Dierbach) D'Arcy & Eshbaugh – Y, Z]

* ***Capsicum frutescens*** Linnaeus, Tabasco. Cp (GA): persistent from gardens; uncommonly cultivated, rare as a waif, native of Andean South America. Reported in e. GA (Duncan 1985; Jones & Coile 1988). [= V, X, Y; = *C. annuum* Linnaeus var. *frutescens* (Linnaeus) Kuntze]

* *Capsicum chinense* Jacquin, Habanero, Scotch Bonnet. Rarely cultivated, not (yet) reported as persistent or escaped. Native of Andean South America. [= V, X, Y, Z]

Cestrum Linnaeus 1753 (Night-flowering Jessamine)

A genus of 150-200 shrubs (rarely trees or vines), of Tropical America. References: Hunziker (2001)=Z.

* ***Cestrum nocturnum*** Linnaeus, Night-flowering Jessamine. Cp (GA, LA): cultivated, weakly (if at all) established; rare, native of West Indies. See Small (1933). [= K, Z; *? C. parqui* – S, misapplied]

Datura Linnaeus 1753 (Jimsonweed)

A genus of about 10 species, of s. North America (probably originally native to sw. United States and Mexico). Several species of *Datura* are known to have been in our area at the time of first settlement by Europeans. They may have been weeds in Indian fields, or grown for their hallucinogenic properties. The common name "Jimsonweed" is a corruption of "Jamestown Weed." References: Avery, Satina, & Rietsema (1959)=Z. {needs thorough rework, based on herbarium material and clarification of nomenclature}

1 Calyx 3-5 cm long, the tube strongly angled, the angles even narrowly winged; corolla 7-10 cm long; capsule erect, dehiscent by 4 valves; [section *Datura*]..... ***D. stramonium***
1 Calyx 5-15 cm long, the tube terete or slightly angled; corolla 12-25 cm long; capsule inclined or nodding, irregularly dehiscent; [section *Dutra*].
  2 Corolla with 10 teeth, lavender; spines of capsule few, very stout-based ..... ***D. metel***
  2 Corolla with 5 or 10 teeth, white or pale lavender; spines of capsule many, hispid (the base only slightly thickened).
    3 Corolla with 10 teeth; leaves soft-pubescent ..... ***D. inoxia***
    3 Corolla with 5 teeth; leaves glaucescent..... ***D. wrightii***

* ***Datura inoxia*** J.S. Miller, Indian-apple. Cp (NC, SC), Pd (NC, SC), Mt (WV), {VA?}: disturbed areas; rare, native of Mexico. September-October. This species may not be distinct from *D. wrightii*. {It is currently not known with confidence which records in our area apply to which taxon} [= K, Z; = *D. innoxia* – F, S, WV, orthographic variant; ? *D. meteloides* – G, misapplied]

* ***Datura metel*** Linnaeus (NC): location and habitat in our area not known; rare, presumably introduced, allegedly native of tropical Africa and Asia. July-August. [= RAB, C, K, S, Z]

* ***Datura stramonium*** Linnaeus, Jimsonweed. Cp (AL, DE, FL, GA, LA, MS, NC, SC, VA), Pd (AL, DE, GA, NC, SC, VA), Mt (AL, GA, NC, SC, VA, WV): fields, pastures, disturbed areas, especially common in severely over-grazed pastures; common, presumably introduced from further south and west (Mexico or Central America). July-September; August-October. The plant is dangerously poisonous. [= RAB, C, K, S, W, WV, Z; > *D. stramonium* var. *stramonium* – F; > *D. stramonium* var. *tatula* (Linnaeus) Torrey – F; > *D. tatula* Linnaeus]

* ***Datura wrightii*** Regel, Indian-apple. Cp (AL, FL, VA), Pd (NC, SC), Mt (AL, WV): disturbed areas; rare, native of Mexico. July-September; September-October. [= K; *? D. meteloides* Dunal – RAB, S, Z, misapplied; *? D. metel* – G, misapplied; ? *D. innoxia* – WV, misapplied]

* ***Datura quercifolia*** Kunth is reported for sw. GA by Jones & Coile (1988). [= K] {not yet keyed}

Hyoscyamus Linnaeus 1753 (Henbane)

A genus of about 23 species, herbs, of Eurasia and n. Africa.

* ***Hyoscyamus niger*** Linnaeus, Black Henbane. Pd (DE): disturbed areas; rare, native of Europe. May-September. [= C, F, G, K]

Lycium Linnaeus 1753 (Matrimony-vine, Wolfberry, Goji Berry)

A genus of about 100 species, shrubs, of warm temperate and tropical areas of the Old World and New Word (especially America).

1 Leaves succulent, oblanceolate, 1-5 mm wide; [native, in maritime situations]..... ***L. carolinianum***
1 Leaves herbaceous, elliptic, ovate, or broadly oblanceolate, 8-30 mm wide; [introduced, persistent or naturalized, usually around old home sites].
2 Corolla lobes shorter than the corolla tube; leaves gray-green, 2-5 cm long..... ***L. barbarum***
2 Corolla lobes longer than the corolla tube; leaves bright green, 3-8 cm long ..... ***L. chinense***

* ***Lycium barbarum*** Linnaeus, Common Matrimony-vine, Wolfberry, Goji Berry. Cp (NC, SC, VA), Pd (DE, GA, NC, VA), Mt (GA, NC, VA, WV): old home sites, disturbed areas, along railroad tracks; rare, native of s. Europe. May-November; August-December. [= K; *? L. halimifolium* P. Miller – RAB, F, G, S, W, WV; < *L. barbarum* – C (also see *L. chinense*)]

Lycium carolinianum Walter, Christmas-berry, Carolina Matrimony-vine. Cp (FL, GA, SC): shell middens, shell mounds, shelly sand dunes, brackish marshes, maritime sand spits; uncommon (rare in GA and SC). September-October. Se. SC and e. GA south to FL, west to e. TX; also in the West Indies. Apparently not recently seen in SC; its occurrence in that state is based on Walter's flora. [= RAB, GW, S, WH; > *L. carolinianum* var. *carolinianum* – K]

* ***Lycium chinense*** P. Miller, Chinese Matrimony-vine, Wolfberry, Goji Berry. Mt (NC, VA), Cp (VA): old home sites; rare, native of China. May-November; August-December. [= RAB, F, G, K; < *L. barbarum* – C]

Nicandra Adanson 1763 (Apple-of-Peru)

A monotypic genus, an annual herb native of Peru.

* ***Nicandra physalodes*** (Linnaeus) Gaertner, Apple-of-Peru. Mt (GA, NC, SC, VA, WV), Pd (GA, NC, SC, VA), Cp (DE, NC, SC, VA): disturbed places, such as cultivated fields; uncommon, native of Peru. July-September; August-October. [= RAB, C, F, G, K, W, WV; = *Physalodes physalodes* (Linnaeus) Britton – S]

Nicotiana Linnaeus 1753 (Tobacco)

A genus of about 67 species, of America, Australia, and s. Pacific areas. Fernald (1950) describes the genus as "rank, acrid-narcotic American herbs." References: Goodspeed (1954)=Z; Knapp, Chase, & Clarkson (2004).

1 Plant a shrub or small tree, 3-10 m tall; stems glabrous and glaucous; [section *Paniculatae*]..... ***N. glauca***
1 Plant an herb, 0.5-3 m tall; stems densely viscid-puberulent (or sparsely so to merely tuberculate in *N. longiflora*).
2 Corolla tube 1.2-1.7 cm long, greenish yellow, with limb 3-6 mm wide; leaves distinctly petiolate; [section *Rusticae*]..... ***N. rustica***
2 Corolla tube 3.0-12.0 cm long, cream, white, yellow, or pink, with limb 10-25 mm wide; leaves auriculate clasping.
3 Larger leaves on a plant 3.5-8 dm long; corolla tube 3.0-5.5 cm long, 4-7× as long as the average diameter, the limb 10-15 mm wide, pink or reddish (rarely white); [section *Nicotiana*] ..... ***N. tabacum***
3 Larger leaves on a plant 1-3 dm long; corolla tube 4.0-12.0 cm long, 10-20× as long as the average diameter, the limb 15-25 mm wide, white or lavender; [section *Alatae*].
4 Rosette of a few leaves, not persisting; cauline leaves clasping and decurrent on the stem ..... ***N. alata***
4 Rosette persisting; cauline leaves clasping but not decurrent on the stem ..... ***N. longiflora***

* ***Nicotiana alata*** Link & Otto, Jasmine Tobacco. Cp (GA): cultivated in gardens; rarely persistent, native of South America. See Jones & Coile (1988). [= K, Z]

* ***Nicotiana glauca*** Graham, Tree Tobacco. Cp (GA): cultivated in gardens, rarely persistent or spreading; rare, native of South America. Apparently present at Fort Pulaski National Monument, Chatham County, GA (Jones & Coile 1988; W. Duncan pers.comm. 2004). [= K, S, Z]

* ***Nicotiana longiflora*** Cavanilles, Long-flower Tobacco. Pd (DE): disturbed areas, rare, native of South America. Cultivated and may be found as a waif or persistent. [= K, S, Z]

* ***Nicotiana rustica*** Linnaeus, Indian Tobacco, Wild Tobacco. Cp (GA, NC, SC, VA), Pd (GA, NC, SC, VA), Mt (GA, NC, SC, VA): formerly commonly cultivated by native Americans in all parts of our area, persistent following cultivation, now apparently extinct in our area; rare, originally native of Peru. This was the tobacco cultivated by American Indians at the time of contact by Europeans, and was the first tobacco taken to Europe and cultivated there. [= RAB, C, F, K, S; > *N. rustica* var. *rustica* – Z]

* ***Nicotiana tabacum*** Linnaeus, Cultivated Tobacco. Pd (GA, NC, SC, VA), Cp (GA, NC, SC, VA), Mt (GA, NC, SC, VA): persistent after cultivation; commonly cultivated, rarely naturalized, native of tropical America. June-frost; September-October. This is the tobacco currently cultivated in our area for the manufacture of cigarettes, cigars, and other smoking and chewing tobacco products. Two different strains are cultivated. Burley tobacco, with acute to acuminate leaves, grown mostly in the

Mountains and upper Piedmont, is air-cured in open barns, and used mostly for cigar and pipe tobacco. Flue-cured tobacco, with obtuse or broadly acute leaves, is grown mostly in the Coastal Plain and lower Piedmont, cured in closed, cubical barns with forced heat, and used mostly for cigarettes. [= RAB, C, F, K, S]

Nierembergia Ruiz & Pavón 1794 (Cupflower)

A genus of about 23 species, of Mexico, Central America, and South America.

* ***Nierembergia frutescens*** Durieu, Tall Cupflower, is reported from sw. GA (Jones & Coile 1988). [= K]

Petunia Antoine Laurent de Jussieu 1803 (Petunia)

[also see *Calibrachoa*]

* ***Petunia ×hybrida*** Vilmorin [*P. axillaris* × *integrifolia*], Petunia. Cp (FL, GA, NC, SC, VA), Pd (DE, GA, NC, SC, VA), Mt (WV): disturbed areas, garden edges, common in cultivation; rare, native of Argentina. May-November. Individual plants may closely resemble either parent, but this taxon in our area is best considered as a variable hybrid taxon. [= WH; = *P. ×atkinsiana* D. Don ex Loudon – RAB; > *P. axillaris* (Lamarck) Britton, Sterns, & Poggenburg – C, F, G, K, S; > *P. violacea* Antoine Laurent de Jussieu – F, S, misapplied; > *P. integrifolia* (Hooker) Schinz. & Thellung – C, G, K; > *P. ×atkinsiana* D. Don ex Loudon – K]

Physalis Linnaeus 1753 (Ground-cherry)
(contributed by Milo Pyne)

A genus of about 80 species, nearly cosmopolitan, but especially diverse in America. Many of the species of *Physalis* in our area occur primarily in disturbed habitats; their pre-Columbian ranges are unclear and they may have been introduced to e. North America by native Americans. Of the species treated here, only a few are definitely introduced. References: Sullivan (2004)=Z; Waterfall =Y (1958, 1967); Sullivan (1985)=X; Ward (2008a)=V; Mione et al. (1994); Whitson & Manos (2005); Whitson (2011). Key based in part on Sullivan (2004).

1 Flowers 2 or more per leaf axil; berries with spherical seed-like bodies intermixed with the flattened, reniform seeds; [of the Gulf Coastal Plain] ..... ***P. carpenteri***
1 Flowers 1 per leaf axil; berries with flattened, reniform seeds only; [collectively widespread].
  2 Berry 20-40 mm in diameter, green or yellow-green when ripe (tomatillo); anthers strongly coiled after dehiscence, blue; corolla throat with bluish tinge; [cultivated and weakly naturalized near gardens] ..... ***P. philadelphica***
  2 Berry to 20 mm in diameter, orange, yellow, or green when ripe; anthers not coiled after dehiscence, yellow, blue, or purple; corolla throat purple, brown, green, or ochre; [collectively widespread].
    3 Plants pubescent with stellate hairs, these in some taxa abundantly covering the leaves, or if leaves glabrous, the stellate hairs visible on the tips and margins of the sepals; plants perennial, from deeply buried rhizomes.
      4 Leaves linear, 10-20× as long as wide, glabrous; plants erect; [of FL Panhandle westwards] ..... ***P. angustifolia***
      4 Leaves ovate, elliptic, obovate or spatulate, 2-10× as long as wide, stellate pubescent, especially on the young growth, flowering calyces, and pedicels (or glabrous south of our area); [of FL Panhandle, peninsula, and Atlantic coast from VA southwards] ..... ***P. walteri***
    3 Plants glabrous, or pubescent with simple hairs; plants annual or perennial.
      5 Leaves glabrous or essentially so.
        6 Perennials from rhizomes, frequently with remnant of last year's stem attached to crown; corolla with 5 dark maculations in the throat.
          7 Hairs on the pedicels and young stems retrorse or retrorse-spreading; fruiting calyx 5-angled, indented at base ..... ***P. virginiana*** *var.* ***virginiana***
          7 Hairs on the pedicels and young stems antrorse; fruiting calyx subterete, with 10 ribs, not indented at base ..... ***P. longifolia*** *var.* ***subglabrata***
        6 Annuals from taproots; corolla with or without 5 dark maculations in the throat.
          8 Upper part of the stem glabrous or glabrate (when young, sometimes with minute, deflexed hairs in lines); corolla with or without 5 dark maculations in the throat.
            9 Corolla 7-15 mm long, yellow and with 5 dark maculations in the throat; anthers 2.5-4 mm long; berry to 40 mm in diameter ..... ***P. philadelphica***
            9 Corolla 4-10 mm long entirely yellow, without 5 dark maculations in the throat; anthers 1-2.3 mm long; berry 8-11 mm in diameter.
              10 Principal cauline leaf blades generally < 2.5× as long as wide; flowering and fruiting pedicels 0.5-1.0 cm long; pedicels and calyx essentially glabrous at anthesis except for hairs on the margins of the calyx lobes ..... ***P. angulata*** *var.* ***angulata***
              10 Principal cauline leaf blades generally > 2.75× as long as wide; flowering pedicels 1.5-2.5 cm long, elongating to 3.0-4.0 cm long in fruit; pedicels and calyx covered at anthesis with fine, even, antrorse hairs, especially at the base of the calyx ..... ***[P. angulata*** *var.* ***pendula]***
          8 Upper part of the stem with long, spreading hairs; corolla with 5 dark maculations in the throat.

11 Leaf margins strongly dentate with 7-10 (or more) teeth per side; fruiting pedicels 12 mm or more long; mature fruiting calyx 2.5-4 cm (or more) long, the lobes long-acuminate to attenuate; corolla pubescent internally ..... ***P. cordata***
11 Leaf margins entire, or dentate with 1-8 teeth per side; fruiting pedicels < 10 mm long; mature fruiting calyx 2.5 cm or less long, the lobes triangular-acuminate; corolla glabrous internally.
12 Leaves entire or with few teeth, usually 1-4 teeth per side; leaf blade thin in texture, flaccid and translucent; fruiting calyces 1.2-2.5 cm long, 1-1.5 cm wide, the lobes ovate to deltoid, the apex acute, 3-3.5 mm long ..... ***P. pubescens*** *var.* ***integrifolia***
12 Leaves mostly toothed nearly to the base with 5-8 teeth per side; leaf blade thick in texture, not translucent; fruiting calyces 2-3.5 cm long, 1.2-3 cm wide, the lobes triangular to narrowly lanceolate, the apex narrowly acute to acuminate, (3.5-) 4.5-6.5 mm long ..... ***P. pubescens*** *var.* ***pubescens***

5 Leaves variously pubescent, the hairs copious and villous to sparse and appressed.
13 Flowering calyces 6 mm or less long; annuals from taproots.
14 Stems, young growth, and major veins of the leaves covered with villous pubescence intermixed with sessile glands; leaves gray-green, prominently and coarsely dentate to the base, with well-defined reticulate venation, especially visible on the lower surface, frequently drying orange or with orange spots; anthers yellow, perhaps with a bluish tinge; body of mature calyx about as long as broad, abruptly acuminate at apex; berry tawny orange when mature ..... ***P. grisea***
14 Stems, young growth, and major veins of leaves with fine, non-villous pubescence; leaves green, obscurely dentate, often in the upper half only, or entire, without well-defined reticulate venation, drying green or brownish; anthers blue or violet; body of mature calyx longer than broad, long-acuminate at the apex; berry green when mature.
15 Leaves entire or with few teeth, usually 1-4 teeth per side; leaf blade thin in texture, flaccid and translucent; fruiting calyces 1.2-2.5 cm long, 1-1.5 cm wide, the lobes ovate to deltoid, the apex acute, 3-3.5 mm long..... ***P. pubescens*** *var.* ***integrifolia***
15 Leaves mostly toothed nearly to the base with 5-8 teeth per side; leaf blade thick in texture, not translucent; fruiting calyces 2-3.5 cm long, 1.2-3 cm wide, the lobes triangular to narrowly lanceolate, the apex narrowly acute to acuminate, (3.5-) 4.5-6.5 mm long..... ***P. pubescens*** *var.* ***pubescens***
13 Flowering calyces 6 mm or more long; perennials from rhizomes.
16 Pubescence viscid, generally composed of glandular trichomes mixed with fine, short hairs and long, multicellular hairs; leaf blades broadly ovate to suborbicular, the base rounded, truncate, or cordate (occasionally widely cuneate)..... ***P. heterophylla***
16 Pubescence seldom if at all glandular-viscid, composed of trichomes of varying lengths, from dense, spreading, and long-villous to sparse, strigose, and appressed; leaf blades narrowly ovate to broadly lanceolate, the base cuneate (rarely truncate).
17 Pedicels and flowering calyces pubescent with minute, appressed, antrorse hairs; hairs on the calyx primarily confined to 10 narrow longitudinal strips consisting of simple, appressed hairs 0.5 mm or less long ..... ***P. longifolia*** *var.* ***subglabrata***
17 Pedicels and flowering calyces densely pubescent with divergent and appressed hairs mixed (or only with appressed retrorse hairs); hairs on the calyx scattered more or less evenly over the surface, not confined to 10 longitudinal strips.
18 Pedicels with both divergent and antrorse hairs; principle leaf blades 5-8 cm long; filaments 0.5 as wide as the anthers; spots at the base of the corolla inconspicuous or absent; berry > 14 mm in diameter when mature ..... ***P. lanceolata***
18 Pedicels with short, appressed, retrorse hairs, or with short retrorse and longer divergent hairs intermixed; principle leaf blades 3-6 cm long; filaments as wide or wider than the anthers; spots at base of the corolla prominent; berry < 12 mm in diameter when mature ..... ***P. virginiana*** *var.* ***virginiana***

Physalis angulata Linnaeus var. ***angulata***, Smooth Ground-cherry. Cp (DE*, FL, GA, NC, SC, VA), Pd (GA, NC, SC, VA), Mt (GA): disturbed areas, open woodlands, agricultural fields; common (uncommon in VA, rare in DE). August-October. Var. *angulata* is widely distributed in tropical America, north to se. VA and MO, and scattered as an adventive further north. Var. *pendula* (Rydberg) Waterfall is (in North America) more western, east to nw. TN and, allegedly, to SC. It can be distinguished from var. *angulata* by the following characters: principle cauline leaf blades generally > 2.75× as long as wide (vs. < 2.5× as long as wide), flowering pedicels 1.5-2.5 cm long, elongating to 3.0-4.0 cm long in fruit (vs. flowering and fruiting pedicels 0.5-1.0 cm long), pedicels and calyx covered at anthesis with fine, even, antrorse hairs, especially at the base of the calyx (vs. pedicels and calyx essentially glabrous at anthesis except for hairs on the margins of the calyx lobes). [< *P. angulata* – RAB, C, K, S, WH, Z; = *P. angulata* – F, G]

Physalis angustifolia Nuttall, Coastal Ground-cherry. Cp (AL, FL, LA, MS): maritime dunes and coastal sands; uncommon. January-December. Gulf Coast shorelines from S. FL west to s. LA. Reports of *P. viscosa* from the Southeast are based on either *P. angustifolia* or *P. walteri*. [= K, V, WH, Z] {add to synonymy}

Physalis carpenteri Riddell ex Rydberg, Carpenter's Ground-cherry. Cp (AL, FL, LA, MS): sandhills, dry hammocks, dry sandy soils; rare. N. peninsular FL and Panhandle FL west to e. LA. [= K, V, WH, Z] {add to synonymy}

Physalis cordata P. Miller, Toothleaf Ground-cherry. Cp (FL, NC), {GA, SC}: disturbed areas; rare. July-October. This species is scattered in the Southeastern United States, south to s. FL, and is more widespread in Mexico, Central America, and West Indies. [= K, WH, V, Z; = *P. pubescens* var. *glabra* (Michaux) Waterfall – RAB; = *P. barbadensis* var. *glabra* (Michaux) Fernald – F]

Physalis grisea (Waterfall) M. Martínez, Gray Ground-cherry, Strawberry-tomato, Dwarf Cape-gooseberry. Mt (GA, NC, VA), Pd (GA, NC, VA), Cp? (GA?), {SC}: wooded slopes, disturbed areas; uncommon. July-September; August-October. The species is mainly distributed in ne. United States, south (mainly) to NC, TN, and MO, and scattered further south. The fruits are edible, sweet, and tasty. Martínez (1993) discusses the nomenclature of this species, showing that the *P. pruinosa* Linnaeus is properly applied to a Mexican and Central American species. [= K, V, Z; = *P. pubescens* var. *grisea* Waterfall – RAB, C; < *P. pruinosa* Linnaeus – F, G, S, W, misapplied]

Physalis heterophylla Nees, Clammy Ground-cherry. Pd (DE, GA, NC, SC, VA), Mt (GA, NC, SC, VA, WV), Cp (DE, FL, GA, NC, SC, VA): disturbed areas, dry rocky woodlands, hammocks; common (uncommon in Mountains, rare in Coastal Plain of FL, GA, NC, and SC). May-July; July-September. Widespread in e. and c. United States and adjacent Canada, south to ne. FL and Panhandle FL. [= RAB, C, S, W, WH, Z; > *P. heterophylla* var. *heterophylla* – F, G; > *P. heterophylla* var. *ambigua* (A. Gray) Rydberg – F, G; > *P. heterophylla* var. *clavipes* Fernald – F; > *P. heterophylla* var. *nyctaginea* (Dunal) Rydberg – F; > *P. heterophylla* var. *heterophylla* – K; > *P. heterophylla* – S; > *P. ambigua* (A. Gray) Britton – S; > *P. nyctaginea* Dunal – S]

Physalis lanceolata Michaux, Sandhills Ground-cherry. Cp (GA, NC, SC): sandhills; rare. June-July; July-September. Endemic to sandhill habitats of (primarily) sc. and (rarely) se. NC (northern limit in Lee, Wayne, and New Hanover counties), south through SC to just over the Savannah River in Richmond County, GA. Many earlier floras included midwestern material in the concept of this species; it is, however, limited to the Carolinas and Georgia. See Hinton (1970) for discussion of its taxonomic status. [= RAB, Z; < *P. lanceolata* – F, G, S (also see *P. hispida* (Waterfall) Cronquist)]

Physalis longifolia Nuttall *var.* ***subglabrata*** (Mackenzie & Bush) Cronquist, Longleaf Ground-cherry. Mt (NC, VA, WV), Pd (DE, NC, VA), Cp (DE, FL), {GA, SC}: open woodlands, gardens and disturbed areas; common (uncommon in GA, NC, SC, VA). June-August; August-October. The species is widespread in e. and c. United States; var. *subglabrata* is more eastern, south to Panhandle FL, var. *longifolia* more western. [= C, G, K, W, Z; = *P. virginiana* P. Miller var. *subglabrata* (Mackenzie & Bush) Waterfall – RAB; = *P. subglabrata* Mackenzie & Bush – F, S, WV; < *P. longifolia* – WH]

* ***Physalis philadelphica*** Lamarck, Tomatillo. Cp (DE), Pd (DE, NC), Mt (VA, WV): naturalized after cultivation; uncommon (rare in NC and VA), native of Mexico and Central America. June-August; July-October. See Kartesz & Gandhi (1994) for a discussion of this group. It is the large-flowered plant (and therefore *P. philadelphica* in the narrow sense) that is weakly naturalized after cultivation in our area. [= C, Z; < *P. ixocarpa* Brotero ex Hornemann – F, G, misapplied; > *P. philadelphica* var. *immaculata* Waterfall – K]

Physalis pubescens Linnaeus *var.* ***integrifolia*** (Dunal) Waterfall, Thinleaf Downy Ground-cherry. Cp (DE), Pd (DE), Mt (WV), {FL?, GA?, NC?, SC?, VA?}: disturbed areas; common (rare in WV). The distribution, abundance, and habitats of the two varieties are poorly known. July-September; August-October. Widespread in the American tropics, north to PA and IA. [= C, K; < *P. pubescens* var. *pubescens* – RAB; = *P. pubescens* – F; > *P. pubescens* – G, S; > *P. turbinata* Medikus – G, S; = *P. integrifolia* (Dunal) D.B. Ward – V; < *P. pubescens* – W, WH, Z; < *P. pruinosa* Linnaeus, misapplied]

Physalis pubescens Linnaeus *var.* ***pubescens***, Thickleaf Downy Ground-cherry. Mt (WV), {VA}: disturbed areas; rare in WV. The distribution, abundance, and habitats of the two varieties are poorly known. July-September; August-October. Widespread in the American tropics, north to VA. [= C, K; < *P. pubescens* var. *pubescens* – RAB; > *P. barbadensis* Jacquin var. *barbadensis* – F; > *P. barbadensis* Jacquin – G, S; > *P. pubescens* – S; > *P. barbadensis* Jacquin – S; < *P. pubescens* – W, WH, Z]

Physalis virginiana P. Miller *var.* ***virginiana***, Virginia Ground-cherry. Pd (GA, NC, SC, VA), Mt (GA, NC, SC, VA, WV), Cp (DE, FL, GA, NC, SC, VA): woodlands and disturbed areas; common (rare in FL and WV). April-May; June-July. This complex species is widespread in e. and c. North America. Var. *virginiana* is the most eastern of a number of varieties, some of the others being var. *campaniforma* Waterfall, var. *polyphylla* (Greene) Waterfall, and var. *texana* (Rydberg) Waterfall. The validity and true affinities of some of these varieties is, at present, uncertain; var. *texana* may be actually affiliated with *P. longifolia*. [= RAB, K; < *P. virginiana* – C, F, G, V, W, Z; > *P. virginiana* – S; > *P. intermedia* Rydberg – S; > *P. monticola* C. Mohr – S]

Physalis walteri Nuttall, Dune Ground-cherry. Cp (FL, GA, NC, SC, VA): dunes of sea-beaches, openings in maritime forests, sandhills (southwards), and rarely inland as a waif in disturbed areas; common (uncommon in GA, NC, SC, rare in VA). May-September. This species ranges from se. VA south to s. FL and west to s. MS. See Sullivan (1985) for further information on this species and its relatives. It is largely replaced on the Gulf Coast by the related *P. angustifolia*, with which it locally intergrades in peninsular FL. *P. viscosa* Linnaeus is South American. [= C, K, WH, Z; < *P. viscosa* Linnaeus ssp. *maritima* (M.A. Curtis) Waterfall – RAB; < *P. maritima* M.A. Curtis – F; < *P. viscosa* – G, S; > *P. walteri* var. *walteri* – V; > *P. walteri* var. *glabra* (Waterfall) D.B. Ward – V]

* *Physalis acutifolia* (Miers emend Sandwith) Sandwith, native to AZ and vicinity, was collected once in NC (in 1936), from a nursery in Mecklenburg County, NC, and in MS (Sullivan 2004). It may not be established. It is most similar to *P. angulata*, but differs in its white to cream-colored corollas, with yellow basal spots, and the presence of 5 hairy pads, alternating with the stamens near the base of the corolla limb. [= K, Z]

Physalis angulata Linnaeus *var.* ***pendula*** (Rydberg) Waterfall. *P. angulata* var. *pendula* (Rydberg) Waterfall is (in North America) more western, east to nw. TN and, allegedly, to SC. [< *P. angulata* – RAB, C, K, S, WH, Z; = *P. pendula* Rydberg – F, G]

Physalis arenicola Kearney, Sandhill Ground-cherry. Cp (FL, GA): sandhills, flatwoods; common (rare in GA). GA south to s. FL. Reported from nc. GA by Jones & Coile (1988) and for "cypress-heads and scrub thickets" by GANHP. [= K, WH, Z; > *P. arenicola* var. *arenicola* – V; > *P. arenicola* var. *ciliosa* (Rydberg) Waterfall – V] {not yet keyed; synonymy incomplete}

* *Physalis cinerascens* (Dunal) A.S. Hitchcock var. *cinerascens*, native to OK, TX, and Mexico, occurs locally in the Southeastern United States in weedy situations; it has been found once in our area, in a disturbed habitat in SC. It is probably not established. It resembles *P. walteri* in having stellate pubescence, but differs in having leaves ovate to suborbicular, with margins sinuate, dentate, or entire (vs. leaves obovate, with margins entire), anthers at least 1.5× as long as the filaments (vs. anthers equal to or shorter than the filaments), and fruiting pedicels mostly at least 1.5× as long as the calyces (vs. fruiting pedicels equal to or shorter than the fruiting calyces). [= K, Z] {not yet keyed; full treatment}

Physalis longifolia Nuttall *var.* ***longifolia***. East to PA, WV, KY, TN, and GA (Kartesz 1999). [= K, Z]

Physalis missouriensis Mackenzie & Bush. Reported from nc. GA in Jones & Coile (1988); record not repeated in Kartesz (1999). [= K, Z; *P. pubescens* Linnaeus var. *missouriensis* (Mackenzie & Bush) Waterfall] {investigate; not yet keyed; synonymy incomplete}

* *Physalis peruviana* Linnaeus, Cape Gooseberry or Po'ha, is also cultivated. Native to South America, it is now cultivated for its edible fruit in various tropical and temperate areas, and is known to rarely persist in e. North America. [= K]

Physalis viscosa Linnaeus. Reports in the Southeast are based on a broad interpretation of *P. viscosa* to include southeastern taxa *P. angustifolia* and *P. walteri*. Rejected.

Salpichroa Miers 1845

A genus of about 17 species, herbs and shrubs, native of South America. References: Hunziker (2001)=Z.

* ***Salpichroa origanifolia*** (Lamarck) Baillon. Cp (GA, NC, SC, VA), Pd (GA, NC, SC): gardens, roadsides, disturbed areas; rare, native of n. South America. May-November. [= RAB, K, Z; = *Perizoma rhomboidea* (Gillies & Hooker) Small – S; = *Salpichroa rhomboidea* (Gillies & Hooker) Miers]

Solanum Linnaeus 1753 (Nightshade, Tomato, Potato, Horse-nettle)
(contributed by Milo Pyne and Alan S. Weakley)

A genus of about 1700 species, trees, shrubs, vines, and herbs, of tropical and temperate regions of the Old and New World. References: Schilling (1981)=Z; Bohs & Olmstead (1997); Olmstead & Palmer (1997). [including *Lycopersicum*]

1 Anthers opening by longitudinal slits, connivent into a slender cone with sterile tip; berry fleshy, seeds pubescent; plant glandular "clammy"-pubescent; [cultivated plant, also appearing as a waif, escape, or discard, e.g. on sewage sludge] ..... ***S. lycopersicum***
1 Anthers opening by terminal pores, separate or connivent; berry dry to juicy, not fleshy, seeds glabrous; plant not clammy-pubescent; [plants native, exotic, or cultivated escapes, some are weeds of cultivation].
2 Stems and leaves not prickly or spiny.
3 Leaves irregularly pinnatifid or auriculate-lobed.
4 Woody climbing or twining vine; leaves auriculate-lobed ..... ***S. dulcamara***
4 Herb, not twining; leaves irregularly pinnatifid.
5 Fetid annual, plant more or less prostrate; leaves sessile or short-petiolate, lateral leaflets lanceolate, not alternating with smaller ones ..... ***[S. triflorum]***
5 Tuberiferous perennial, plant more or less erect; leaves distinctly petiolate, lateral leaflets ovate, alternating with smaller ones ..... ***S. tuberosum***
3 Leaves not appearing compound or auriculate-lobed.
6 Foliage densely pubescent to puberulent with spreading hairs, especially on undersurface.
7 Trichomes stellate; ripe berry yellow; corolla lavender ..... ***S. elaeagnifolium***
7 Trichomes simple; ripe berry black or green to yellow; corolla white.
8 Berry black when ripe; leaves lance-elliptic, 1-2.5 cm wide, style usually protruding beyond anthers by > 1 mm; plants strictly coastal, on dunes and similar habitats ..... ***S. pseudogracile***
8 Berry green to yellow when ripe; leaves ovate, 2.5-6 cm wide, style not protruding; plants widespread, weedy ... ***S. sarrachoides***
6 Foliage glabrous, glabrescent or very sparsely pubescent (with appressed hairs).
9 Berry dull red, ca. 1 cm wide at maturity, uncommon horticultural escape ..... ***S. pseudocapsicum***
9 Berry black (rarely green, never red), up to 0.5 cm wide at maturity, ruderal weeds.
10 Inflorescence subracemose, corymbose or umbellate, pedicels and peduncles becoming stout; anthers 1.8-2.6 [2.2-2.9] mm long; berry dull; seed 1.7-2.2 mm long [1.8 mm wide or wider]; sclerotic granules (concretions of stone cells) typically absent .. .. ***S. nigrum***
10 Inflorescence umbellate, pedicels and peduncles remaining slender; anthers 1.4-2 mm long; berry glossy; seed 1.2-1.8 mm long; sclerotic granules typically present but occasionally absent
11 Calyx lobes strongly reflexed in mature fruit; sclerotic granules in fruit five or less if present, occasionally absent; flowers 2-14 per inflorescence, usually > 7 in largest inflorescences; fruiting pedicels erect (may be deflexed with age or in winter), to 8 mm long; fruit shiny, black ..... ***S. americanum***
11 Calyx lobes adherent or spreading in mature fruit, occasionally somewhat reflexed; sclerotic granules usually 7-12 per fruit, often visible through skin of dried berry; flowers usually < 6 per inflorescence, fruiting pedicels deflexed, to 13 mm long; fruit dull or shiny black, or rarely green ..... ***S. ptychanthum***
2 Stems, and often leaves, prickly and/or spiny.
12 Berry enveloped at least until near maturity by prickly calyx; leaves regularly and strongly pinnately parted or very deeply divided (sinus depth greater than 1/2 distance from leaf margin to midvein).
13 Corolla yellow, anthers dissimilar, the lowest larger and longer; calyx tightly enveloping the fruit, seeds coarsely undulate-rugose ..... ***S. rostratum***
13 Corolla violet to (rarely) white, anthers all similar; calyx loosely enveloping the fruit, seeds minutely reticulate-pitted ..... ***S. sisymbriifolium***
12 Berry not enveloped by prickly calyx; the leaves not pinnately parted or divided (except in *S. sisymbriifolium*), or only weakly so (sinus depth < ½ the distance from leaf margin to midvein).
14 Berry > 2 cm in diameter; lower leaf surface not stellate-pubescent.
15 Ripe berry orange-red to reddish, leaves deeply lobed (sinus depth up to 1/2 distance from leaf margin to midvein) ..... ***S. capsicoides***
15 Ripe berry yellow, immature berry green with white mottles, leaves shallowly lobed (sinus depth typically < 1/3 distance from leaf margin to midvein) ..... ***S. viarum***
14 Berry < 2 cm in diameter; lower leaf-surface stellate-pubescent.
16 Leaves linear-lanceolate, 1-3 cm wide, trichome clusters 0.5 mm broad, with 12 or more rays..... ***S. elaeagnifolium***
16 Leaves ovate to elliptic, 2-8 cm wide, often lobed or cleft, trichome clusters 1 mm broad, with 5-10 rays.
17 Stellate trichomes of lower leaf surface stipitate, the 6-8 rays essentially equal; corolla 3-4 cm wide, calyx 8-12 mm long ..... ***S. dimidiatum***
17 Stellate trichomes of lower leaf surface sessile, 2-5 rays, the central one elongate; corolla 2-3 cm wide, calyx 5-7 mm long.
18 Leaves entire, margins at most sinuate; plants up to 2 dm in stature; prickles few, absent, and/or confined to midveins; corollas white; [rare plants of Bibb and Chilton counties, AL] ..... ***[S. pumilum]***
18 Leaves not entire, lobed, cleft, pinnately parted, or divided; plants 3-10 dm in stature; prickles more abundant and generally distributed; corollas purple, rarely white; [plants more widely distributed, weedy or ruderal].
19 Leaves pinnately parted or divided, the segments often pinnately lobed; calyx enveloping fruit when ripe, berry red; plant annual ..... ***S. sisymbriifolium***

19 Leaves irregularly lobed or cleft, the lobes or segments entire; calyx not enveloping fruit when ripe; berry yellowish orange, never red; plant perennial.
20 Leaves lobed to near the middle ..... ***S. carolinense*** *var.* ***floridanum***
20 Leaves lobed < ½ way to the middle ..... ***S. carolinense*** *var.* ***carolinense***

Solanum americanum P. Miller. Cp (FL, GA), {}: hammocks, disturbed areas; common. North to e. GA (SC). South to s. FL. [= K, WH; < *S. americanum* – RAB, F; < *S. nigrum* – C, G, S]

Solanum capsicoides Allioni, Soda Apple. Cp (FL, SC), Pd* (NC*): disturbed areas; uncommon (rare in NC and SC). [= K, WH; = *S. aculeatissimum* – RAB, S, misapplied]

Solanum carolinense Linnaeus *var.* ***carolinense***, Horse-nettle, Ball-nettle. Cp (DE, FL, GA, NC, SC, VA), Pd (DE, GA, NC, SC, VA), Mt (GA, NC, SC, VA, WV): fields, gardens, disturbed areas; common (uncommon in DE). [= K, WH; < *S. carolinense* – RAB, C, F, G, W, WV; = *S. carolinense* – S]

Solanum carolinense Linnaeus *var.* ***floridanum*** (Shuttleworth ex Dunal) Chapman. Cp (FL, GA): sandhills, dry hammocks, maritime forests, disturbed areas; uncommon (rare in GA). S. GA to n. peninsular FL. [= K, WH; < *S. carolinense* – RAB; = *S. floridanum* Shuttleworth ex Dunal – S]

* ***Solanum dimidiatum*** Rafinesque. Cp (FL, SC), {GA}: disturbed areas; rare, native of w. North America. April-June. [= C, K, WH; = *S. torreyi* A. Gray – RAB, F, G; = *S. perplexum* Small – S]

* ***Solanum dulcamara*** Linnaeus, Bittersweet, Nightshade. Mt (NC, VA, WV), Pd (DE, VA), Cp (FL, VA), {GA}: disturbed areas; common (rare in FL, GA, NC, and VA), native of Europe. [= RAB, C, W, WH, WV; > *S. dulcamara* var. *dulcamara* – F, K]

* ***Solanum elaeagnifolium*** Cavanilles, Silverleaf Nightshade, White Horse-nettle. Cp (FL, GA, NC, SC), Pd (NC). Mt (GA): disturbed areas; rare, native of sc. North America. June-September. [= C, F, G, K, WH; = *S. eleagnifolium* – RAB, S, orthographic error]

* ***Solanum lycopersicum*** Linnaeus, Tomato. Cp (GA, NC, SC, VA), Pd (GA, NC, SC, VA), Mt (GA, NC, SC, VA): persistent and weakly naturalized around gardens, especially where compost or sewage sludge is spread; commonly cultivated, rare as a naturalized species. June-frost. The species is native to the Andes Mountains of nw. South America. *S. lycopersicum* is one of the most important and influential of edible species native of the New World introduced to the Old World, along with two other Solanaceae, the potato (*Solanum tuberosum*) and the chili (*Capsicum annuum*). There appears to be little reason to separate *Lycopersicon* from *Solanum*. [= *Lycopersicon esculentum* – RAB, C, F, G; > *Solanum lycopersicum* Linnaeus var. *cerasiforme* (Dunal) Spooner, J. An derson, & R.K. Jansen – K; > *Solanum lycopersicum* var. *lycopersicum* – K; = *Lycopersicon lycopersicon* (Linnaeus) Karsten – S; > *Lycopersicon esculentum* var. *cerasiforme* (Dunal) Alefani]

* ***Solanum pseudocapsicum*** Linnaeus, Jerusalem-cherry. Cp, Mt (GA), Pd (NC), {SC}: rarely cultivated, perhaps not established, native of Mediterranean Europe. [= K; = *S. pseudo-capsicum* – F, orthographic variant]

Solanum pseudogracile Heiser, Dune Nightshade. Cp (GA, NC, SC): ocean dunes, usually with *Uniola paniculata*, maritime forests; uncommon. May-October. E. NC south to FL, west to LA. [= K, Z; = *S. gracile* – RAB, S, misapplied]

Solanum ptychanthum Dunal, American Black Nightshade. Mt (GA, NC, SC, VA, WV), Pd (GA, NC, SC, VA), Cp (GA, NC, SC, VA): disturbed areas; common. June-December. [= K, W, Z; < *S. americanum* P. Miller – RAB, F, WV, misapplied; < *S. nigrum* – C, G, S; = *S. ptycanthum*, orthographic variant]

Solanum pumilum Dunal. {GA} . Known from dolomitic Ketona glades in Bibb County, c. AL (Allison & Stevens 2001) and historically in GA (GAHP). [= *Solanum carolinense* Linnaeus var. *hirsutum* (Nuttall) A. Gray – K]

* ***Solanum rostratum*** Dunal, Buffalo-bur, Kansas-thistle. Cp (GA, NC, SC, VA), Mt (GA, NC, VA, WV), Pd (DE, GA, NC, VA): disturbed areas; uncommon (rare in DE and WV), native of w. North America. [= RAB, C, F, G, K, W; = *Androcera rostrata* (Dunal) Rydberg – S; *? S. cornutum* Lamarck, misapplied]

* ***Solanum sarrachoides*** Sendtner, Hairy Nightshade. Cp (NC, VA), Pd (DE, NC, VA): disturbed areas; uncommon, native of South America. Works by Edmonds and associates have established that *S. sarrachoides* and *S. physalifolium* Rusby are two distinct species, but both are presently known from North America. Mistaken interpretations of Cronquist's 1991 treatment of *Solanum* (e.g. by Kartesz 1999) have given rise to the incorrect belief that only *S. physalifolium* is found in North America. True *S. physalifolium* is present in the western United States, *S. sarrachoides* in the Southeast. [= RAB, C, Z; < *S. physalifolium* Rusby – K; = *S. sarachoides* – F, orthographic error]

* ***Solanum sisymbriifolium*** Lamarck, Sticky Nightshade. Cp (GA, NC, SC), Pd (DE), {VA}: disturbed areas; uncommon (rare in DE), native of South America. July-September; September-October. [= RAB, C, F, G, K, S]

* ***Solanum tuberosum*** Linnaeus, Potato, Irish Potato, White Potato. Cp (GA, NC, SC, VA), Pd (GA, NC, SC, VA), Mt (GA, NC, SC, VA): commonly cultivated, rarely escaped or spontaneous from thrown-out tubers, native of Andean South America. June-August. [= RAB, C, F, G, K]

* ***Solanum viarum*** Dunal, Tropical Soda Apple. Cp (GA, NC, SC): pastures; rare, native of South America (s. Brazil, Paraguay, and n. Argentina). This species has only recently appeared in our area, but has been publicized as a severe, extremely aggressive, and rapidly spreading weed further south (Wunderlin et al. 1993, Mullahey et al. 1993, Mullahey 1996). [= K]

* *Solanum capsicastrum* Link ex Schauer. Reported for NC and SC (Kartesz 1999), but apparently erroneously. [= K]

* ***Solanum citrullifolium*** A. Braun *var.* ***citrullifolium***, Watermelon Nightshade. Pd (DE): disturbed areas; rare, native of {}. Introduced in scattered states, including DE (Kartesz 1999) and Alachua County, FL (Wunderlin & Hansen 2008). [= K; < *S. citrullifolium* – C, F, G, WH] {not yet keyed}

* *Solanum melongena* Linnaeus, Eggplant, Aubergine. Planted in gardens but does not persist. [= F, G, K, S]

* ***Solanum nigrescens*** Mart. & Gal. Cp (FL): disturbed areas; uncommon. Reported from NC, SC, GA, FL, etc. (Kartesz 1999), but actual status unclear. [= K; ***S. chenopodioides*** Lamarck – WH] {not yet keyed}

* ***Solanum nigrum*** Linnaeus *ssp.* ***nigrum***, European Black Nightshade. Cp (DE), Pd (DE), {FL, GA, NC, SC, VA}: disturbed areas; common (rare elsewhere?), native of Eurasia. May-November. [= K, Z; = *S. nigrum* – RAB; < *S. nigrum* – C, F, G, S]

* *Solanum torvum* Swartz, Turkey-berry. Introduced in AL. [= K]
* *Solanum triflorum* Nuttall. Introduced in c. TN. [= C, F, G, K]

360. SPHENOCLEACEAE von Martius ex A.P. de Candolle 1839 (Chickenspike Family) [in SOLANALES]

A family of one genus and 2 species, annual herbs, of tropical regions, native of the Old World. References: Rosatti (1986)=Z.

Sphenoclea Gaertner (Chickenspike)

A genus of 2 species, annual herbs, native of the Old World.

* ***Sphenoclea zeylanica*** Gaertner, Chickenspike. Cp (FL, SC), Pd (GA, NC): rice plantations, reservoirs, other disturbed wetlands; rare, native of Old World tropics. August-October. [= K, S, WH, Z; = *S. zeylandica* – RAB, GW, orthographic error (presumably from a mistaken notion that the epithet refers to New Zealand rather than Ceylon)]

361. HYDROLEACEAE Berchtold & J. Presl 1820 (Hydrolea Family) [in SOLANALES]

A family of one genus and about 12 species, herbs and shrubs of water bodies and wetlands, primarily tropical. The Hydroleaceae is not closely related to Hydrophyllaceae; recent molecular data confirm the view prevailing through most of the 19th century that *Hydrolea* should be placed in its own family. References: Ferguson (1998); Hilger & Diane (2003); Angiosperm Phylogeny Group (1998, 2003, 2009).

Hydrolea Linnaeus 1762

A genus of about 11 species, aquatic and wetland herbs, of tropical and subtropical regions.

1 Flowers in axillary cymes; leaves 3-14 cm long, 1.5-4 cm wide; axillary spines present in the axils of some leaves; corolla 7-8 mm long.
  2 Calyx and stem sparsely pubescent with spreading hairs 2-3 mm long ..... ***H. quadrivalvis***
  2 Calyx and stem glabrous, or minutely puberulent or with sessile glands ..... ***H. uniflora***
1 Flowers in terminal cymes or corymbs; leaves 2-6 cm long, 0.6-2.5 cm wide; axillary spines present or absent; corolla 10-15 mm long.
  3 Leaves elliptic to lanceolate, 2-3 cm long, 0.6-1.0 cm wide; axillary spines absent or rudimentary ..... ***H. corymbosa***
  3 Leaves ovate to ovate-lanceolate, 3-6 cm long, 1.5-2.5 cm wide; axillary spines preset, well-developed, to 1.5 cm long ..... ***H. ovata***

Hydrolea corymbosa J. Macbride ex Elliott, Skyflower. Cp (FL, GA, SC): pond cypress savannas, depression meadows; uncommon (rare north of FL). Ne. SC south to sw. GA and s. FL. See Nelson (1993). The author is sometimes stated as J.F. Macbride, but this is an error. [= RAB, GW, K, WH; = *Nama corymbosum* (Macbride ex Elliott) Kuntze – S]

Hydrolea ovata Nuttall ex Choisy, Ovate False-fiddleleaf. Cp (FL, GA): swamps, ponds, ditches; rare. June-August. C. GA and Panhandle FL west to TX, north in the interior to sc. TN and MO. [= C, F, G, GW, K, WH; = *Nama ovatum* (Nuttall ex Choisy) Britton – S]

Hydrolea quadrivalvis Walter, Waterpod. Cp (FL, GA, NC, SC, VA), Pd (NC, VA): swamp forests, backwater sloughs, marshes, ditches; common (VA Watch List). June-September. Se. VA south to c. peninsular FL, west to LA. [= RAB, C, F, G, GW, K, WH; = *Nama quadrivalve* (Walter) Kuntze – S]

Hydrolea uniflora Rafinesque. Swamp forests, sloughs, marshes. June-September. Mainly in the Mississippi River Alluvial Plain, west to e. TX and east to AL, TN, and KY. [= C, F, G, GW, K; = *Nama affine* (A. Gray) Kuntze – S; = *Hydrolea affinis* A. Gray]

364. OLEACEAE Hoffmansegg & Link 1813 (Olive Family) [in LAMIALES]

A family of about 25 genera and 600-615 species, trees and shrubs, nearly cosmopolitan, but centered in Asia. References: Hardin (1974)=Z; Green in Kadereit (2004).

1 Leaves compound.
  2 Leaves pinnately compound with > 5 leaflets; petals absent; fruit a samara; small to large tree; [tribe *Oleeae*, subtribe *Fraxininae*] ..... ***Fraxinus***
  2 Leaves trifoliolate; petals 6-10, yellow, conspicuous; fruit a deeply 2-lobed dryish berry; [tribe *Jasmineae*] ..... ***Jasminum***
1 Leaves simple.
  3 Flowers bright yellow, showy; fruit a many-seeded capsule; [tribe *Forsythieae*] ..... ***Forsythia***
  3 Flowers white, lilac, or purplish; fruit a drupe or 4-seeded capsule.
    4 Leaves cordate or truncate at the base; fruit a 4-seeded capsule; corolla lobes shorter than the tube; flowers lilac or white, in terminal panicles; [tribe *Oleeae*, subtribe *Ligustrinae*] ..... ***Syringa***
    4 Leaves cuneate to rounded at the base; fruit a drupe; corolla lobes either shorter or longer than the tube; flowers white or greenish-white, in terminal or lateral panicles or fascicles.
      5 Corolla absent; calyx minute or lacking; flowers in axillary fascicles; [tribe *Oleeae*, subtribe *Oleinae*] ..... ***Forestiera***

5 Corolla present (often conspicuous and showy); calyx present; flowers in lateral or terminal panicles or in terminal subumbellate clusters.
6 Corolla lobes 5-12; flowers in terminal subumbellate clusters; [tribe *Jasmineae*] ..... ***Jasminum***
6 Corolla lobes 4; flowers in lateral or terminal panicles
7 Corolla lobes elongate, much longer than the corolla tube; [tribe *Oleeae*, subtribe *Oleinae*] ..... ***Chionanthus***
7 Corolla lobes short, no longer than the corolla tube.
8 Inflorescence a many-flowered terminal panicle; leaves generally ovate, elliptic or lanceolate (widest below or at the middle); [tribe *Oleeae*, subtribe *Ligustrinae*] ..... ***Ligustrum***
8 Inflorescence a few-flowered axillary panicle; leaves generally oblanceolate or obovate (widest above the middle); [tribe *Oleeae*, subtribe *Oleinae*] ..... ***Osmanthus***

Chionanthus Linnaeus 1753 (Fringe-tree, Old Man's Beard)

A genus of controversial circumscription, either of only 3 species, limited to se. North America and e. Asia, or (if including *Linociera*) of about 60, primarily tropical. *C. pygmaeus* Small is endemic to scrub in peninsular FL. References: Hardin (1974)=Z.

Chionanthus virginicus Linnaeus, Fringe-tree, Old Man's Beard. Pd (DE, GA, NC, SC, VA), Mt (GA, NC, SC, VA, WV), Cp (DE, FL, GA, NC, SC, VA): dry, mesic, or wet forests and woodlands, granitic flatrocks and domes, glades and barrens over various rocks (including granite, greenstone, etc.), swamp forests in the Coastal Plain, rarely pocosins; common (rare in DE Piedmont). April-May; July-September. NJ, s. PA, s. OH, and MO south to c. peninsular FL and e. TX. *C. virginicus* in our area shows a diversity of morphology and correlated habitat that suggests the possible presence of two taxa. Swamp- and pocosin-inhabiting populations in the outer Coastal Plain have leaves 4-8× as long as wide and seem very different than Piedmont dry woodland populations with leaves 1-2× as long as wide; further and more careful study is needed. *C. virginicus* is a traditional southern yard plant, often used as a "specimen plant," very showy in spring, particularly when grown to its full size. [= RAB, C, F, G, GW, K, S, W, WH, Z]

Forestiera Poiret 1812 (Forestiera)

A genus of about 15-20 species, shrubs, of sw. and se. North America, Central America, and the West Indies. References: Anderson (1985)=Y; Godfrey (1988)=X; Hardin (1974)=Z; Johnston (1957)=Q; Green in Kadereit (2004).

1 Leaves (6-) 7-8 (-9) cm long, long-acuminate or acuminate (rarely acute) at the apex, the tip sharply pointed; [of swamp forests, sloughs, and ponds] ..... ***F. acuminata***
1 Leaves 1.5-7 (-8) cm long, obtuse at the apex, or if short-acuminate the ultimate tip blunt; [of shell middens and calcareous bluffs].
2 Leaves evergreen, glabrous above, glabrous and punctate below; leaf margins entire ..... ***F. segregata*** *var.* ***segregata***
2 Leaves deciduous, at least sparsely pubescent on the midrib above, pubescent and non-punctate below.
3 First-year twigs pubescent, the pubescence evenly distributed (not in 2 lines); petioles moderately pubescent; flowering in early spring from buds on twigs of the previous season; leaves 5-7 (-8) cm long ..... ***F. godfreyi***
3 First-year twigs pubescent, the pubescence in 2 lines on either side of the twig; petioles glabrous (or with a very few hairs; flowering in mid-late summer, the flowers in leaf axils; leaves mostly 2-5 cm long ..... ***F. ligustrina***

Forestiera acuminata (Michaux) Poiret, Swamp-privet. Cp (FL, GA, SC): swamp forests, especially over calcareous substrates; uncommon. March; May-June. SC south to n. FL, west to TX, north in the interior to KY, e. and c. TN, IN, IL, MO, and KS. [= RAB, C, F, G, GW, K, S, Q, WH, X, Y, Z]

Forestiera godfreyi L.C. Anderson, Godfrey's Forestiera. Cp (FL, GA, SC): shell middens, maritime forests over shell substrate; rare. Mid January-February; April-May. Se. SC (Beaufort and Charleston counties) to e. GA and n. peninsular and e. Panhandle FL. [= K, WH, X, Y; < *F. pubescens* Nuttall – S, in part (apparently)]

Forestiera ligustrina (Michaux) Poiret, Southern-privet. Cp (FL, GA, SC), Pd (GA, SC): upland forests and slopes along streams, mostly on shell middens or calcareous rocks; uncommon (rare in SC). E. SC south to n. peninsular FL, west to se. TX, north in the interior to c. TN and KY. [= K, S, Q, X, Z]

Forestiera segregata (Jacquin) Krug & Urban *var.* ***segregata***, Florida-privet. Cp (FL, GA, SC): calcareous scrub, shell middens, maritime forests and thickets; rare. Se. SC south to s. FL, and in the West Indies. Var. *pinetorum* (Small) M.C. Johnston is restricted to s. FL. [= K, Q, Z; > *F. porulosa* (Michaux) Poiret – S; > *F. globularis* Small – S; < *F. segregata* – WH, X]

Forsythia Vahl 1804 (Forsythia, Golden-bells)

A genus of about 7-9 species, shrubs, of e. Asia and se. Europe. References: Hardin (1974)=Z; Green in Kadereit (2004).

1 Mature branches hollow or irregularly pith-filled between the nodes; leaves oblong-ovate, toothed or 3-parted; branches arching when well-developed ..... ***F. suspensa***
1 Mature branches cross-septate (chambered) between the nodes; leaves oblong-lanceolate, toothed; branches upright ..... ***F. viridissima***

* ***Forsythia suspensa*** (Thunberg) Vahl, Weeping Forsythia. Pd (GA, NC, VA), Mt (VA, WV): waste places, vacant lots, suburban woodlands; commonly planted and persistent, rarely escaped (native of China). [= C, G, K, Z]

* ***Forsythia viridissima*** Lindley, Greenstem Forsythia. Pd (GA, NC, VA), Cp (VA), Mt (VA, WV): waste places, vacant lots, suburban woodlands; commonly planted and persistent, rarely escaped (native of China). [= C, G, K, W, Z]

Fraxinus Linnaeus 1753 (Ash)

A genus of about 43-65 species, trees, mostly north temperate (Asia, North America, Europe). The sectional classification follows Wallander (2008). References: Nesom (2010i)=X; Hardin & Beckmann (1982)=Z; Miller (1955)=Y; Wallander (2008); Green in Kadereit (2004).

1 Young twigs 4-angled or narrowly 4-winged; [trees of calcareous woodlands west of ne. WV, sw. VA, e. TN, nw. GA, and c. AL]; [section *Dipetalae*] ..... ***F. quadrangulata***
1 Young twigs terete (rounded in cross-section); [trees of various habitats, collectively widespread in our area].
2 Lateral leaflets sessile; calyx absent; seed cavity of samara flattened in cross-section; [of VA and KY northwards]; [section *Fraxinus*] ..... ***F. nigra***
2 Lateral leaflets with petiolules (1-) 3-20 mm long; calyx present, persisting as a minute cup at the base of the fruits; seed cavity of samara round in cross-section (except flattened in *F. caroliniana*); [collectively widespread in our area]; [section *Melioides*].
3 Leaves minutely honeycombed-reticulate beneath (best seen at magnification of 40× or more), and sometimes also pubescent, more-or-less strongly whitened; wing of the samara decurrent only onto the upper 1/3 (or less) of the samara body ..... ***F. americana***
3 Leaves glabrous to pubescent beneath (and sometimes with papillae and small scales visible at 40×, but never minutely honeycombed-reticulate), green; wing of the samara decurrent onto 1/2 (or more) of the samara body.
4 Petiolules of the lowermost leaflets 1-9 mm long, all but 1-2 mm narrowly winged; samara mostly < 7 mm wide; calyx 0.5-1.5 mm long ..... ***F. pennsylvanica***
4 Petiolules of the lowermost leaflets 3-20 mm long, not winged (except *F. caroliniana*); samara mostly > 7 mm wide; calyx 1-6 mm long.
5 Body of samara flattened, winged the full length of the samara body; calyx 1 mm long; leaf scars slightly notched; small tree, often multi-trunked ..... ***F. caroliniana***
5 Body of samara terete or subterete, winged about 1/2 the length of the samara body; calyx 2.5-6 mm long; leaf scars deeply notched; medium to large tree, typically single-trunked ..... ***F. profunda***

New provisional key

1 Leaves minutely honeycombed-reticulate beneath (best seen at magnification of 40× or more), more-or-less strongly whitened (and otherwise variously glabrous or pubescent).
2 Petiole bases and leaf scars V- to U- or crescent-shaped with a deeply concave or notched apex; samaras (19-) 25-32 (-38) mm long, samara wings 3-5 (-6) mm wide, samara bodies (5-) 6-11 mm long, 1.5-2.5 mm wide; twigs, petioles, petiolules, and rachises glabrous ..... ***F. americana***
2 Petiole bases and leaf scars oblong-obovate to widely obovate with a nearly truncate apex; samaras (32-) 33-54 mm long, samara wings (4.5-) 5-8 mm wide, samara bodies (7-) 10-15 mm long, 2-4 mm wide; twigs, petioles, petiolules, and rachises glabrous or hirtellous to hirtellous-puberulent to tomentulose.
3 Twigs, petioles, petiolules, and rachises sparsely to densely hirtellous to hirtellous-puberulent or tomentulose; samaras 33-54 mm long, samara wings 6-8 mm wide, samara bodies (7-) 11-15 mm long, 2-4 mm wide ..... ***F. biltmoreana***
3 Twigs, petioles, petiolules, and rachises glabrous; samaras (32-) 36-44 mm long, samara wings (4.5-) 5-7 mm wide, samara bodies (9-) 10-13 mm long, 2-3.5 mm wide ..... ***F. smallii***
1 Leaves not minutely-honeycombed-reticulate beneath (sometimes with papillae and small scales visible at 40×, but these not forming a developed netlike pattern), pale green (and otherwise variously glabrous or pubescent).
4 Youngest twigs 4-angled to narrowly 4-winged; petiole bases raised on a distinct pedestal; lateral leaflets sessile to subsessile.
5 Samara bodies strongly flattened and often nearly indistinct from wings, wings 5-8 mm wide; buds black to blackish brown; leaf scars shallowly hemispheric, apex truncate; flowers bisexual and unisexual ..... ***[F. excelsior]***
5 Samara bodies flattened but clearly distinct from wings, wings 8-10 mm wide; buds gray to reddish brown; leaf scars crescent-shaped, apex concave; flowers bisexual ..... ***F. quadrangulata***
4 Youngest twigs terete; petiole bases flush with stem; lateral leaflets sessile to subsessile or petiolulate.
6 Multi-trunked shrubs or small trees; samara wings 2-3, arising from the base or proximal ¼ of body, (8-) 10-20 mm wide ..... ***F. caroliniana***
6 Trees; samara wings 2, arising from near the base to near apex of body, (5.5-) 6-10 (-12) mm or 4-7 mm wide.
7 Lateral leaflets sessile; samara bodies strongly flattened and often nearly indistinct from wings; buds black to blackish brown, corky-ridged ..... ***F. nigra***
7 Lateral leaflets petiolulate; samara bodies distinct from wings; buds brownish, not corky-ridged.
8 Leaflets mostly (6-) 7.5-11 (-12) cm × 2.5-5(-6) cm, bases obtuse to acute or abruptly attenuate; samaras 20-45 (-60) mm, wings arising abruptly from distal ¼-1/5 (-½) of body, 4-7 mm wide ..... ***F. pennsylvanica***
8 Leaflets (7-) 9-15 (-25) cm × (2.5-) 3.5-7 (-11) cm, bases often rounded, less commonly obtuse to acute or acuminate; samaras (35-) 40-70 (-75) mm, wings gradually expanded from near the base of the body to proximal ½, (5.5-) 6-10 (-12) mm wide ..... ***F. profunda***

Fraxinus americana Linnaeus, White Ash, American Ash. Mt (GA, NC, SC, VA, WV), Pd (DE, GA, NC, SC, VA), Cp (DE, FL, GA, NC, SC, VA): mesic slopes, rich cove forests, dryish calcareous or mafic glades and woodlands (with *Juniperus*

virginiana var. *virginiana* and *Carya glabra*); common (rare in Coastal Plain of DE, NC, SC, and GA). April-May; August-October. NS west to MN, south to n. peninsular FL and TX. A valuable timber tree. The division into 2 or more taxa is very likely warranted. [= C, K, W, WH, Z; > *F. americana* Linnaeus var. *americana* – RAB, F, G, WV; > *F. americana* Linnaeus var. *biltmoreana* (Beadle) J. Wright ex Fernald – RAB, F, G, WV; > *F. americana* var. *microcarpa* A. Gray – F; > *F. americana* – S, Y; > *F. biltmoreana* Beadle – S, Y]

Fraxinus berlandierana DC., Mexican Ash. This species, native of sc. OK south to s. TX, has been reported as naturalized in s. MS and e. LA (Kartesz 2010), but these records are discounted as being based on cultivated individuals (Nesom 2010h). {excluded; not keyed or mapped}

Fraxinus caroliniana P. Miller, Water Ash, Pop Ash, Carolina Ash. Cp (FL, GA, NC, SC, VA), Pd (GA, NC, SC, VA): deeply to shallowly flooded swamps; common (rare in Piedmont). May; July-October. Se. VA south to s. FL, west to TX, primarily on the Coastal Plain. A small tree, sometimes very abundant (and nearly the only subcanopy species) as the understory in *Taxodium-Nyssa* swamps. [= RAB, C, G, GW, K, WH, Y, Z; > *F. caroliniana* var. *caroliniana* – F; > *F. caroliniana* var. *oblanceolata* (M.A. Curtis) Fernald & Schubert – F; > *F. caroliniana* var. *cubensis* (Grisebach) Lingelsheim – F, misapplied; > *F. caroliniana* – S; > *F. pauciflora* Nuttall – S]

Fraxinus cubensis Grisebach, Cuban Water Ash, approaches our area from the south (it is extensively distributed in peninsular FL), but is not know from the Flora area. {excluded; not keyed or mapped}

Fraxinus nigra Marshall, Black Ash. Mt (VA, WV), Pd (DE, VA), Cp (DE): seepage swamps and mountain streambanks; rare. April-May; August-October. NL (Newfoundland) and QC west to MB, south to DE, VA, IN, and IA. [= C, F, G, K, W, WV, Y, Z]

Fraxinus pennsylvanica Marshall, Green Ash, Red Ash. Cp (DE, GA, NC, SC, VA), Pd (DE, GA, NC, SC, VA), Mt (GA, NC, SC, VA, WV): bottomlands and swamps, especially along brownwater rivers and streams; common. April-May; August-October. NS west to AB, south to FL and TX. Variation in this species (see synonymy) needs further study. [= C, GW, K, W, Z; > *F. pennsylvanica* var. *subintegerrima* (Vahl) Fernald – RAB, F, G, WV; > *F. pennsylvanica* var. *pennsylvanica* – RAB, F, G, WV; > *F. pennsylvanica* var. *austinii* Fernald – F; > *F. darlingtonii* Britton – S; > *F. pennsylvanica* – S; > *F. smallii* Britton – S; < *F. pennsylvanica* – WH; *? F. pennsylvanica* ssp. *pennsylvanica* – Y]

Fraxinus profunda (Bush) Bush, Pumpkin Ash. Cp (DE, GA, NC, SC, VA), Pd (GA, NC, SC, VA), Mt (NC): swamps, especially along blackwater rivers and streams and in freshwater tidal wetlands (as along the James, Pamunkey, Mattaponi, and Rappahannock rivers in e. VA), also in brownwater bottomlands; common (rare in Piedmont and Mountains). April-May; August-October. S. NJ south to n. FL, west to LA, mostly on the Coastal Plain, north in the interior to w. NC, sc. TN, e. AR, se. MO, s. IL, IN, OH, sc. MI, ne. PA, and w. NY. This species has a peculiar distribution; see McCormac, Bissell, & Stine (1995) and Nesom (2010) for additional discussion. The nomenclature has been controversial, but is now resolved. There is also some question as to its taxonomic recognition; it may be an allopolyploid derivative of *F. pennsylvanica*, perhaps from multiple origins. [= C, GW, K, W, Z; = *F. tomentosa* Michaux f. – RAB, F, G, Y; > *F. profunda* – S; > *F. michauxii* Britton – S; < *F. pennsylvanica* – WH]

Fraxinus quadrangulata Michaux, Blue Ash. Mt (GA, VA, WV): mesic to dry calcareous woodlands and forests; rare. April; July-October. S. ON west to s. MI and e. KS, south to sw. VA, e. TN, nw. GA, n. AL, and OK. [= C, F, G, K, S, WV, Y, Z]

Fraxinus biltmoreana Beadle, Biltmore Ash, Biltmore White Ash. {add data}

* *Fraxinus excelsior* Linnaeus, European Ash. Naturalized in ne. US, south to KY and s. NJ.

Fraxinus pauciflora Nuttall, Swamp White Ash. Cp (FL, GA): deep swamps; uncommon. {not yet keyed}

Fraxinus smallii Britton, Small's White Ash. {add data}

Jasminum Linnaeus 1753 (Winter Jasmine)

A genus of about 200 species, shrubs and woody vines, of tropical (and rarely temperate) Eurasia. References: Green in Kadereit (2004)

1 Leaves simple; flowers white ..... ***J. multiflorum***
1 Leaves trifoliolate; flowers yellow.
2 Leaflets 2.5-7 cm long; flowers 3.5-5 cm across ..... ***J. mesnyi***
2 Leaflets 1-3 cm long; flowers ca. 2.5 cm across ..... ***[J. nudiflorum]***

* ***Jasminum mesnyi*** Hance, Japanese Jasmine, Primrose Jasmine. Cp (FL, GA?): cultivated and sometimes persistent or spreading from plantings; rare, native of w. China. Reported for GA (Kartesz 1999) and Panhandle FL (Kunzer et al. 2009). [= K, WH]

* ***Jasminum multiflorum*** (Burmann f.) Andrews, Star Jasmine. Cp (FL): cultivated and sometimes persistent or spreading; rare, native of India and Pakistan. Naturalized at least as far north as Jacksonville, Duval County, FL (Wunderlin & Hansen 2004). [= K, WH]

* *Jasminum nudiflorum* Lindley, Winter Jasmine, native of China, is commonly planted and often persists. It has green stems and yellow flowers. Reported for GA (K). [= K]

Ligustrum Linnaeus 1753 (Privet)

[contributed by Guy L. Nesom and Alan S. Weakley]

A genus of about 40 species, shrubs and trees, of the Old World. References: Nesom (2009a)=Y; Hardin (1974)=Z; Green in Kadereit (2004). The key is based on Nesom (2009a) and Hardin (1974).

1 Leaves (3-) 4-13 (-15) cm long.
  2 Leaves mostly (3-) 4-8 (-9) cm long, primary lateral veins 3-5 pairs, apex acute to abruptly acuminate, abaxial midvein covered by epidermis; flowers short-pedicellate on pedicels 0.5-2 mm; corolla tube hardly exserted from calyx, ca. equal lobe length ..... ***L. japonicum***
  2 Leaves (4.5-) 6-13 (-15) cm, primary lateral veins (5-) 6-8 pairs, apex usually long-acuminate, abaxial midvein not covered by epidermis; flowers subsessile on pedicels 0-0.5 mm; corolla tube distinctly exserted from calyx, ca. 2× longer than lobes ..... ***L. lucidum***
1 Leaves 1.5–6 (-6.5) cm long.
  3 Branchlets glabrous and usually glossy..... ***L. ovalifolium***
  3 Branchlets minutely hirtellous, hirsute-hirtellous, or hirsutulous, dull.
    4 Leaf blades hirsutulous abaxially, rarely only along the nerves, sparsely hirsute-strigose adaxially, sometimes mostly near the margins, primary lateral veins (5-) 6-8 pairs, apices sharply acute (to slightly acuminate, or rarely obtuse)..... ***[L tschonoskii]***
    4 Leaf blades glabrous on both surfaces or sometimes sparsely hairy along the abaxial midvein, primary lateral veins (2-) 3-6 pairs, apices obtuse to acute (in *L. vulgare*) or obtuse to rounded.
      5 Leaf blades narrowly oblong-elliptic to oblanceolate-elliptic, oblanceolate or narrowly obovate, usually broadest slightly above the middle; inflorescence usually narrowly cylindric, flowers sessile to subsessile in verticil-like clusters..... ***L. quihoui***
      5 Leaf blades variously shaped; inflorescence broadly cylindric to pyramidal, flowers sessile to pedicellate in broadly cylindric to pyramidal panicles of cymes.
        6 Corolla tube < 1.2× as long as the lobes.
          7 Leaves ovate-elliptic to oblong-ovate, elliptic-lanceolate, or suborbicular, primary lateral veins (3-) 4-5 pairs, apex obtuse to rounded or retuse, abaxial midvein usually sparsely hirsutulous to puberulent; inflorescence diffuse and open panicles terminal and on essentially leafless, lateral branches interspersed with leafy ones; branchlets hirtellous to loosely substrigose with straight hairs of uneven length; corolla tube slightly shorter than lobes, often barely exserted from the calyx tube; pedicels glabrous..... ***L. sinense***
          7 Leaves elliptic-lanceolate to elliptic-ovate, primary lateral veins 4-6 pairs, apex obtuse to acute, abaxial midvein usually glabrous or with a few scattered hairs; inflorescence mostly a compact, terminal panicle; branchlets evenly and minutely hirtellous to hirsutulous with relatively even-length hairs; corolla tube equal the lobes or slightly shorter, distinctly exserted from the calyx tube; pedicels hirtellous ..... ***L. vulgare***
        6 Corolla tube 1.5-3× longer than the lobes.
          8 Leaf blades usually sparsely villous abaxially; calyx and pedicels sparsely to densely hirtellous (rarely nearly glabrous); corolla tube 2-3× as long as the lobes..... ***L. obtusifolium*** *var.* ***obtusifolium***
          8 Leaf blades usually glabrous abaxially; calyx and pedicels glabrous to very sparsely hirtellous; corolla tube 1.5-2× as long as the lobes ..... ***L. obtusifolium*** *var.* ***suave***

* ***Ligustrum japonicum*** Thunberg, Japanese Privet. Cp (FL, GA, NC, SC, VA), Pd (NC, VA): disturbed places; rare, native of Japan and Korea. April-June. [= RAB, K, WH, Y, Z]

* ***Ligustrum lucidum*** Aiton f., Glossy Privet, Broadleaf Privet. Pd (NC), Cp (FL, NC): disturbed places; rare, native of China, Japan, and Korea. This species is superficially similar to *L. japonicum*; the lateral leaf veins are translucent in this species. [= K, S, WH, Y, Z]

* ***Ligustrum obtusifolium*** Siebold & Zuccarini *var.* ***obtusifolium***. Cp (NC, VA), Pd (NC, VA), Mt (VA, WV), {SC}: disturbed places; uncommon (rare in WV), native of Japan. [= Y; = *L. obtusifolium* – C, F, G, K, Z]

* ***Ligustrum obtusifolium*** Siebold & Zuccarini *var.* ***suave*** (Kitagawa) H. Hara, Amur Privet. Cp, Pd (NC, VA), Mt (VA), {SC}: disturbed places; uncommon, native of Japan. [= Y; = *L. amurense* Carrière – RAB, C, F, G, K, Z; = *Ligustrum obtusifolium* Siebold & Zuccarini var. *amurense* (Carrière) Mansfeld]

* ***Ligustrum ovalifolium*** Hasskarl, California Privet. Cp (FL, NC, VA), Pd (NC, VA), Mt (WV): disturbed places; rare, native of Japan. April-July. [= RAB, C, F, G, K, S, WH, Y, Z]

* ***Ligustrum quihoui*** Carrière, Waxy-leaf Privet. Cp (FL, NC, VA): disturbed places; rare, native of China. May-July. [= K, WH, Y, Z]

* ***Ligustrum sinense*** Loureiro, Chinese Privet. Cp (FL, GA, NC, SC, VA), Pd (GA, NC, SC, VA), Mt (GA, NC, SC, VA): moist forests, especially alluvial bottomlands; common, native of China. This species is one of the most noxious of our weeds, choking out native vegetation in hundreds of square kilometers of land in our area. The rapidity with which it has engulfed southern wetlands is hinted at by Small's (1933) mention of it only as "an escape in southern Louisiana." [= RAB, C, G, GW, K, S, W, WH, Y, Z]

* ***Ligustrum vulgare*** Linnaeus, Common Privet. Mt (WV), Pd (NC, VA), Cp (NC, VA): disturbed places; common (rare in NC and VA), native of Europe and n. Africa. (May-) June-July. [= C, F, G, K, S, WV, Y, Z]

Ligustrum tschonoskii Decaisne. Pd (DC): suburban forests; rare, native of Japan. Known in the flora area "only from the woods along the bank of Rock Creek in Rock Creek Park" (Nesom 2009a; Shetler and Orli 2000). Two varieties within *L. tschonoskii* were recognized by Noshiro (1985), distinguished by slight and overlapping size differences. Var. *tschonoskii* is restricted in native range to Japan; var. *kiyozumianum* (Nakai) Ohwi occurs in Japan and Korea. [= Y]

Osmanthus Loureiro 1790 (Wild Olive, Devilwood)

A genus of about 15-32 species, shrubs and trees, of se. Asia (most species) and se. North America. References: Hardin (1974)=Z; Green in Kadereit (2004).

1 Leaf margins entire; leaves usually >7 cm long; [native tree of Coastal Plain forests] ..... ***O. americanus***
1 Leaf margins spiny-toothed; leaves < 10 cm long; [horticulturally planted, rarely naturalizing] ..... ***O. ×fortunei***

Osmanthus americanus (Linnaeus) Bentham & Hooker f. ex A. Gray, Wild Olive, Devilwood. Cp (FL, GA, NC, SC, VA): maritime forests and (in FL, GA, SC, and extreme s. NC) dry, sandy forests well inland, and reported for wet habitats as well further south; uncommon (rare in VA). April-May; August-October. Se. VA south to c. peninsular FL, west to LA; also in Mexico. *O. megacarpus* Small, sometimes treated as a variety, *O. americanus* var. *megacarpus* (Small) P.S. Greene, is endemic to pine scrub in peninsular FL and differs primarily in having a larger fruit. The very hard, tough, and "unsplittable" wood is the inspiration for the common name "Devilwood." *O. americanus* is a conspicuous element of maritime forests in most of our area, readily recognizable by the flattened twigs characteristic of the family, and the opposite (or typically, actually subopposite), glossy, oblanceolate to obovate, evergreen leaves. [= RAB, F, G, GW, WH; = *O. americanus* var. *americanus* – C, K, Z; = *Amarolea americana* (Linnaeus) Small – S]

* ***Osmanthus ×fortunei*** Carrière [= *O. fragrans* × *heterophyllus*], Fortune's Sweet Olive. Pd (NC): suburban woodlands, escaped from horticultural plantings; rare, hybrid originating in Japan of two species native to Japan.

* ***Osmanthus heterophyllus*** D. Don, Holly Osmanthus. Pd (NC): suburban woodlands; rare, native of Japan. Naturalizing in Guilford County, NC (W. Cook, pers. comm. 2010). {not yet keyed}

Syringa Linnaeus 1753 (Lilac)

A genus of about 20-23 species, shrubs, from s. Europe to se. Asia. References: Hardin (1974)=Z; Green in Kadereit (2004).

* ***Syringa vulgaris*** Linnaeus, Lilac. Mt (NC, VA, WV): commonly planted, persistent and naturalizing around old farms; rare, native of se. Europe. [= C, F, G, K, Z]

365. TETRACHONDRACEAE Wettstein 1924 (Tetrachondra Family) [in LAMIALES]

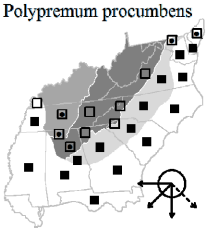
A family of 2 genera, *Polypremum* and *Tetrachondra* (Oxelman et al. 1999), and 3 species, perennial herbs, of s. North America south to South America, and New Zealand. The assignment of *Polypremum* to family has been controversial, with placement formerly in Loganiaceae or Buddleiaceae. A recent molecular analysis strongly suggests that its closest relationship is with *Tetrachondra* (Oxelman et al. 1999), and the treatment followed here reflects the current genral consensus. References: Oxelman et al. (1999); Wagstaff in Kadereit (2004).

Polypremum Linnaeus 1753 (Polypremum)

The genus is monotypic, an herb, or warm temperate, subtropical and tropical America. References: Rogers (1986)=Z; Wagstaff in Kadereit (2004).

Polypremum procumbens Linnaeus, Polypremum, Rustweed, Juniperleaf. Cp (DE, GA, NC, SC, VA), Pd (GA, NC, SC, VA), Mt (GA, NC, SC, VA): fields, disturbed areas; common, rare in Mountains. Late May-September; August-October. Se. NY, NJ, and MO south to FL and TX, and south into Central America, South Amerie West Indies. [= RAB, C, F, G, GW, K, S, W, Z]

Polypremum procumbens



368. PLANTAGINACEAE A.L. de Jussieu 1789 (Plantain Family) [in LAMIALES]

As newly and radically recircumscribed, a family of about 120 genera and 1800 species. References: Albach, Meudt, & Oxelman (2005); Olmstead et al. (2001); Schwarzbach in Kadereit (2004); Fischer in Kadereit (2004).

1 Leaves alternate, at least those on the upper stem; calyx 5-merous; stamens 4.
  2 Corolla lacking a spur or pouch at the base.
    3 Stem erect; flowers > 10 mm long; [tribe *Digitaleae*] ..... ***Digitalis***
    3 Stems prostrate; flowers < 5 mm long; [tribe *Limoselleae*] ..... ***Limosella***
  2 Corolla with a distinct spur or broad pouch protruding between the 2 lower calyx lobes; [tribe *Antirrhineae*].
    4 Corolla with a broad pouch at the base.

5 Calyx lobes about equal, all shorter than the the corolla tube; corolla 25-40 mm long; leaves to 15 mm wide.....***Antirrhinum***
5 Calyx lobes distinctly unequal, all longer than the corolla tube; corolla 10-13 mm long; leaves to 5 mm wide .....***Misopates***
4 Corolla with a slender spur at the base.
6 Flowers in terminal racemes.
7 Corolla yellow; capsule 9-12 mm long.....***Linaria***
7 Corolla blue; capsule 2-3 mm long.....***Nuttallanthus***
6 Flowers solitary in leaf axils.
8 Stems erect; leaves linear.....***Chaenorrhinum***
8 Stems prostrate; leaves orbicular, ovate, or triangular.
9 Leaves orbicular in outline, palmately lobed and veined; stems rooting at nodes .....***Cymbalaria***
9 Leaves ovate or triangular, pinnately veined; stems not rooting .....***Kickxia***
1 Leaves either strictly basal, or opposite or whorled throughout; calyx 0-, 4-, or 5-merous; stamens 1, 2, or 4.
10 Leaves strongly basally disposed, usually all the leaves basal; petals 4, scarious and translucent in texture; inflorescence a spike; [tribe *Plantagineae*].....***Plantago***
10 Leaves cauline, either opposite or whorled; petal 0, or 4, or 5; inflorescence various.
11 Leaves whorled.
12 Aquatic; leaves 5-30 mm long, lanceolate, toothed to deeply dissected into linear segments; [tribe *Gratioleae*] .....***Limnophila***
12 Terrestrial; leaves 40-15 cm long, lanceolate or elliptic, toothed; [tribe *Veroniceae*] .....***Veronicastrum***
11 Leaves opposite.
13 Petals 0; sepals 0, stamens 1; leaves both < 2 cm long and entire; [tribe *Callitricheae*] .....***Callitriche***
13 Petals 4 or 5; sepals 4 or 5; stamens 2 or 4; leaves > 2 cm long, or serrate, or both.
14 Calyx and corolla 4-merous.
15 Leaves punctate; stamens 4; [tribe *Gratioleae*].....***Scoparia***
15 Leaves not punctate; stamens 2; [tribe *Veroniceae*] .....***Veronica***
14 Calyx and corolla 5-merous.
16 Plants erect, moderately robust, usually > 4 dm tall, larger leaves > 5 cm long; inflorescences terminal (the bracts subtending flowers strongly reduced in size in comparison to main leaves of the stem); [tribe *Cheloneae*].
17 Inflorescence compact, the inflorescence axis generally hidden by the closely packed and overlapping flowers; each flower subtended by large overlapping bracts.....***Chelone***
17 Inflorescence more diffuse, the inflorescence axis readily visible between the flowers; flowers lacking extra subtending bracts .....***Penstemon***
16 Plants creeping, decumbent or erect, small, usually < 4 dm tall (except *Mecardonia*, to 5 dm tall), larger leaves < 5 cm long; inflorescences axillary (all or most of the flowers axillary to more-or-less normaly sized leaves).
18 Stamens 2; [section *Gratioleae*].
19 Capsule flattened, wider than long, notched; leaves dimorphic, with narrow submersed leaves on the lower stems, and broad floating leaves just subtending the aerial inflorescences; [of vernal pools on granite outcrops in Piedmont SC, GA, and AL].....***Gratiola amphiantha***
19 Capsule turgid, longer than wide; levaes monomorphic; [collectively of many habitats and widespread].
20 Flowers and fruits on definite pedicels; annual or perennial; leaves not papillose.....***Gratiola***
20 Flowers and fruits sessile or subsessile, the pedicels < 1 mm long; perennial; leaves papillose on the surfaces and margins.....***Sophronanthe***
18 Stamens 4.
21 Sepals evidently connate into a tube about as long as the lobes; [section *Cheloneae*] .....***Collinsia***
21 Sepals distinct or very nearly so.
22 Leaves deeply pinnatifid; [tribe *Stemodieae*].....***Leucospora***
22 Leaves entire or toothed; [tribe *Gratioleae*].
23 Corolla nearly radially symmetrical; corolla lobes about as long as the corolla tube; leaves palmately veined, with parallel veins diverging from the base, margins entire to crenulate; of aquatic to moist habitats, often somewhat succulent.....***Bacopa***
23 Corolla distinctly bilabiate; corolla lobes shorter than the corolla lobe; leaves pinnately veined, with a single main-vein and lateral veins diverging along it, margins serrate; of moist habitats, not succulent.....***Mecardonia***

Antirrhinum Linnaeus 1753 (Snapdragon)

A genus of about 20 species, herbs, of Mediterranean Europe. References: Sutton (1988)=Z; Pennell (1935)=P. [also see *Misopates*]

* ***Antirrhinum majus*** Linnaeus, Common Snapdragon. Mt (VA, WV), Pd (VA): cultivated, rarely persistent or naturalized; rare, native of Mediterranean Europe. July. [= C, G, K, P, WV, Z]

Bacopa Aublet 1775 (Water-hyssop)

A genus of about 50 species, herbs (mostly aquatic or at least wetland), of tropical, subtropical, and warm temperate regions of the Old and New Worlds. References: Schuyler (1989)=Z; Fernald (1942); Pennell (1935)=P.

1 Leaves obovate to oblanceolate, cuneate at the base, 1-veined (or with 1-2 additional obscure veins), 3-8 mm wide; stems glabrous; fresh plants not aromatic .....***B. monnieri***

1 Leaves mostly orbicular to ovate (or sometimes obovate in the very rare *B. repens*), rounded to clasping at the base, 3-9-veined; stems pubescent or puberulent, at least when young (check at growing tips) or glabrous (in tidal forms of *B. innominata*); fresh plants aromatic or not.
2 Fresh plants strongly aromatic when bruised; corolla pale to bright blue, 9-13 mm long; calyx subtended by 2 subulate bractlets; stamens 4 ..... ***B. caroliniana***
2 Fresh plants not aromatic when bruised; corolla predominantly white (in some species slightly pink or marked with yellow), 2-10 mm long; calyx not subtended by bractlets; stamens 2 or 4.
3 Corolla 4-10 mm long, white with a yellow throat; capsule ca. 5 mm long ..... ***B. rotundifolia***
3 Corolla 2-5 mm long, white or pink, without a yellow throat; capsule 2-3 mm long.
4 Leaves strongly clasping, mostly ovate; stamens 2 (or very rarely 4); [native] ..... ***B. innominata***
4 Leaves only slightly clasping, mostly obovate; stamens 4; [a very rare introduction] ..... ***B. repens***

Bacopa caroliniana (Walter) B.L. Robinson, Blue Water-hyssop, Sweet Water-hyssop, Carolina Water-hyssop, Lemon Bacopa. Cp (FL, GA, NC, SC, VA), Pd (GA, SC): wet shores, tidal muds, marshes; common (rare in NC and VA). May-September. Se. VA south to s. FL, west to e. TX; disjunct in KY. The strongly fragrant stems and leaves are unique. [= RAB, C, F, G, GW, K, W, WH; = *Hydrotrida caroliniana* (Walter) Small – P, S]

Bacopa innominata (Gómez Maza) Alain, Tropical Water-hyssop. Cp (FL, GA, NC, SC, VA): freshwater tidal muds, marshes, shallow water; uncommon (rare in GA, NC, SC, and VA). June-September. MD south to s. FL, and in the West Indies and Central America. *B. stragula* Fernald has been considered a rare endemic of tidal areas in VA and MD, differing from *B. innominata* in its glabrous stems (vs. pubescent), smaller flowers (the corolla < 3 mm long vs. > 3 mm long), and shorter, glabrous pedicels 3-6 mm long (vs. pubescent and to 8 mm long). Schuyler (1989) concluded that *B. stragula* is an intertidal form of *B. innominata*, the morphologic differences induced by the flooding regime. Additional work, perhaps involving growth under experimental conditions or chemical or molecular studies, is needed to corroborate Schuyler's conclusion. See Schuyler (1989), F, and Fernald (1942) for further discussion. [= C, GW, K, WH, Z; > *B. cyclophylla* Fernald – RAB; > *B. stragula* Fernald – F, G; *? Herpestis rotundifolia* Gaertner f. – P, S; *? Macuillamia obovata* Rafinesque – P]

Bacopa monnieri (Linnaeus) Wettstein, Monnier's Water-hyssop. Cp (FL, GA, NC, SC, VA): freshwater tidal marshes, muddy shores, streams and pools; common (uncommon in GA, NC, SC, and VA). E. VA south to s. FL, west to c. TX, and in the West Indies and the New World subtropics and tropics. [= RAB, C, F, G, GW, K, WH; = *Bramia monnieri* (Linnaeus) Drake – P, S]

* ***Bacopa repens*** (Swartz) Wettstein, South American Water-hyssop. Cp (SC): freshwater pools; rare, presumably native of the New World tropics. [= RAB, GW, K; = *Macuillamia repens* (Swartz) Pennell – P, S]

Bacopa rotundifolia (Michaux) Wettstein, Midwestern Water-hyssop. Cp (NC, VA): tidal muds, shallow water of large natural lake; rare. June-September. IN and IA west to ND and MT, south to AL and AZ; disjunct in e. MD, e. VA, and ne. NC, where apparently native (though C considers introduced). Known in NC only from Lake Mattamuskeet, Hyde County, where not seen since 1929. *B. simulans* Fernald has been considered a rare endemic of tidal areas in VA and MD. It is alleged to differ from *B. rotundifolia* in its glabrous to glabrescent stems (vs. pubescent), more succulent condition, smaller leaves (the larger 1-2 cm long and 0.6-1.5 cm wide vs. 2-3.5 cm long and 1.5-2.7 cm wide), smaller flowers (corolla 3-4 mm long vs. 6-10 mm long). Schuyler (1989) concluded that *B. simulans* is an intertidal form of *B. rotundifolia*, the morphologic differences the result of differences in inundation. Additional work, perhaps involving growth under experimental conditions or chemical or molecular studies, is needed to corroborate Schuyler's conclusion. See Schuyler (1989), F, and Fernald (1942) for further discussion. [= C, GW, K, Z; > *B. rotundifolia* – F, G; > *B. simulans* Fernald – F, G; = *Macuillamia rotundifolia* (Michaux) Rafinesque – P, S]

Callitriche Linnaeus 1753 (Water-starwort)

A genus of 20-50 species, annual and perennial herbs of aquatic, wetland, and upland habitats, nearly cosmopolitan. This genus should be included in a greatly expanded Plantaginaceae. References: Angiosperm Phylogeny Group (2003, 2009); Crow & Hellquist (2000)=Z; Fassett (1951)=Y; Erbar & Leins in Kadereit (2004). Key based on Z.

1 Flowers and young fruits with 2 inflated bracteoles at the base; leaves dimorphic (with floating rosettes of spatulate leaves and submersed linear leaves) or monomorphic.
2 Fruit margin distinctly winged, the wing nearly 0.1 mm wide, extending the entire distance from the summit to the base of the fruit; fruit globose ..... ***C. stagnalis***
2 Fruit margin either not winged or with a wing < 0.05 mm wide, narrowing towards the base of the fruit before ending above the base; fruit ellipsoidal, obovoid, or nearly heart-shaped.
3 Fruit as wide as long, obovoid or nearly heart-shaped ..... ***C. heterophylla*** *var.* ***heterophylla***
3 Fruit longer than wide by > 0.2 mm, ellipsoidal ..... ***C. palustris***
1 Flowers and young fruits lacking bracts at their base; leaves monomorphic, obovate-spatulate, rounded at the tip.
4 Mericarps bent at an angle and thickened on one side at the base; [of SC southward] ..... ***C. peploides***
4 Mericarps not bent at an angle nor thickened at the base; [collectively widespread].
5 Fruit on pedicels 0.5-7 mm long; margin of fruit curled over on itself, appearing thickened; fruit developing underground ..... ***C. pedunculosa***
5 Fruit on pedicels 0.1-0.6 mm long; margin of fruit narrow, thin; fruit developing aboveground ..... ***C. terrestris***

Callitriche heterophylla Pursh *var.* ***heterophylla***, Common Water-starwort. Cp (DE, FL, GA, NC, SC, VA), Pd (DE, GA, NC, SC, VA), Mt (GA, NC, SC, VA, WV): pools, slow-moving streams, ditches; common (uncommon in GA, NC, SC, and VA Piedmont, uncommon in Mountains). March-October. Greenland west to AK, south to c. peninsular FL, TX, CA, and Mexico. The other variety, var. *bolanderi* (Hegelmann) Fassett, with larger fruits, co-occurs with var. *heterophylla* in nw. North America

and is of uncertain taxonomic status, having been treated as species, subspecies, variety, and lumped. [< *C. heterophylla* – RAB, C, G, GW, S, W, WH, Z; > *C. heterophylla* – F; > *C. anceps* Fernald – F, Y; = *C. heterophylla* ssp. *heterophylla* – K; > *C. heterophylla* var. *heterophylla* – Y]

Callitriche palustris Linnaeus, Swamp Water-starwort. Cp (DE, VA), Pd (DE, VA), Mt (VA, WV): ponds, lakes, stagnant streams, wet soil; rare. Circumboreal, in North America south to VA, WV, IL, TX, and CA; South America. The nomenclatural debate between *C. palustris* and *C. verna* is difficult to resolve. [= C, F, K, S; = *C. verna* Linnaeus – G, W, Y, Z]

Callitriche pedunculosa Nuttall. Cp (FL, GA, NC), Pd (NC): low fields, pond shores; rare. NC, c. TN, and OK south to c. peninsular FL, AL, and TX. [= K, WH; = *C. nuttallii* Torrey – GW, Y, Z]

Callitriche peploides Nuttall. Cp (FL, GA, SC): low fields, ditches; rare. April-June. SC south to s. FL, west to TX; disjunct inland in TN, AR; e. Mexico south to Costa Rica. [= RAB, GW, K, S, WH; > *C. peploides* var. *peploides* – Y]

* ***Callitriche stagnalis*** Scopoli. Pd (DE, VA), Mt (VA), Cp (VA): ponds, stagnant water, wet soil; rare, native of Europe, or possibly also native in some areas. See Philbrick, Aakjar, & Stuckey (1998) for additional discussion of the spread of this species in North America. [= C, F, G, K, Y, Z]

Callitriche terrestris Rafinesque emend. Torrey, Terrestrial Water-starwort. Cp (DE, GA, NC, SC, VA), Pd (DE, GA, NC, SC, VA), Mt (GA, NC, SC, VA, WV): streambanks, ditches, low fields, wet paths; uncommon. April-June. MA to KS, south to GA, TX, and Mexico. [= C, GW, K, S, W, Z; = *C. deflexa* A. Braun – RAB, Y; > *C. deflexa* var. *austinii* (Engelmann) Hegelmann – F, G]

Chaenorrhinum (A.P. de Candolle ex Duby) Reichenbach 1828
(Dwarf Snapdragon, Lesser Toadflax)

A genus of about 21 species, herbs, of Mediterranean Europe. References: Sutton (1988)=Z; Pennell (1935)=P.

* ***Chaenorrhinum minus*** (Linnaeus) Lange *ssp.* ***minus***, Dwarf Snapdragon, Small Toadflax, Lesser Toadflax. Mt (VA, WV), Cp (VA), Pd (DE, GA, NC, VA): disturbed areas; common (rare in DE, GA, and NC), native of Eurasia. June-November. [= Z; ? *Chaenorrhinum minus* – C, F, G, K, P, W]

Chelone Linnaeus 1753 (Turtlehead)

A genus of about 4 species, perennial herbs, of e. North America. References: Nelson, Elisens, & Benesh (1998); Pennell (1935)=P.

Identification notes: The four fertile stamens are inserted on either side of the corolla near its base and are flattened and conspicuously pilose. The single staminodium (the color of which is used in the key) is much shorter (often only a few mm long), and is inserted uppermost on the corolla near its base.

1 Leaves sessile; flowers distinctly 4-ranked; staminodium purple; corolla purple ..... ***C. cuthbertii***
1 Leaves with petioles 0.5-1.5 cm long (or subsessile in *C. glabra*); flowers less distinctly 4-ranked; staminodium white or green; corolla purple or white.
  2 Petioles 1.5-4 cm long; leaf blade rounded at the base; leaf blades averaging ca. 2× as long as wide, 4-8 cm wide; staminodium white; corolla purple ..... ***C. lyonii***
  2 Petioles 0.1-1.5 cm long; leaf blade cuneate at the base; staminodium white or green; leaf blades averaging 3× (or more) as long as wide, 1-6 cm wide; corolla purple or white.
    3 Corolla white (or tinged with purple near the summit); staminodium green ..... ***C. glabra***
    3 Corolla purple throughout; staminodium white ..... ***C. obliqua***

Chelone cuthbertii Small, Cuthbert Turtlehead. Mt (GA, NC, SC, VA), Pd (NC), Cp (NC, VA): bogs, sphagnous swamps, seeps; uncommon (rare in GA, rare in Piedmont). Late July-September; September-October. This species has a curious, disjunct distribution: Mountains and rarely upper Piedmont of w. NC and n. GA, and Coastal Plain of se. VA and e. NC. The species is diploid (Nelson, Elisens, & Benish 1998). [= RAB, C, F, G, GW, F, K, P, S, W]

Chelone glabra Linnaeus, White Turtlehead. Mt (GA, NC, SC, VA, WV), Pd (DE, GA, NC, SC, VA), Cp (DE, GA, NC, SC, VA): streambanks, seeps, swamp forests; common. August-October; September-November. NL (Newfoundland) and MN south to GA and AL. The named varieties are intergrading and the characters used to distinguish them do not correlate well. The species is diploid (Nelson, Elisens, & Benish 1998). [= RAB, C, GW, K, W; > *C. glabra* var. *dilatata* Fernald & Wiegand – F, P; > *C. glabra* var. *elatior* Rafinesque – F, G, P, S; > *C. glabra* var. *elongata* – F, G, P, S; > *C. glabra* var. *ochroleuca* Pennell & Wherry – F, G, P, S; > *C. glabra* var. *glabra* – F, G, S; > *C. glabra* var. *chlorantha* (Pennell & Wherry) Pennell – P; > *C. glabra* var. *typica* – P; > *C. chlorantha* Pennell & Wherry – S; > *C. montana* (Rafinesque) Pennell & Wherry var. *montana* – S; > *C. montana* var. *elatior* (Rafinesque) Small – S]

Chelone lyonii Pursh, Appalachian Turtlehead. Mt (NC, SC, WV*), Pd (NC, SC): cove forests, spruce-fir forests, balds, streambanks; uncommon. July-September; October. W. NC and e. TN south to nw. SC. The species is diploid (Nelson, Elisens, & Benish 1998). [= RAB, C, GW, K, W; = *C. lyoni* – F, G, P, S, orthographic variant]

Chelone obliqua Linnaeus, Purple Turtlehead. Cp (GA, NC, SC, VA), Pd (GA, NC, SC), Mt (GA, NC, SC): streambanks, swamp forests; uncommon. October; November. MD and MN south to AL, w. TN, and MO. A tetraploid race is restricted to the southern Blue Ridge; plants in the remainder of the distribution are hexaploid (Nelson, Elisens, & Benish 1998). [= RAB, C, GW, F, G, S, W; > *C. obliqua* var. *obliqua* – K; > *C. obliqua* var. *typica* – P; > *C. obliqua* var. *erwiniae* Pennell & Wherry – K, P]

Collinsia Nuttall 1817 (Blue-eyed Mary)

A genus of about 20 species, herbs, of North America (especially diverse in w. North America). References: Pennell (1935)=P

Collinsia verna Nuttall, Eastern Blue-eyed Mary. Mt (VA, WV): nutrient-rich, moist bottomlands and forested slopes; uncommon (rare in VA). April-June. NY west to s. WI, south to w. VA, WV, nc. TN (Chester, Wofford, & Kral 1997), KY, and AR. [= C, F, G, K, P, S, W, WV]

Cymbalaria Hill 1756 (Kenilworth-ivy)

A genus of about 9 species, herbs, of Europe west to c. Asia. References: Sutton (1988)=Z; Pennell (1935)=P.

* ***Cymbalaria muralis*** P.G. Gaertner, B. Meyer, & Scherbius *ssp.* ***muralis***, Kenilworth-ivy. Mt (NC, VA, WV), Pd (DE, VA), Cp (DE, VA): naturalized on walls and rock outcrops near plantings, roadsides, disturbed areas; uncommon (rare in NC and VA), native of Eurasia. May-August. The other two subspecies, both villous throughout (vs. glabrous or with a few scattered hairs in ssp. *muralis*) are Mediterranean and are not known to be naturalized in North America. Reported for NC (Henderson County) by Pittillo & Brown (1988) as "derived from potted plants that have become established beneath the overhang of a porch for over a decade," and reported again more recently as spreading from plantings in Alleghany County, NC (Poindexter 2006) and Buncombe County, NC (C.A. McCormick, pers.comm. 2009). Reported by Pennell (1935) as being "in herbaria" from DC, KY, MD, SC, TN, WV, and other states beyond our area. [= Z; < *C. muralis* – C, F, G, K, P, WV; = *C. cymbalaria* (Linnaeus) Wettstein;= *Linaria cymbalaria* (Linnaeus) P. Miller]

Digitalis Linnaeus 1753 (Foxglove)

A genus of about 19 species, herbs, of Europe west to central Asia. Famous as the source of the drug digitalis, a cardiac glycoside. References: Pennell (1935)=P.

1 Corolla 1.3-1.8 cm long, pale yellow to white; plant nearly glabrous ..... ***[D. lutea]***
1 Corolla 2-5.5 cm long, white, yellow, or purple; plant conspicuously pubescent on the stem and/or leaves.
  2 Corolla 2-3 cm long, white to pale yellow, the lower median lobe much longer than the others ..... ***D. lanata***
  2 Corolla 4-5.5 cm long, purple or white, the lower median lobe only slightly longer than the others ..... ***D. purpurea***

* ***Digitalis lanata*** Ehrhart, Grecian Foxglove, Hairy Foxglove. Pd (SC), Mt (VA): naturalized along roadside; rare, native of Mediterranean Europe. May-June. Reported for South Carolina by Hill & Horn (1997). [= C, F, G, K, P]

* ***Digitalis purpurea*** Linnaeus, Digitalis, Common Foxglove, Purple Foxglove, Lady's-glove. Mt (NC, WV), Cp (VA): disturbed areas, bog margins; uncommon (rare in NC and VA), native of Europe. June-August. Introduced and established at scattered locations in ne. North America, as far south as PA (Rhoads & Klein 1993). [= C, P, WV; > *D. purpurea* var. *purpurea* – K; > *D. purpurea* var. *alba* – K]

* *Digitalis lutea* Linnaeus, Straw Foxglove. Naturalized south to MD, PA, and OH. [= C, G, K]

Gratiola Linnaeus 1753 (Hedge-hyssop)

A genus of about 20 species, herbs, of temperate regions (and tropical mountains) of the Old and New Worlds. References: Estes & Small (2007)=Z; Estes & Small (2008)=Y; Pennell (1935)=P. Key based in part on Estes & Small (2007). [including *Amphianthus*]

Identification notes: *Gratiola amphiantha* somewhat resembles *Callitriche*, but has floating leaves in single pairs rather than in a whorl.

1 Capsule flattened, wider than long, notched; leaves dimorphic, with narrow submersed leaves on the lower stems, and broad floating leaves just subtending the aerial inflorescences; [of vernal pools on granite outcrops in Piedmont SC, GA, and AL] ..... ***G. amphiantha***
1 Capsule turgid, longer than wide; leaves monomorphic; [collectively of many habitats and widespread].
  2 Flowers and fruits sessile or subsessile, the pedicels < 1 mm long; perennial.
    3 Leaves linear-subulate; corolla 2-3× as long as the calyx ..... ***[see Sophronanthe hispida]***
    3 Leaves ovate; corolla 1-1.5 × as long as the calyx ..... ***[see Sophronanthe pilosa]***
  2 Flowers and fruits on definite pedicels; annual or perennial.
    4 Leaves clasping or subclasping-rounded at the base; perennial; [section *Gratiola*].
      5 Calyx subtended by 0 (-1) bractlet; corolla lobes white; corolla tube greenish yellow, conspicuously veined ..... ***G. ramosa***
      5 Calyx subtended by 2 bractlets; corolla lobes white or yellow-orange; corolla tube greenish yellow and conspicuously veined, or orange and not conspicuously veined.
        6 Corolla lobes and tube yellow-orange (very rarely white), not conspicuously veined; sepals and flower stalks sparsely or not at all glandular-puberulent ..... ***G. aurea***
        6 Corolla lobes white to lavender, corolla tube greenish yellow, usually conspicuously veined; sepals and flower stalks densely glandular-puberulent.

7 Leaves triangular to lanceolate, margins entire, or with a few teeth toward the tip; corolla veined with brown lines; sepals linear-lanceolate ..... ***G. brevifolia***
7 Leaves oblong-ovate to ovate (or linear-lanceolate in submersed forms), finely dentate; corolla veined with purple lines; sepals lanceolate to oblong-lanceolate ..... ***G. viscidula***
4 Leaves cuneate at the base; annual; [section *Nibora*].
8 Pedicels stout, erect, 1-5 (-12) mm long ..... ***G. virginiana***
8 Pedicels slender, spreading, 10-45 mm long.
9 Corolla 13-25 mm long; leaves oval or oblanceolate ..... ***G. floridana***
9 Corolla 5-14 mm long; leaves elliptic, rhombic-lanceolate, or lanceolate
10 Mid-stem leaves (6-) 7-13 (-18) mm long; proximal fruiting pedicels (5-) 7-17 (-22) mm long, (0.9-) 1-2 (-2.3) × as long as the subtending bracteal leaves; bracteoles shorter than to barely exceeding the sepals; [of granite outcrops in the GA Piedmont] ..... ***G. graniticola***
10 Mid-stem leaves (11-) 20-41 -66) mm long; proximal fruiting pedicels (8-) 13-25 (-37) mm long, (0.3-) 0.5-1 (-1.6) × as long as the subtending bracteal leaves; bracteoles slightly to conspicuously longer than the sepals; [collectively of more habitats and more widespread].
11 Leaves narrowly elliptic or rhombic to oblanceolate, not conspicuously falcate, (2.7-) 5-11 (-18) mm wide, (2.5-) 3.5-5 (-6)× as long as wide; leaf margins with (1-) 3-5 (-7) teeth per side; primary veins 3-5 (-7); mid-stem moderately to densely glandular pubescent (rarely glabrate); seeds (0.18-) 0.22-0.26 (-0.29) mm thick; [widespread] ..... ***G. neglecta***
11 Leaves linear, linear-lanceolate, to elliptic-lanceolate, often falcate, (1-) 2.5-4 (-4.5) mm wide, (5.5-) 6-9.5 (-11)× as long as wide; leaf margins with 0-2 (-3) teeth per side; primary veins 1 (-3); mid-stem glabrous; seeds (0.19-) 0.26-0.32 (-0.37) mm thick; [limestone cedar glades of n. AL and c. TN] ..... ***G. quartermaniae***

Gratiola amphiantha D. Estes & R.L. Small, Pool-sprite, Snorkelwort. Pd (GA, SC): vernal pools on granitic flatrocks; rare. April. Endemic to granitic flatrocks of ec. AL, nc. GA (17 counties), and sc. SC. Hilton & Boyd (1996) and Patrick, Allison, & Krakow (1995) discuss the ecology and population ecology of this remarkable plant in detail. [= Y; = *Amphianthus pusillus* Torrey – RAB, GW, K, P, S]

Gratiola aurea Pursh, Yellow Hedge-hyssop, Golden-pert. Cp (DE, FL, GA, NC, SC): blackwater river banks, pondcypress savannas in Carolina bays, other acidic wetlands; uncommon (rare in FL). May-September. NL (Newfoundland) and QC south in the Coastal Plain to Panhandle FL; disjunct around the Great Lakes and inland in NY, ON, IL, and ND. [= RAB, C, F, G, GW, K, S, WH; > *G. lutea* Rafinesque var. *typica* – P; > *G. lutea* var. *obtusa* (Pennell) Pennell – P]

Gratiola brevifolia Rafinesque. Cp (DE, FL, GA): wet places; uncommon (rare in DE and FL). E. GA, south and west to c. peninsular FL, e. Panhandle FL, and se. AL; c. AR, se. OK, se. LA, and e. TX; c. TN; s. DE (Knapp & Estes 2006). Previous reports from SC are based on misidentifications (Knapp & Estes 2006). [= GW, K, P, S, WH]

Gratiola floridana Nuttall. Cp (FL, GA), Mt (GA), Pd (GA): stream banks, spring runs, blackwater swamps; uncommon. Ne. GA and se. TN (in counties adjacent to NC) (Chester, Wofford, & Kral 1997), south to e. GA (in counties adjacent to SC) (Jones & Coile 1988), ne. FL, Panhandle FL, AL, and MS. [= GW, K, P, S, WH]

Gratiola graniticola D. Estes, Granite Hedge-hyssop. Pd (GA, SC): granitic flatrocks; rare. April-May. Endemic to granitic flatrocks of GA and SC (Estes & Small 2007, 2008; Brunton 2009). [= Z; < *G. neglecta* – RAB, GW, K, P, S]

Gratiola neglecta Torrey, Mud-hyssop. Cp (DE, NC, SC, VA), Pd (DE, GA, NC, SC, VA), Mt (GA, NC, SC, VA, WV): ditches, wet areas, bottomlands; common. March-October. QC and ME west to BC, south to c. GA, e. TX, AZ, and CA. [= Z; < *G. neglecta* - RAB, C, G, GW, K, P, S, W, WV; < *G. neglecta* var. *neglecta* – F]

Gratiola quartermaniae D. Estes, Limestone Hedge-hyssop, Quarterman's Hedge-hyssop. Ip (TN): limestone glades; rare. April-early June. C. TN south to n. AL; c. TX (Edwards Plateau); s. ON; ne. IL. [= Z; < *G. neglecta* – C, G, GW, K, P, S, W; < *G. neglecta* var. *neglecta* – F]

Gratiola ramosa Walter. Cp (FL, GA, NC, SC, VA): wet pine savannas, marshes, pond margins; ditches; common (rare in VA). May-June. Se. NC south to s. FL, west to sw. LA; disjunct in se. VA (Greensville County) and (at least historically) in e. MD. [= RAB, C, F, G, GW, K, P, S, WH]

Gratiola virginiana Linnaeus, Virginia Hedge-hyssop. Cp (DE, FL, GA, NC, SC, VA), Pd (GA, NC, SC, VA), Mt (GA, WV): sluggish streams, bogs, wet areas; common (uncommon in WV). March-May. NJ west to OH and IA and KS, south to c. peninsular FL and e. TX. Var. *aestuariorum* Pennell, of s. NJ south to e. VA, is alleged to differ in being shorter, with more rounded leaves, short pedicels (< 2 mm long), a shorter calyx and corolla, and a smaller capsule; it is likely merely a stunted aquatic form, but needs additional study (see F and P for additional details). [= RAB, C, G, GW, S, W, WH, WV; > *G. virginiana* var. *virginiana* – F, K, P; > *G. virginiana* var. *aestuariorum* Pennell – F, K, P]

Gratiola viscidula Pennell, Viscid Hedge-hyssop. Cp (DE, FL, NC, SC, VA), Pd (NC, SC, VA), Mt (GA, NC, SC): bogs, wet areas, ditches, margins of Coastal Plain ponds; common (uncommon in Mountains, rare in DE and FL, rare in VA Piedmont). June-November. DE, MD and e. VA, south to c. SC and ne. GA; disjunct in s. OH, WV, e. TN, MO, and ne. FL. Spooner (1984) studied infraspecific taxa recognized in *G. viscidula* and determined that they did not warrant recognition. [= RAB, C, F, GW, K, S, W, WH; > *G. viscidula* var. *viscidula* – G; > *G. viscidula* var. *shortii* Pennell – G, P; > *G. viscidula* var. *typica* – P]

Kickxia Dumortier 1827 (Fluellen, Cancerwort)

A genus of about 47 species, herbs, of Mediterranean Europe west to c. Asia. References: Sutton (1988)=Z; Pennell (1935)=P.

1 Leaves round-ovate, rounded to cordate at the base; pedicels villous throughout their length; [ballast waif] ..... ***K. spuria***
1 Leaves triangular-ovate or hastate, truncate at the base; pedicels glabrous through much of their length **or** villous; [more widespread alien].

2 Stems densely villous; stems robust (usually 1.5-3.5 mm thick), often much-branched; pedicels 5-12 (-20) mm long, 0.25-0.35 mm in diameter, often villous their entire lengths ..... ***K. elatine ssp. crinita***
2 Stems sparsely villous; stems slender (to 1.5 mm thick), sparingly (if at all) branched, pedicels mostly (8-) 15-25 (-30) mm long, 0.1-0.2 mm in diameter, glabrous except for immediately below the calyx ..... ***K. elatine*** *ssp.* ***elatine***

* ***Kickxia elatine*** (Linnaeus) Dumortier *ssp.* ***crinita*** (Mabille) W. Greuter, Sharp-leaved Fluellen. Pd (NC, VA), Cp (VA), {GA?}: disturbed areas; uncommon, native of Eurasia. May-November. [= Z; < *K. elatine* – RAB, C, F, G, K, P, S]
* ***Kickxia elatine*** (Linnaeus) Dumortier *ssp.* ***elatine***, Sharp-leaved Fluellen. Pd (NC, SC, VA), Mt (NC, VA, WV), Cp (VA), {GA?}: disturbed areas; uncommon, native of Eurasia. May-November. [= Z; < *K. elatine* – RAB, C, F, G, K, P, S, WV]
* ***Kickxia spuria*** (Linnaeus) Dumortier, Round-leaved Fluellen, Female Fluellen. Cp (FL, NC): ballast near old port (Wilmington, New Hanover County, NC), other disturbed sites; rare, perhaps onlya waif, native of s. Europe. July. [= RAB, C, F, G, K, P, S, WH; > *K. spuria* ssp. *spuria* – Z]

Leucospora Nuttall 1834 (Leucospora)

A genus of 2 species, herbs, of e. North America and Coahuila, Mexico. *Leucospora* may not be distinct from *Stemodia*. References: Pennell (1935)=P.

Leucospora multifida (Michaux) Nuttall, Leucospora, Narrowleaf Paleseed. Cp* (FL*, NC*), Pd (VA*), Mt (GA, WV): moist to wet, sandy margins of artificial ponds, drawdown areas on riverbanks, drawdown depressional wetlands, other seasonally ponded disturbed areas; rare, probably introduced in most of our area from c. United States. S. ON west to IA and KS, south to nw. GA, AL, LA, and e. TX; scattered occurrences further east (as in e. NC, FL, KY, TN, VA, and se. PA) may be recent introductions. [= C, G, GW, K, P, S; = *Conobea multifida* (Michaux) Bentham – F, WH; = *Stemodia multifida* (Michaux) Sprengel]

Limnophila R. Brown 1810 (Marshweed)

A genus of about 37 species, of tropical regions of the Old World.

* ***Limnophila sessiliflora*** (Vahl) Blume, Asian Marshweed. Cp (FL, GA): ponds, ditches, lakes; rare, native of Old World tropics. Reported as introduced in sw. GA (Jones & Coile 1988). [= GW, K, WH]

Limosella Linnaeus 1753 (Mudwort, Awl-leaf)

A genus of about 11 species, aquatic herbs, of cosmopolitan distribution. References: Pennell (1935)=P.

Limosella australis R. Brown, Mudwort, Awl-leaf. Cp (DE, NC, VA): fresh or slightly brackish tidal flats; rare. June. NL (Newfoundland) and QC south along the Atlantic Coast to se. VA and extreme ne. NC. This plant is very inconspicuous, though locally abundant. [= K; ? *L. subulata* Ives – RAB, C, F, G, GW, P]

Linaria P. Miller 1754 (Yellow-toadflax)

A genus of about 150 species, of temperate regions of Eurasia. References: Sutton (1988)=Z; Pennell (1935)=P. [also see *Nuttallanthus*]

* ***Linaria vulgaris*** P. Miller, Butter-and-eggs, Yellow Toadflax, Wild-snapdragon. Mt (GA, NC, SC, VA, WV), Pd (DE, GA, NC, VA), Cp (DE, GA, NC, VA): fields, pastures, roadsides, disturbed areas; common (uncommon in Piedmont of GA and NC, rare in Coastal Plain of GA and NC), native of Europe. Reported for Coastal Plain of GA (Taylor County) by Carter, Baker, & Morris 2009). [= RAB, C, F, G, K, P, W, WV, Z; = *Linaria linaria* (Linnaeus) Karsten – S]

* ***Linaria maroccana*** Hooker f., Moroccan Toadflax. Mt (WV), Pd (VA): disturbed areas; rare, native of n. Africa. Introduced in VA (perhaps just a waif) and WV. [= K] {investigate; not yet keyed; synonymy incomplete}

Mecardonia Ruiz & Pavón 1794 (Mecardonia, Axil-flower)

A genus of about 10 species, of tropical, subtropical, and warm temperate regions of America. References: Pennell (1935)=P.

1 Corolla yellow; outer sepals broadly lanceolate to ovate, overlapping the shorter, much narrower inner sepals ..... ***M. procumbens***
1 Corolla white, with purple veins; sepals lanceolate nearly equal in length.
2 Peduncles > 10 mm long; sepals < 2 mm wide ..... ***M. acuminata*** *var.* ***acuminata***
2 Peduncles < 10 mm long; sepals > 2 mm wide ..... ***[M. acuminata*** *var.* ***microphylla]***

Mecardonia acuminata (Walter) Small *var.* ***acuminata***, Mecardonia, Common Axil-flower. Cp (DE, FL, GA, NC, SC, VA), Pd (GA, NC, SC, VA), Mt (GA): marshes, ditches, bottomland forests, wet disturbed areas; common (uncommon in DE, uncommon in Piedmont of VA). July-September; August-October. DE and MD south to n. peninsular FL, west to e. TX, north in the interior to KY, TN, and MO. The long, ascending pedicels are distinctive. The plant blackens on drying. [= K, S; < *M. acuminata* – RAB, C, G, GW; < *Bacopa acuminata* (Walter) B.L. Robinson – F; = *Pagesia acuminata* (Walter) Pennell ssp. *typica* – P; = *M. acuminata* ssp. *acuminata* – WH]

Mecardonia acuminata (Walter) Small *var.* ***microphylla*** (Rafinesque) Pennell, Pond Axil-flower. Cp (FL, GA): margins of Coastal Plain ponds; rare. Sc. GA south to Panhandle FL and west to e. LA. [= K, S; < *M. acuminata* – GW; = *Pagesia acuminata* (Walter) Pennell ssp. *microphylla* (Rafinesque) Pennell – P; = *M. acuminata* var. *microphyla* – WH (misspelling)]

Mecardonia procumbens (Miller) Small, Baby Jump-up. Cp (AL, FL, LA): ponds, streams, ditches; rare. June-September. [= K, WH; ? *M. vandelliodes* (Kunth) Pennell – GW, misspelled; = *Pagesia procumbens* (Miller) Pennell – P; > *M. procumbens* – S; > *M. tenuis* Small – S; ? *M. vandellioides* (Kunth) Pennell]

Misopates Rafinesque 1840 (Weasel's-snout)

A genus of about 8 species, herbs, of Mediterranean Europe and n. Africa west to c. Asia. References: Sutton (1988)=Z; Pennell (1935)=P.

* ***Misopates orontium*** (Linnaeus) Rafinesque, Weasel's-snout, Lesser Snapdragon. Pd (VA), Cp (FL): disturbed sites; rare, cultivated, persistent or possibly naturalized, native of Eurasia. Introduced at least far south as se. PA (Rhoads & Klein 1993), KY (Pennell 1935), and FL Panhandle (Hansen & Wunderlin 2008). [= K, WH; = *Antirrhinum orontium* Linnaeus – C, G, P, Z]

Nuttallanthus D.A. Sutton 1988 (American-toadflax)

A genus of 4 species, herbs, of North and South America. Sutton (1988) separates these three species, along with *N. subandinus* (Diels) D.A. Sutton, of Bolivia, Chile, Ecuador, Peru, and Uruguay, from *Linaria* on the basis of "the corolla with the abaxial lip greatly exceeding the adaxial lip; the palate weakly developed and scarcely occluding the tube; the spur very slender or absent and the prismatic seeds with 4-7 longitudinal ridges." *Nuttallanthus* is American; *Linaria* is Eurasian. References: Sutton (1988)=Z; Pennell (1935)=P. Key based on Z.

1 Infructescence axis zigzag; fruiting pedicels densely glandular pubescent, 5-13 mm long, 2× or more as long as the calyx ..... ***N. floridanus***
1 Infructescence axis straight or nearly so; fruiting pedicels glabrous or with a few scattered glandular hairs, 2-6 (-9) mm long, < 1× as long as the calyx.
  2 Corolla 8-11 (-13) mm long (measured from the tip of the spur to the apex of the adaxial lip), the abaxial lip 2-6 mm long; seeds longitudinally ridged, the intervening faces smooth or with sparse low tubercles ..... ***N. canadensis***
  2 Corolla 14-22 mm long (measured from the tip of the spur to the apex of the adaxial lip), the abaxial lip 6-11 mm long; seeds densely tuberculate, not longitudinally ridged ..... ***N. texanus***

Nuttallanthus canadensis (Linnaeus) D.A. Sutton, Common Toadflax. Cp (DE, FL, GA, NC, SC, VA), Pd (DE, GA, NC, SC, VA), Mt (GA, NC, SC, VA, WV): in a wide variety of natural and disturbed habitats, especially common and weedy in disturbed sites such as roadsides and fields, also common and apparently native in thin soil of rock outcrops; common (rare in WV, rare in Mountains of VA). March-May. NS west to ND, south to s. FL and TX; also adventive on the west coast, from WA to CA. Sutton (1988) comments that there is substantial variation in this species not taxonomically explained. [= K, Z; < *Linaria canadensis* (Linnaeus) Dumortier – RAB, W (also see *N. texanus*); = *Linaria canadensis* var. *canadensis* – C, F, G, S; = *Linaria canadensis* (Linnaeus) Dumortier – P, WH, WV]

Nuttallanthus floridanus (Chapman) D.A. Sutton, Florida Toadflax. Cp (FL, GA): sandhills, scrub, dunes, other dry, sandy places; uncommon. E. GA south to s. FL and west to s. MS. [= K, Z; = *Linaria floridana* Chapman – P, S, WH]

Nuttallanthus texanus (Scheele) D.A. Sutton, Texas Toadflax. Cp (FL, GA, NC*?, SC*, VA*?), Pd (NC*, SC): granite flatrocks, dry sandy soils, tdisturbed soils of roadsides and fields; uncommon, native of sc. United States, not clear how far east the original range extended. March-May. Ranging as a native species in sc. and sw. North America and in temperate South America; introduced elsewhere (as in most of our area, the exact limits unclear). [= K, Z; < *Linaria canadensis* (Linnaeus) Dumortier – RAB, W; = *Linaria canadensis* var. *texana* (Scheele) Pennell – C, F, G, S; = *Linaria texana* Scheele – P, WH]

Penstemon Mitchell 1769 (Beard-tongue, Penstemon)

A genus of about 250 species, perennial herbs and shrubs, of w. North America, e. North America, and (a single species) ne. Asia. References: Clements, Baskin, & Baskin (1998)=Z; Pennell (1935)=P. Key based in part on Z.

1 Cauline leaves bipinnatifid; basal leaves sessile; [endemic to GA]; [section *Dissecti*] ..... ***P. dissectus***
1 Cauline leaves entire or toothed; basal leaves petioled; [collectively widespread].
  2 Inflorescence with many nodes; anther cells dehiscing by short proximal slits; [s. GA south to s. FL]; [section *Multiflori*] ..... ***P. multiflorus***
  2 Inflorescence with <10 nodes; anther cells dehiscing their entire length; [collectively widespread].
    3 Corolla glandular-pubescent within; [section *Tubiflori*] ..... ***[P. tubiflorus]***
    3 Corolla pubescent with non-glandular hairs within; [section *Graciles*].

4 Lower lobes of the corolla essentially equaling the upper lobes; corolla throat with little ridging on its floor; sterile filament slightly to moderately bearded.
5 Anthers with short, stiff hairs; corolla white, lined with purple.
6 Stems pubescent; inflorescence glabrous or slightly glandular-pubescent; corolla 16-23 mm long ..... ***[P. alluviorum]***
6 Stems glabrous, shiny and slightly glaucous; inflorescence glandular-pubescent; corolla 23-30 mm long ..... ***P. digitalis***
5 Anthers glabrous; corolla purple to violet.
7 Sepals long-attenuate, to 12 mm long; leaves finely serrate; corolla 20-35 mm long ..... ***P. calycosus***
7 Sepals < 8 mm long; leaves obscurely serrate; corolla lobes strongly deflexed; corolla 15-22 mm long ..... ***P. laevigatus***
4 Lower lobes of the corolla projecting beyond the upper lobes; corolla throat strongly ridged on its floor; sterile filament densely bearded (only moderately bearded in *P. pallidus*).
8 Throat of corolla more-or-less closed by a palate formed by the upward arch of the corolla lip (opened only by the weight of the landing pollinator).
9 Buds yellow-purple; corolla violet-purple with white lobes (fading white when dried); leaves essentially glabrous ..... ***P. hirsutus***
9 Buds yellow; corolla creamy white; leaves pubescent ..... ***[P. tenuiflorus]***
8 Throat of corolla open.
10 Peduncles strongly ascending, the inflorescence therefore narrow; corolla reddish-purple ..... ***P. australis***
10 Peduncles spreading, the inflorescence therefore relatively broad; corolla white to violet or purple.
11 Leaves velvety pubescent; corolla white with fine purple lines ..... ***P. pallidus***
11 Leaves pubescent, but not velvety; corolla violet or purple.
12 Basal leaves truncate or cordate at base; lower bracts of inflorescence foliose, slightly smaller than the cauline leaves ..... ***P. smallii***
12 Basal leaves cuneate at base; lower bracts of inflorescence reduced, much smaller than the cauline leaves.
13 Cauline leaf blades wide, ovate-lanceolate to ovate ..... ***P. canescens***
13 Cauline leaf blades narrow, acute to acuminate ..... ***P. laxiflorus***

Penstemon australis Small, Southern Beardtongue, Sandhill Beardtongue. Cp (FL, GA, NC, SC, VA), Pd (GA, NC, SC, VA), Mt (GA, SC): sandhills, flatwoods, dry hammocks, dry sandy roadsides; common (rare in Piedmont of VA). May-July; July-August. Se. VA south to c. peninsular FL, west to s. and wc. AL, primarily on the Coastal Plain, but not uncommon westward into the Piedmont and lower Mountains, and extending in the interior into c. TN. [= K, P, S, Z; < *P. australis* – RAB, C, F, G, W, WH]

Penstemon calycosus Small. Mt (GA, NC, SC, VA): limestone ledges, other woodlands; rare. May-July. OH and s. MI and IL south to w. VA, GA, and AL. [= F, G, GW, K, P, S, W, Z; < *P. laevigatus* – C]

Penstemon canescens (Britton) Britton, Appalachian Beardtongue. Mt (GA, NC, SC, VA, WV), Pd (GA, NC, SC, VA), Cp (VA): woodlands, glades, forest edges, roadsides; common (uncommon in Coastal Plain of VA). May-July. PA and s. IN south to nc. GA, n. AL, and c. TN. [= RAB, C, K, W, Z; > *P. canescens* – F, G, S, WV; > *P. canescens* var. *typicus* – P; > *P. canescens* var. *brittonorum* (Pennell) Pennell – P; > *P. brittonorum* Pennell – S; > *P. brevisepalus* Pennell – F, G, P, S, WV]

*? ***Penstemon digitalis*** Nuttall ex Sims, Tall White Beardtongue. Mt (NC, SC, VA, WV), Pd (DE, VA), Cp (DE, VA): alluvial forests, moist fields, disturbed areas; common (rare in Coastal Plain of VA). May-June; July-August. NS and ME west to MN and SD, south to e. VA, w. SC, AL, and TX. [= RAB, C, F, G, GW, K, P, S, W, WV, Z]

Penstemon dissectus Elliott, Georgia Beardtongue, Grit Beardtongue. Cp (GA): Altamaha Grit outcrops, sandhills; rare. Endemic to Altamaha Grit outcrops and other sandy areas from e. GA south and west to sw. GA. This species is unmistakable because of its bipinnatifid leaves. [= K, P, S, Z]

Penstemon hirsutus (Linnaeus) Willdenow, Northeastern Beardtongue. Pd (DE, VA), Mt (VA, WV): dry woodlands, forests, and fields; uncommon (rare in DE). May-July. QC and ME west to MI and WI, south to n. VA and KY. [= C, F, G, K, P, S, W, WV, Z]

Penstemon laevigatus Aiton, Eastern Beardtongue. Cp (DE, FL, GA, NC, SC, VA), Pd (DE, GA, NC, SC, VA), Mt (GA, NC, SC, VA, WV): low meadows, bottomlands, forest edges, hammocks; common (rare in DE and FL). May-June; July-August. ME west to MI, south to s. GA, Panhandle FL, MS, and AR. [= RAB, F, G, GW, K, P, W, WH, WV, Z; < *P. laevigatus* – C (also see *P. calycosus*); = *P. pentstemon* (Linnaeus) MacMillan – S]

Penstemon laxiflorus Pennell. Cp (FL, GA): dry sandy areas; rare. C. GA, FL Panhandle, and n. AL west to c. OK and c. TX. [= K, P, S, Z; < *P. australis* – WH; = *P. australis* Small ssp. *laxiflorus* (Pennell) Bennett]

Penstemon multiflorus Chapman ex Bentham. Cp (FL, GA): sandhills, dry flatwoods; uncommon. S. and e. GA south to s. FL. [= K, P, S, WH, Z]

Penstemon pallidus Small, Eastern White Beardtongue. Cp (GA, NC, VA), Pd (GA, VA), Mt (GA, VA, WV): limestone and shale barrens, other dry, disturbed areas; uncommon (rare in GA). May-June. ME west to MN, south to NC, GA, and AR. [= RAB, C, F, G, K, P, S, W, Z]

Penstemon smallii A. Heller, Blue Ridge Beardtongue. Mt (GA, NC, SC): woodlands, cliffs, glades, roadbanks; common. May-June; July. A Southern Appalachian endemic, distributed from nw. NC and ne. TN south to nw. SC, n. GA, and n. AL. [= RAB, K, P, S, W, Z]

Penstemon alluviorum Pennell, Lowland Beardtongue. East to AL, TN, KY. [= C, F, G, K, P, S, Z]

Penstemon species 1. Of e. AL, with very small corollas and sharply dentate teeth. Under study by Dwayne Estes.

Penstemon tenuiflorus Pennell, Plateau Beardtongue, Limestone Beardtongue, Kentucky Beardtongue. Endemic to the Interior Low Plateau of wc. KY, c. TN, n. AL, extending slightly into the Coastal Plain to the west, and disjunct in the Black Belt of AL and MS. [= C, F, G, K, P, S, Z]

Penstemon tubiflorus Nuttall, Tube Beardtongue. A more western species, reaching its eastern limit in w. TN (Chester, Woffor, & Kral 1997). It is also known from adventive sites further east, as in e. PA (Rhoads & Klein 1993). [= S; = *P. tubaeflorus* – C, G, P, Z, orthographic

variant; > *P. tubaeflorus* var. *achoreus* Fernald – F; > *P. tubaeflorus* var. *tubaeflorus* – F; > *P. tubiflorus* var. *achoreus* Fernald – K; > *P. tubiflorus* var. *tubiflorus* – K]

Plantago Linnaeus 1753 (Plantain)

A genus of about 270 species, herbs and rarely shrubs, of cosmopolitan distribution. Harper (1944) discusses at length the interesting issue of the native distributions of the many weedy species of *Plantago*. The native or introduced status of many of our species is uncertain or controversial. References: Rosatti (1984)=Z; Bassett (1966)=Y; Bassett (1967)=X; Schwarzbach in Kadereit (2004).

1 Leaves cauline, opposite; spikes on peduncles from the leaf axils; [section *Psyllium*] ..... ***P. psyllium***
1 Leaves basal; spikes on scapes from the base of the plant.
2 Leaves ovate to broadly lanceolate or broadly oblanceolate, distinctly broadened upward from a petiolar base, the leaves > 1 cm wide (some species keyed both ways).
3 Leaf venation pinnate, some major veins departing from the midvein well above the leaf base; perennial from thick, fleshy rootstock, typically 3-8 cm wide near its summit, with a cavity below (like an inverted bowl), and with 3-10 fleshy roots 3-15 mm thick descending or spreading from the bowl rim; capsule 2-4-seeded; scapes hollow and terete; [aquatic or semi-aquatic]; [section *Palaeopsyllium*] ..... ***P. cordata***
3 Leaf venation parallel, with all of the major veins separating at the base of the leaf; **either** perennial from thin, fibrous roots or an erect caudex, **or** annual from a small taproot; capsule 2-30-seeded; scapes either solid and terete, solid and angled, or hollow and terete; [terrestrial].
4 Leaves broadly ovate-elliptic, the blades 1-3× as long as wide, distinctly petiolate; scapes solid and terete; [section *Plantago*].
5 Fruit 2.5-4 mm long, dehiscent near the middle, the terminal portion about as long as the basal; sepals broadly ovate, ca. 1.5× as long as wide, mostly obtuse; petioles usually green and pubescent at the base ..... ***P. major***
5 Fruit 4-6 mm long, dehiscent below the middle, the terminal portion about 2× as long as the basal; sepals narrowly elliptic, 2-4× as long as wide, mostly acute; petioles usually purple and glabrous at the base ..... ***P. rugelii***
4 Leaves mostly broadly oblanceolate, broadly lanceolate,or spatulate, (3-) 4-10× as long as wide, attenuate to the only somewhat petiolar base; scapes solid and 5-angled, or hollow (to solid) and terete.
6 Bracts and calyx pubescent, at least on the keels; ephemeral annual, flowering late March-June, and then senescing; [section *Virginica*]
7 Mature seeds 2.5-3 mm long, reddish, nearly flat oin both sides; sepals with an excurrent midrib; leaves typically toothed; [rare adventive in western part of our area] ..... ***P. rhodosperma***
7 Mature seeds tan or brown, 1.5-2 mm long, concave on one side, convex on the other; sepals obtuse to rounded; leaves entire; [common in our area] ..... ***P. virginica***
6 Bracts and calyx glabrous; perennial, flowering April-November.
8 Spikes very densely flowered, the rachis hidden; scape 5-angled; [widespread weedy alien]; [section *Lancifolia*]... ***P. lanceolata***
8 Spikes loosely flowered, the rachis visible its entire length; scape terete; [rare native of Coastal Plain pinelands and adjacent fire-plow lines and ditches]; [section *Palaeopsyllium*] ..... ***P. sparsiflora***
2 Leaves lanceolate or linear, slightly if at all broadened upward, the base not petiolar, the leaves typically < 1 cm wide.
9 Summer and winter leaves dimorphic, the winter leaves lanceolate (typically submersed), the summer leaves ovate or cordate (emersed except in floods); plant perennial from thick, fleshy rootstock, typically 3-8 cm wide near its summit, with a cavity below (like an inverted bowl), and with 3-10 fleshy roots 3-15 mm thick descending or spreading from the bowl rim; [aquatic or semi-aquatic]; [section *Palaeopsyllium*] ..... ***P. cordata***
9 Summer and winter leaves not dimorphic, all leaves lanceolate or linear; plant either perennial from thin, fibrous roots, or annual from a small taproot; [terrestrial].
10 Leaves fleshy; corolla tube pubescent on its outer surface; [of sea beaches] ..... ***P. maritima*** *var.* ***juncoides***
10 Leaves herbaceous (though often rather thick and leathery); corolla tube glabrous on its outer surface; [of various habitats, not as above].
11 Bracts of the inflorescence and sepals conspicuously pubescent; annual (rarely biennial), with a taproot; stamens 4.
12 Leaves oblanceolate; [section *Virginica*] ..... ***P. virginica***
12 Leaves linear; [section *Gnaphaloides*].
13 Bracts of the lower flowers in the spikes conspicuously exserted, at least 2 × as long as the subtended flower.
14 Leaves glabrous or puberulent above; longer bracts 8-30 mm long; seeds 2.2-3.0 mm long ..... ***P. aristata***
14 Leaves silky-pubescent above; longer bracts mostly < 5 mm long; seeds 1.3-1.9 mm long ..... ***P. patagonica***
13 Bracts of the lower flowers in the spikes not conspicuously exserted, < 2× as long as the subtended flower.
15 Bracts 1-2× as long as the the calyx; seeds 1.3-1.9 mm long ..... ***P. patagonica***
15 Bracts 0.5-1× as long as the calyx; seeds 2.7-3 mm long ..... ***P. wrightiana***
11 Bracts of the inflorescence glabrous or inconspicuously ciliate-margined; stamens 2 or 4; [annual or perennial].
16 Annual; flowers with 2 stamens; capsule 4-25-seeded; leaves linear, 0.5-5 mm wide; [section *Micropsyllium*].
17 Capsule mostly 10-25-seeded; seeds 0.5-0.8 mm long ..... ***P. heterophylla***
17 Capsule 4-seeded; seeds 0.75-1.8 mm long ..... ***P. pusilla***
16 Perennial; flowers with 4 stamens; capsule 1-2-seeded; leaves lanceolate (or broader), 7-50 mm wide.
18 Spikes very densely flowered, the rachis hidden; scape 5-angled; [widespread weedy alien]; [section *Lancifolia*] ..... ***P. lanceolata***
18 Spikes loosely flowered, the rachis visible its entire length; scape terete; [rare native of Coastal Plain pinelands and adjacent fire-plow lines, ditches, and mowed roadsides]; [section *Palaeopsyllium*] ..... ***P. sparsiflora***

* ***Plantago aristata*** Michaux, Buckhorn Plantain. Cp (DE, FL, GA, NC, SC, VA), Pd (GA, NC, SC, VA), Mt (GA, NC, SC, VA, WV): disturbed areas, especially dry, barren, exposed soil, such as clay soils denuded by bull-dozing; common (uncommon

in DE), introduced from farther west (though the original distribution is unclear, and the species is sometimes considered native in at least portions of our area). Late April-July. [= RAB, C, F, G, K, S, W, WH, WV, Z]

Plantago cordata Lamarck, King-root, Heartleaf Plantain. Pd (NC), Mt (GA, VA), Cp (VA): aquatic or semi-aquatic in streambeds with outcrops of slate, aquatic in tidal estuaries; rare. March-April; May-June. NY and s. ON west to WI, south to w. VA, c. NC, nw. GA, AL, sc. TN, and MO, very scattered and rare in every state in which it occurs, except MO. Characteristically, *P. cordata* is a very robust plant, the inflorescences often 1 meter in height, and the glabrous leaves with ovate blades to 30 cm long and 20 cm wide, on ascending petioles up to 40 cm long and 2 cm wide; Winter leaves are 3-10 cm long, ca. 1 cm wide, and remotely toothed. Spring leaves show a gradual transition from the winter form to the summer form. *P. cordata* is not known to be extant in VA, where it formerly occurred in the estuary of the Potomac River and in Smyth County in sw. VA. In NC, *P. cordata* is apparently limited to 2 slate-bottomed streams in s. Davidson County, where it is locally abundant. A recent study of morphological and genetic variability in the species found the 2 NC populations to "represent sites of primary [conservation] concern with unique genetic composition" (Mymudes & Les 1993). [= RAB, C, F, G, GW, K, S, W, X, Z]

Plantago heterophylla Nuttall, Many-seeded Plantain. Cp (DE*, FL, GA, NC, SC, VA), Pd (GA, NC, SC): fields, roadsides, disturbed areas; common (rare in DE and VA). March-May. Se. VA and MO south to Panhandle FL and TX; adventive at scattered sites further north (at least as far north as NY). [= RAB, C, F, G, K, S, W, WH, Y, Z; = *P. hybrida* W. Bart. – GW]

* ***Plantago lanceolata*** Linnaeus, English Plantain, Rib-grass. Cp (DE, FL, GA, NC, SC, VA), Pd (DE, GA, NC, SC, VA), Mt (GA, NC, SC, VA, WV): lawns, roadsides, disturbed areas; common, native of Europe. April-November. [= RAB, C, K, S, W, WH, WV, Z; > *P. lanceolata* var. *lanceolata* – F, G; > *P. lanceolata* var. *sphaerostachya* Mertens & Koch – F, G; > *P. lanceolata* var. *angustifolia* Poiret – G]

*? ***Plantago major*** Linnaeus, Common Plantain, Whiteman's-foot. Cp (DE, FL*, GA, NC, SC, VA), Pd (DE, GA, NC, VA), Mt (GA, NC, VA, WV): lawns, roadsides, disturbed areas; common (uncommon in FL, GA, NC, SC, VA, and WV), native of Europe, possibly also native in ne. North America, possibly as far south as the northern part of our area. June-November. Very variable, and possibly worthy of some of the infraspecific subdivisions suggested by various authors. The Coastal Plain populations associated with the Chesapeake Bay in VA may represent a native, estuarine genotype. [= RAB, C, GW, K, S, W, WH, WV, Z; > *P. major* var. *major* – F; > *P. major* var. *scopulorum* Fries & Broberg – F; > *P. major* ssp. *pleiosperma* Pilger var. *paludosa* Béguinot – G; > *P. major* ssp. *pleiosperma* Pilger var. *scopulorum* Fries & Broberg – G; > *P. major* var. *intermedia* (A.P. de Candolle) Pilger]

Plantago maritima Linnaeus *var.* ***juncoides*** (Lamarck) A. Gray, Seaside Plantain. Cp (VA): salt marshes; rare. Var. *juncoides* apparently ranges from Greenland and ne. Canada south to e. VA. Other varieties occur in nw. North America and n. Eurasia, the species as a whole is an interruptedly circumboreal plant of ocean shores, also disjunct inland in saline areas. [= K; = *P. maritima* ssp. *juncoides* (Lamarck) Hultén – C; > *P. juncoides* Lamarck var. *decipiens* (Barnéoud) Fernald – F; < *P. maritima* – G]

* ***Plantago patagonica*** Jacquin, Woolly Plantain. Pd (GA, SC), Cp (GA, VA), Mt (WV): roadsides; rare. United States and s. South America. May-June. [= K, Z; > *P. purshii* Roemer & Schultes – RAB, F; > *P. patagonica* var. *patagonica* – C, G; > *P. patagonica* var. *gnaphaloides* (Nuttall) A. Gray – C, G]

* ***Plantago psyllium*** Linnaeus, Leafy-stemmed Plantain. Cp (DE, NC, VA), Mt (NC, VA, WV): disturbed areas; rare, introduced from Europe. June-November. [= C, K, Z; = *P. psillium* – RAB, orthographic variant; > *P. indica* Linnaeus – F, G; *? P. arenaria* Waldstein & Kitaibel]

* ***Plantago pusilla*** Nuttall, Little Plantain. Cp (DE, FL, NC), Pd (DE, VA) {GA, SC}: roadsides, disturbed areas; common (uncommon in FL, GA, NC, SC, VA), probably native of sc. United States (the original range uncertain). March-May. Belden et al. (2004) discuss the Virginia occurrence, on Fort Pickett Military Reservation, Nottoway County. [= C, K, S, WH, Y, Z; > *P. pusilla* var. *pusilla* – F, G; > *P. pusilla* var. *major* Engelmann – F, G; = *P. elongata* Pursh – GW]

* ***Plantago rhodosperma*** Decaisne, Redseed Plantain, reported as ranging east to KY, TN, and GA (Kartesz 1999), probably as adventive from further west. The reports for GA and TN require confirmation. [= C, F, G, K]

Plantago rugelii Decaisne, American Plantain, Broad-leaved Plantain, Blackseed Plantain. Cp (DE, FL, GA, NC, SC, VA), Pd (DE, GA, NC, SC, VA), Mt (GA, NC, SC, VA, WV): roadsides, lawns, disturbed areas; common. June-November. Widespread in e. and c. North America, the original distribution obscure. [= RAB, C, F, G, GW, S, W, WH, WV, Z; > *P. rugelii* var. *rugelii* – K; > *P. rugelii* var. *asperula* Farwell – K]

Plantago sparsiflora Michaux, Pineland Plantain. Cp (FL, GA, NC, SC): wet savannas over calcareous substrates (coquina limestone), now usually found in moister human-created microhabitats adjacent to these sites, such as fire-plow lines, shallow ditches along roadsides, or mowed powerline rights-of-way; rare. April-October. Se. NC south to ne. FL, restricted to the Coastal Plain. Harper (1944), with his usual keen understanding of the ecology of southeastern plants, has provided the most succinct and accurate description of the habitat of this plant: "flattish pine-barrens where there is evidently some calcareous material not far from the surface." Reports of this species for VA are in error. [= RAB, GW, K, S, WH, X, Z]

Plantago virginica Linnaeus, Virginia Plantain. Cp (DE, FL, GA, NC, SC, VA), Pd (DE, GA, NC, SC, VA), Mt (GA, NC, SC, VA, WV): roadsides, lawns, disturbed areas; common. Late March-June. MA and NY west to SD, south to s. FL and TX. [= RAB, C, G, K, S, W, WH, WV, Z; > *P. virginica* var. *virginica* – F; > *P. virginica* var. *viridescens* Fernald – F]

Plantago wrightiana Decaisne, Wright's Plantain. Cp (FL, GA, NC, SC), Pd (GA, NC, SC, VA): roadsides, lawns, disturbed areas; common (uncommon in NC). Late April-July. VA, NC, OK, and AZ south to c. peninsular FL, MS, TX, and Mexico, the original distribution unclear. [= K, WH, Z; = *P. hookeriana* Fischer & C.A. Meyer var. *nuda* (A. Gray) Poe – RAB, W]

* ***Plantago floccosa*** Decaisne. Cp (FL): disturbed areas; rare, native of {}. Panhandle FL. [= WH] {not yet keyed; add to synonymy}

Scoparia Linnaeus 1753 (Goat-weed, Sweet-broom)

A genus of about 20 species, herbs, of tropical and subtropical America. References: Pennell (1935)=P.

1 Corolla white; sepals 4, ovate; stem 3-8 dm tall; annual ..... ***S. dulcis***
1 Corolla yellow; sepals 5, lanceolate; stem 1-1.5 d tall; perennial ..... ***S. montevidensis*** *var.* ***glandulifera***

Scoparia dulcis Linnaeus, Goat-weed, Sweet-broom, Licorice-weed. Cp (FL, GA, SC): marshes, wet hammocks, flatwoods, disturbed places; common (uncommon in GA and SC), rather weedy and the original distribution unclear. May-October (or all year southwards). [= RAB, GW, K, P, S, WH]

* ***Scoparia montevidensis*** (Sprengel) R.E. Fries *var.* ***glandulifera*** (Fritsch) R.E. Fries. Cp (FL, NC): on ballast, other disturbed areas; rare, native of South America. [= K, P, WH]

Sophronanthe Bentham 1836

A genus of 2 species, herbs, of southeastern North America. The two taxa included here are not part of *Gratiola*. References: Pennell (1935)=P.

1 Leaves linear-subulate; corolla 2-3× as long as the calyx ..... ***S. hispida***
1 Leaves ovate; corolla 1-1.5 × as long as the calyx ..... ***S. pilosa***

Sophronanthe hispida Bentham ex Lindley, Pineland Hedge-hyssop. Cp (FL, GA): dry pinelands, dunes; common (uncommon in GA). E. GA (within a few counties of SC) south to s. FL, and west to MS. [= P, S; = *Gratiola hispida* (Bentham ex Lindley) Pollard – GW, K, WH]

Sophronanthe pilosa (Michaux) Small, Shaggy Hedge-hyssop. Cp (DE, FL, GA, NC, SC, VA), Pd (GA, NC, SC, VA), Mt (GA, NC, SC): marshes, wet areas, wet pine savannas; common (rare in Mountains). June-September. NJ south to s. FL, west to e. TX, northward in the interior to KY, TN, AR, and e. OK. [= *Gratiola pilosa* Michaux= RAB, C, F, G, GW, K, W, WH; > *Tragiola pilosa* (Michaux) Small & Pennell var. *typica* – P; = *Tragiola pilosa* (Michaux) Small & Pennell – S]

Veronica Linnaeus 1753 (Speedwell)

A genus of about 180 species, herbs, nearly cosmopolitan (at least now), most diverse in Europe. The genus appears to be paraphyletic as currently circumscribed (Albach & Chase 2001). References: Walters & Webb (1972)=Z; Crow & Hellquist (2000)=Y; Pennell (1935)=P. Key partly based on C.

1 Flowers in axillary racemes; upper bracteal leaves opposite throughout.
  2 Leaves and stems pubescent; [plants of mesic to dry habitats]; [section *Veronica*].
    3 Leaves cuneate at the base; leaves widest at the middle or beyond; pedicels shorter than the subtending bracts ..... ***V. officinalis***
    3 Leaves cordate, truncate or rounded at the base; leaves widest towards the base; pedicels equaling or longer than the subtending bracts.
      4 Stem pubescence generally distributed; calyx shorter than the capsule; style 6-8 mm long; stems erect .... ***[V. austriaca*** *ssp.* ***teucrium]***
      4 Stem pubescence restricted to 2 lines; calyx longer than the capsule; style 3-5 mm long; stems creeping or ascending ..... ***V. chamaedrys***
  2 Leaves and stems glabrous, or with fine glandular hairs in the inflorescence only; [plants of wetlands].
    5 Leaves (even the upper) short-petiolate; [section *Beccabunga*].
      6 Leaves broadest towards the base, acute at the tip; style 2.5-3.5 mm long ..... ***V. americana***
      6 Leaves broadest near or above the middle, rounded at the tip; style 1.8-2.2 mm long ..... ***V. beccabunga***
    5 Leaves (at least the middle and upper) sessile.
      7 Capsule flattened, conspicuously notched at the style and therefore appearing 2-lobed, wider than long; seeds 1.2-1.8 mm long; leaves (3-) 4-20× as long as wide; < 1 cm wide, tapering to the base and not clasping; [section *Veronica*]..... ***V. scutellata***
      7 Capsule turgid, slightly or not notched at the style, about as long as wide; seeds <0.5 mm long; leaves 1.5-5 (-8)× as long as wide, mostly > 1 cm wide, clasping at the base; [section *Beccabunga*].
        8 Racemes 20-65-flowered; pedicels 4-8 mm long; capsule ovoid to globose, not notched or barely so..... ***V. anagallis-aquatica***
        8 Racemes 5-25 (-35)-flowered; pedicels 3-6 mm long; capsule broadly obcordate, distinctly though slightly notched at the style..... ***[V. catenata]***
1 Flowers in terminal racemes or solitary and axillary, subtended by normally-sized leaves; upper bracteal leaves often alternate.
  9 Bracts abruptly smaller than the foliage leaves, the flowers thus in well-developed terminal racemes or spikes; perennials from rhizomes.
    10 Stems 3-10 dm tall; flowers in a crowded terminal spike; larger leaves > 4 cm long, sharply serrate; [section *Pseudolysimachium*] ..... ***V. longifolia***
    10 Stems 1-3 dm tall; flowers in loose racemes; larger leaves < 2.5 cm long, entire to weakly toothed; [section *Veronicastrum*].
      11 Flowers bright blue; pedicels with some longer gland-tipped hairs; flowers usually < 12 per raceme ... ***[V. serpyllifolia*** *var.* ***humifusa]***
      11 Flowers pale blue with darker blue lines; pedicels puberulent; flowers usually > 12 per raceme ..... ***V. serpyllifolia*** *var.* ***serpyllifolia***
  9 Bracts gradually reduced in size upwards, all of the flowers or at least those lower on the stem axillary in the axils of well-developed foliage leaves; annuals (except *V. filiformis*); [section *Pocilla*].
    12 Pedicels 0-2 mm long; flowers in the axils of bracts, all or at least the upper of which are very different than foliage leaves.
      13 Leaves 3-10× as long as wide, toothed or entire; flowers white or very pale, ca. 2 mm across; stems usually glabrous (except *V. peregrina* var. *xalapensis*).
        14 Stem glabrous; sepals and fruit glabrous ..... ***V. peregrina*** *var.* ***peregrina***
        14 Stem pubescent with short, gland-tipped hairs; sepals and fruit glabrous or pubescent with short, gland-tipped hairs ..... ***V. peregrina*** *var.* ***xalapensis***

13 Leaves 1-2× as long as wide, palmately lobed or toothed; flowers blue, 2-4 mm across; stems pubescent.
15 Upper leaves and lower bracts trilobed, the lobes cut > ½ way to base ..... ***V. triphyllos***
15 Leaves unlobed (though crenate-serrate).
16 Style 0.4-1.0 mm long ..... ***V. arvensis***
16 Style ca. 1.5 mm long ..... ***V. dillenii***
12 Pedicels 5-40 mm long; flowers in the axils of leaves similar in shape and size to foliage leaves (though the upper are sometimes somewhat smaller).
17 Perennial, the stems rooting at the nodes the length of the stem; pedicels > 2× as long as the the leaves ..... ***V. filiformis***
17 Annual, the stems not rooting at the nodes (or at most only at the base of the plant); pedicels < 2× as long as the the leaves.
18 Calyx lobes cordate at the base; leaves with 3-7 teeth or shallow lobes ..... ***V. hederifolia***
18 Calyx lobes cuneate to rounded at the base; leaves with usually > 7 small teeth or crenations.
19 Lobes of the capsule with apices diverging at ca. 90 degrees; corolla > 8 mm wide ..... ***V. persica***
19 Lobes of the capsule with apices parallel or diverging at an acute angle; corolla < 8 mm wide.
20 Capsule with all hairs straight and gland-tipped; corolla white to pale blue or violet ..... ***V. agrestis***
20 Capsule with a mixture of short, arching, non-glandular hairs and longer, straight, gland-tipped hairs; corolla bright blue ..... ***V. polita***

* ***Veronica agrestis*** Linnaeus, Field Speedwell. Pd (DE, GA, NC), Cp (DE, FL), Mt (GA), {VA, WV}: lawns and disturbed areas; common (rare in FL, GA, NC, and VA), native of Eurasia. [= C, F, G, K, P, WH, Z; < *V. agrestis* – RAB, G; < *V. polita* – WV]

Veronica americana Schweinitz ex Bentham, American Speedwell, Brooklime. Mt (NC, VA, WV), Pd (DE, VA), {SC}: bogs, marshes, streamsides; uncommon (rare in DE, NC, and SC). May-June; July. NL (Newfoundland) west to AK, south to NC, TN, TX, and CA; ne. Asia. [= RAB, C, F, G, K, P, S, W, WV, Y]

Veronica anagallis-aquatica Linnaeus, Water Speedwell. Mt (NC, VA, WV), Cp (DE, NC, VA), Pd (DE, VA): bogs, marshes, streamsides, ditches; uncommon (rare in NC). May-June; July. Circumboreal, south in North America to c. peninsular FL, TX, and CA; some occurrences probably represent introductions of European material. Some authors interpret *V. anagallis-aquatica* as being non-native in North America. [= C, F, G, P, WH, WV, Y; < *V. anagallis-aquatica* – RAB, C, K, W, Z]

* ***Veronica arvensis*** Linnaeus, Corn Speedwell, Wall Speedwell. Mt (GA, NC, SC, VA, WV), Pd (DE, GA, NC, SC, VA), Cp (DE, FL, GA, NC, SC, VA): fields, roadsides, disturbed areas; common, native of Eurasia. March-June. [= RAB, C, F, G, K, P, S, W, WH, WV, Z]

* ***Veronica beccabunga*** Linnaeus, European Brooklime. Mt (VA?, WV): wet places; rare, native of Europe. South to MD, WV, and perhaps VA. [= C, F, G, K, P, WV, Y, Z]

* ***Veronica chamaedrys*** Linnaeus, Germander Speedwell. Mt (NC, WV), Pd (VA): golf courses, lawns; rare, native of Eurasia. May. [= RAB, C, F, G, K, P, WV; ? *V. chamaedrys* ssp. *chamaedrys* – Z]

* ***Veronica dillenii*** Crantz, Dillenius's Speedwell. Mt (VA): disturbed areas; rare, native of Europe. [= C, G, K, P, Z; < *V. verna* Linnaeus – F]

* ***Veronica filiformis*** J.E. Smith, Creeping Speedwell. Mt (WV): lawns, disturbed areas; rare, native of Eurasia. May-August. In WV, MD, and scattered in PA (Rhoads & Klein 1993). [= C, F, G, K, P, WV, Z]

* ***Veronica hederifolia*** Linnaeus, Ivyleaf Speedwell. Pd (DE, GA, NC, SC, VA), Cp (DE, FL, NC, SC, VA), Mt (NC, VA, WV): lawns, fields, disturbed areas; common (rare in FL and WV, uncommon in Mountains of VA), native of Europe. March-May. [= K, W; = *V. hederaefolia* – RAB, C, F, G, P, S, WV, orthographic variant; ? *V. hederifolia* ssp. *hederifolia* –Z]

* ***Veronica longifolia*** Linnaeus, Garden Speedwell, Longleaf Speedwell. Mt (WV): disturbed areas; rare, native of Europe. In WV, scattered in PA (Rhoads & Klein 1993), KY, and in MD (F). [= C, F, G, K, P, WV, Z]

*? ***Veronica officinalis*** Linnaeus, Common Speedwell, Gypsyweed, Heath Speedwell. Mt (GA, NC, VA, WV), Pd (DE, NC, VA), Cp (DE, NC, SC, VA): fields and forests; common, often interpreted as being of mixed native and alien background. May-August. [= RAB, C, G, P, S, W, WV, Z; > *V. officinalis* var. *officinalis* – F, K; > *V. officinalis* var. *tournefortii* (Vill.) Reichenbach – F, K]

Veronica peregrina Linnaeus *var.* ***peregrina***, Common Purslane Speedwell. Mt (GA, NC, SC, VA, WV), Pd (DE, GA, NC, SC, VA), Cp (DE, GA, NC, SC, VA): fields, roadsides, disturbed areas; common. April-May. NS and ND south to FL and TX; AK south to OR (perhaps only as an introduction?); South America. [= C, F, G, S, WV; = *V. peregrina* ssp. *peregrina* – K; < *V. peregrina* – RAB, W, Z; = *V. peregrina* var. *typica* – P; ? *V. peregrina* – WH]

* ***Veronica peregrina*** Linnaeus *var.* ***xalapensis*** (Kunth) Pennell, Western Purslane Speedwell. Cp (GA), {NC?, SC?}: fields, lawns, disturbed places; rare, probably introduced in our area on ballast. April-May. QC and AK south to MA, KY, TX, and south to Guatemala. [= C, F, G, P, S; = *V. peregrina* ssp. *xalapensis* (Kunth) Pennell – K; < *V. peregrina* – RAB, W, Z]

* ***Veronica persica*** Poiret, Bird's-eye Speedwell. Cp (DE, FL, NC, SC, VA), Pd (DE, GA, NC, SC, VA), Mt (GA, NC, VA, WV): lawns, fields, roadsides, disturbed areas; common (uncommon in WV, rare in FL), native of Eurasia. March-June. [= RAB, C, F, G, K, P, S, W, WV, Z]

* ***Veronica polita*** Fries. Pd (DE, NC, VA), Mt (VA), Cp (FL, VA), {WV}: lawns, waste areas; rare, native of Eurasia. March-April. This species is introduced in c. TN (Chester, Wofford, & Kral 1997), WV, and s. PA (Rhoads & Klein 1993), FL (Pennell 1935; Kunzer et al. 2009), NC, and VA (Kartesz 1999). It is similar to *V. agrestis* and has been much confused with it. [= C, F, K, S, WH, Z; < *V. agrestis* – RAB, G; ? *V. didyma* Tenore – P, misapplied; < *V. polita* – WV]

Veronica scutellata Linnaeus, Narrowleaf Speedwell. Mt (VA, WV), {NC?}: marshes, swamps; rare. May-September. Circumboreal, south in North America to w. VA, NC?, TN, and CA. In ne. TN (Chester, Wofford, & Kral 1997). [= C, G, K, P, W, WV, Y, Z; ? *V. scutellata* var. *scutellata* – F]

* ***Veronica serpyllifolia*** Linnaeus *var.* ***serpyllifolia***, Thymeleaf Speedwell. Mt (GA, NC, SC, VA, WV), Pd (DE, GA, NC, SC, VA), Cp (DE, GA, NC, SC, VA): meadows, lawns, roadsides, other disturbed areas; common (rare in Coastal Plain of GA, NC, and SC), native of Eurasia. April-June. [= C, G; = *V. serpyllifolia* ssp. *serpyllifolia* – K, Z; < *V. serpyllifolia* – RAB, F, S, W, WV; = *V. serpyllifolia* – P]

* ***Veronica triphyllos*** Linnaeus. Pd (NC, SC): cultivated fields; rare, native of Eurasia. April. [= RAB, K, P]

* *Veronica austriaca* Linnaeus ssp. *teucrium* (Linnaeus) D.A. Webb. Native of Eurasia, is naturalized at scattered locations in PA (Rhoads & Klein 1993) and MD (Kartesz 1999). [= K, Z; = *V. teucrium* Linnaeus – C; = *V. latifolia* Linnaeus – F, G, P, nomen ambiguum, perhaps misapplied]

Veronica catenata Pennell. Streams and wetlands. Circumboreal, the southern limits obscure because of taxonomic confusion, misidentifications, and misattributions. [= C, Y; < *V. anagallis-aquatica* Linnaeus – K, W, Z; > *V. comosa* Richter – F; > *V. salina* Schur – G; > *V. connata* Rafinesque var. *typica* – P; > *V. glandifera* Pennell – P, S; > *V. catenata* Pennell – P, Z]

*? *Veronica serpyllifolia* Linnaeus var. *humifusa* (Dickson) Vahl. May range south to MD (Pennell 1935, Kartesz 1999). It is native in n. North America. April-June. [= C, G; < *V. serpyllifolia* – F; = *V. serpyllifolia* ssp. *humifusa* (Dickson) Syme – K, Z; = *V. humifusa* Dickson – P]

Veronicastrum Heister ex Fabricius 1759 (Culver's-root)

A genus of 2 species, herbs, of e. North America and e. Asia. References: Pennell (1935)=P.

Veronicastrum virginicum (Linnaeus) Farwell, Culver's-root. Mt (GA, NC, VA, WV), Pd (DE, GA, NC, SC, VA), Cp (DE, FL, VA): streambanks, bogs, wet meadows, dryish soils in areas with prairie affinities; uncommon (rare in Coastal Plain). July-August. VT west to MB, south to nc. and nw. GA, w. FL Panhandle (Escambia County), and LA. Populations seem to be of somewhat sporadic or irregular appearance from year to year. [= RAB, C, F, G, GW, K, P, S, W, WH, WV]

369. SCROPHULARIACEAE A.L. de Jussieu 1789 (Snapdragon Family) [in LAMIALES]

There is increasing evidence that the Scrophulariaceae as traditionally constituted includes two main and quite distinct groups (Olmstead & Reeves 1995; Young, Steiner, & dePamphilis 1999; Albach, Meudt, & Oxelman 2005). Based on molecular analysis, Young, Steiner, & dePamphilis (1999) suggest that Scrophulariaceae, Antirrhinanthaceae, and Orobanchaceae be restructured to include the current members of Orobanchaceae, Scrophulariaceae, and Callitrichaceae. Beardsley & Olmstead (2002) suggest that *Mimulus* and *Mazus* be included with *Phryma* in a redefined Phrymaceae. Additional changes have been suggested, as summarized blow. References: Pennell (1935)=P; Olmstead & Reeves (1995); Young, Steiner, & dePamphilis (1999); Olmstead et al. (2001); Beardsley & Olmstead (2002). [also see *OROBANCHACEAE, PAULOWNIACEAE, PHRYMACEAE,* and *PLANTAGINACEAE*]

Disposition of the traditional Scrophulariaceae (including Antirrhinanthaceae), Orobanchaceae, Plantaginaceae, Buddlejaceae, Phrymaceae:
Linderniaceae: *Lindernia, Hemianthus, Micranthemum, Torenia*
Orobanchaceae: *Agalinis, Aureolaria, Buchnera, Castilleja, Conopholis, Dasistoma, Epifagus, Macranthera, Melampyrum, Orobanche, Pedicularis, Schwalbea, Seymeria, Striga.*
Plantaginaceae (Veronicaceae): *Amphianthus, Antirrhinum, Bacopa, Callitriche, Chaenorrhinum, Chelone, Collinsia, Cymbalaria, Digitalis, Gratiola, Kickxia, Leucospora, Limnophila, Limosella, Linaria, Mecardonia, Misopates, Nuttallanthus, Penstemon, Plantago, Scoparia, Veronica, Veronicastrum.*
Phrymaceae: *Glossostigma, Mazus, Mimulus, Phryma.*
Scrophulariaceae s.s.: *Buddleja, Scrophularia, Verbascum.*

1 Plant a shrub; inflorescence a terminal thyrse ..... ***Buddleja***
1 Plant an herb; inflorescence a raceme, a spike, or a diffuse panicle.
  2 Corolla cylindric, purplish; fertile stamens 4 ..... ***Scrophularia***
  2 Corolla rotate, yellowish; fertile stamens 5 ..... ***Verbascum***

Buddleja Linnaeus 1753 (Butterfly-bush)

A genus of about 90 species, trees and shrubs, of subtropical and tropical America, Asia, and Africa. The two species listed (and others) are grown for ornament and for their attractiveness as nectaring sites for butterflies. References: Rogers (1986)=Z; Oxelman, Kornhall, & Norman in Kadereit (2004).

1 Leaves serrate or crenate; corolla, calyx, pedicels, and inflorescence rachis pubescent (not granular-farinose) ..... ***B. davidii***
1 Leaves entire or remotely dentate; corolla, calyx, pedicels, and inflorescence rachis granular-farinose ..... ***B. lindleyana***

* *Buddleja alternifolia* Maximowicz. Reported as introduced in NC by Kartesz (1999), but the alleged documentation is not present. *B. officinalis* Maximowicz is reported as introduced in GA by Kartesz (1999), but the alleged documentation is not available. {not keyed; not mapped; rejected as a component of our flora}

* ***Buddleja davidii*** Franchet, Summer-lilac, Orange-eye Butterfly-bush. Mt (GA, NC, VA, WV), Pd (DE, SC): planted, rarely escaped to disturbed places, such as thickets or streambanks (Wise Co., VA); rare, native of China. June-October. [= RAB, C, F, G, K, Z]

* ***Buddleja lindleyana*** Fortune ex Lindley. Pd (GA, NC, SC), Mt, Cp (NC, SC): rarely escaped to disturbed areas; rare, native of China. June-October. [= RAB, K, Z; = *Adenoplea lindleyana* (Fortune ex Lindley) Small – S]

Scrophularia Linnaeus 1753 (Figwort)

A genus of about 200 species, of temperate and tropical regions of the Old and New Worlds. Though our 2 species are only subtly distinct morphologically, they are clearly distinct. References: Pennell (1935)=P; Fischer in Kadereit (2004).

1 Sterile filament (hidden under the upper corolla lip) yellowish-green, often wider than long; leaf serrations coarse, often > 3 mm long; flowering May-early July; capsule 6-10 mm long ..... ***S. lanceolata***
1 Sterile filament dark purple or brownish, often longer than wide; leaf serrations fairly fine, < 3 mm long; flowering mid July-October; capsule 4-7 mm long ..... ***S. marilandica***

Scrophularia lanceolata Pursh, American Figwort. Mt (VA, WV), Pd (VA), Cp (DE, VA): woodlands and forests; common (rare in Piedmont and Coastal Plain). May-early July. QC and NS west to BC, south to VA, MO, NM, and n. CA. [= C, F, G, K, P, W, WV]

Scrophularia marilandica Linnaeus, Eastern Figwort. Mt (GA, NC, SC, VA, WV), Pd (DE, GA, NC, SC, VA), Cp (DE, GA, NC, SC, VA): moist to dry, nutrient-rich woodlands and forests, especially over mafic or calcareous rocks; common (rare in GA, NC, and SC Piedmont, uncommon in DE Coastal Plain, rare in GA, NC, and SC Coastal Plain). July-October. QC west to MN, south to SC, ne. GA, sw. GA, and LA. [= RAB, C, F, G, K, P, S, W, WV]

Verbascum Linnaeus 1753 (Mullein)

A genus of about 360 species, herbs (annual, biennial, and perennial) and shrubs, of Eurasia and ne. Africa. References: Pennell (1935)=P; Fischer in Kadereit (2004).

1 Leaves green and glabrous on both sides, or sparsely pubescent with glandular hairs; hairs of the calyx and upper stem simple and glandular.
  2 Flowers 1 per node throughout the inflorescence; pedicels longer than the calyx; glandular hairs usually restricted to the upper part of the plant ..... ***V. blattaria***
  2 Flowers usually > 1 per node in the lower parts of the inflorecence; pedicels shorter than the calyx; glandular hairs extending down the stem to the base ..... ***V. virgatum***
1 Leaves densely tomentose at least on the lower surface, and often the upper as well; hairs of the calyx and upper stem branched, not glandular (except in *V. sinuatum*).
  3 Inflorescence generally simple (sometimes with 1-several small branches), dense and spike-like (at least initially); leaves moderately to densely tomentose above; upper 3 filaments bearing white hairs.
    4 Leaves sessile to auriculate-clasping, slightly or not at all decurrent on the stem; stigma patulate, decurrent on the style; corolla white or yellow ..... ***V. phlomoides***
    4 Leaves sessile, decurrent down the stem to the next leaf; stigma capitate; corolla yellow ..... ***V. thapsus***
  3 Inflorescence freely branched, paniculate; leaves green and nearly glabrous above; all 5 filaments bearing either white or violet hairs.
    5 Basal leaves not lobed; inflorescence lacking glandular hairs; filaments bearing white hairs ..... ***V. lychnitis***
    5 Basal leaves lobed; inflorecence with glandular hairs; filaments bearing violet hairs ..... ***[V. sinuatum]***

* ***Verbascum blattaria*** Linnaeus, Moth Mullein. Cp (DE, FL, GA, NC, SC, VA), Pd (DE, GA, NC, SC, VA), Mt (GA, NC, SC, VA, WV): fields, roadsides, disturbed areas; common (rare in FL), native of Eurasia. May-June; June-July. [= RAB, C, F, G, K, P, S, W, WH, WV]

* ***Verbascum lychnitis*** Linnaeus, White Mullein. Cp (VA), Pd (DE, VA): disturbed areas, fields; rare, native of Eurasia. [= RAB, C, F, G, K, P, S]

* ***Verbascum phlomoides*** Linnaeus, Clasping Mullein, Orange Mullein. Mt (NC, VA, WV), Pd (NC, VA), Cp (DE, NC, VA): disturbed areas, roadsides; rare, native of Europe. May-June; July. [= RAB, C, F, G, K, P, W, WV]

* ***Verbascum thapsus*** Linnaeus, Woolly Mullein, Common Mullein, Flannel-plant, Velvet-plant. Mt (DE, GA, NC, SC, VA, WV), Pd (DE, GA, NC, SC, VA), Cp (FL, GA, NC, SC, VA): fields, roadsides, disturbed areas; common (uncommon in FL), native of Europe. June-September; July-October. [= RAB, C, F, G, K, P, S, W, WH, WV]

* ***Verbascum virgatum*** Stokes, Twiggy Mullein. Cp (FL, NC, SC): sandhills, sandy disturbed areas, roadsides; uncommon (rare in NC and SC), native of Europe. April-May; June. [= RAB, C, F, G, K, P, S, WH]

* *Verbascum sinuatum* Linnaeus, Wavyleaf Mullein, is introduced at scattered locations in MD, PA, NJ, and NY, on ballast and in disturbed areas. July-August. [= G, K]

371. LINDERNIACEAE Borsch, K. Müller, & Eb. Fischer 2005 (False-pimpernel Family) [in LAMIALES]

A family of about 13 genera and 195 species, herbs, pantropical and warm temperate. References: Tank et al. (2006); Pennell (1935)=P; Fischer in Kadereit (2004).

1 Calyx conspicuously 5-winged ..... ***Torenia***
1 Calyx not winged.
  2 Flowers > 4 mm long ..... ***Lindernia***
  2 Flowers < 2 mm long.
    3 Leaves elliptic, cuneate at the base; calyx lobes even, all of the sinuses reaching nearly to the base of the calyx ..... ***Hemianthus***

3 Leaves orbicular, rounded at the base; calyx lobes uneven, 3 of the sinuses extending about halfway to the base of the calyx, the lowermost sinus extending to the base..... ***Micranthemum***

Hemianthus Nuttall 1817

A genus of 3-4 species, annual herbs, of se. North America and Central America. The recognition of *Hemianthus* as separate from *Micranthemum* is uncertain and needs additional study. References: Pennell (1935)=P; Fischer in Kadereit (2004).

1 Calyx lobes acute, ⅓ to ½ as long as the calyx tube; flowers opening, chasmogamous..... ***H. glomeratus***
1 Calyx lobes obtuse, < ¼ as long as the calyx tube; flowers not opening, cleistogamous ..... ***H. micranthemoides***

Hemianthus glomeratus (Chapman) Pennell. Lake margins, ponds. January-December. Panhandle FL (Gadsden County) south to s. FL. [= P; = *Micranthemum glomeratum* (Chapman) Shinners WH]

Hemianthus micranthemoides Nuttall, Nuttall's Micranthemum. Muddy, freshwater intertidal shores, possibly extinct. NY (Hudson River) south to VA (Chesapeake Bay, Potomac River, James River). [= C, G, P; = *Micranthemum micranthemoides* (Nuttall) Wettstein F, K]

Lindernia Allioni 1755 (False-pimpernel)

A genus of about 80-100 species, of warm temperate and subtropical regions of the Old and New Worlds. References: Cooperrider & McCready (1975)=Z; Qualls (1984)=Y; Lewis (2000)=X; Pennell (1935)=P; Fischer in Kadereit (2004).

1 Fertile stamens 4; calyx lobes connate at anthesis for > ½ their length, later separating; [section *Torenioides*]..... ***L. crustacea***
1 Fertile stamens 2 (with 2 staminodia without anthers, or with rudimentary anthers); calyx lobes separate, or connate at base for < ¼ the length of the calyx.
2 Capsule lanceoloid, > 8× as long as its diameter; calyx lobes connate at base < ¼ the length of the calyx; [section *Bonnaya*] ..... ***L. antipoda***
2 Capsule ovoid to ellipsoid, < 5× as long as its iameter; calyx lobes distinct to the base at anthesis and after; [section *Brachycarpae*].
3 Pedicels shorter than or about as long as the subtending leaves ..... ***L. dubia*** *var.* ***dubia***
3 Pedicels longer than the subtending leaves (or bracteal leaves in some species).
4 Leaves nearly orbicular; stems creeping ..... ***L. grandiflora***
4 Leaves distinctly longer than wide; stems erect (sometimes decumbent at the base and rooting if knocked down by water).
5 Leaves not glandular punctate; seeds 2-3× as long as wide ..... ***L. dubia*** *var.* ***anagallidea***
5 Leaves glandular punctate; seeds ca. 1× as long as wide.
6 Leaves primarily in a basal rosette, leaves of the stem strongly reduced upward to bracts; capsule (1.8-) 3.4-7 mm long; [primarily of seepage of flatrocks] ..... ***L. monticola*** *("monticola" form)*
6 Leaves primarily on the stem, not conspicuously reduced upward; capsule 1.4-3.4 mm long; [of stream or river banks]..... ***L. monticola*** *("saxicola" form)*

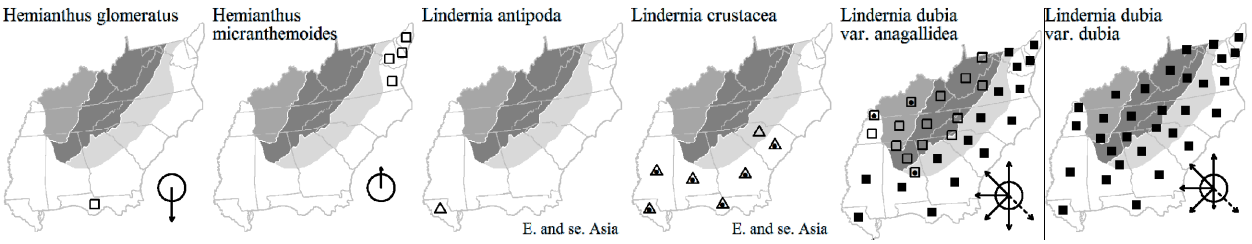
* ***Lindernia antipoda*** (Linnaeus) Alston. Disturbed areas; native of se. Asia, Polynesia, and n. Australia. [= K, Y]

* ***Lindernia crustacea*** (Linnaeus) F. Mueller. Lawns; native of Malaysia. September. [= RAB, GW, K, P, WH, X, Y]

* *Lindernia diffusa* (Linnaeus) Wettstein. Reported for SC by Kartesz (1999) on the basis of specimens at NCU, but the specimens so labelled are actually *L. dubia*. {rejected; not keyed or mapped}

Lindernia dubia (Linnaeus) Pennell *var.* ***anagallidea*** (Michaux) Cooperrider. Wet sandy or muddy areas. June-September. Nearly throughout North America, Central America, and South America. The extensive and essentially coincident ranges of the two varieties of *L. dubia* suggests that they may be merely forms, as suggested by Voss (1996). [= C, K, WH, X, Y, Z; = *L. anagallidea* (Michaux) Pennell – RAB, F, G, GW, P, WV; = *Ilysanthes inequalis* (Walter) Pennell – S; < *L. dubia* – W]

Lindernia dubia (Linnaeus) Pennell *var.* ***dubia***. Wet sandy or muddy areas. May-November. Nearly throughout North America, Central America, and South America. [= C, WH, X, Y, Z; = *L. dubia* (Linnaeus) Pennell – RAB, GW, WV; > *L. dubia* var. *dubia* – F, G, K; > *L. dubia* var. *riparia* (Rafinesque) Fernald – F, G; > *L. dubia* var. *inundata* Pennell – F, G, K; > *L. dubia* var. *major* (Pursh) Pennell – P; > *L. dubia* var. *typica* – P; = *Ilysanthes dubia* (Linnaeus) Barnhart – S; < *L. dubia* – W]



Lindernia grandiflora Nuttall. Depressional wetlands. S. GA south to s. FL. [= GW, K, P, WH, X, Y; = *Ilysanthes grandiflora* (Nuttall) Bentham – S]

Lindernia monticola Muhlenberg ex Nuttall, Flatrock Pimpernel, Riverbank Pimpernel. In seasonal seepage on granitic flatrocks, and on river-scoured siliceous rocks. April-June (-September). Nc. and sw. NC south to ne. FL and ec. AL. *L. saxicola* appears to be merely a form of *L. monticola*, the leafy stems the result of the basal leaves being covered by silt deposited by floodwaters (Qualls 1984; Lewis 2000); this needs additional study. [= K, WH, X; > *L. monticola* – RAB, GW, P, W, Y; > *L.*

saxicola M.A. Curtis – RAB, P, W, Y; > *Ilysanthes monticola* (Muhlenberg ex Nuttall) Rafinesque – S; > *Ilysanthes saxicola* (M.A. Curtis) Chapman – S]

* *Lindernia procumbens* (Krock.) Borb. One record as a waif in Arlington County, VA. {rejected; not keyed or mapped}

Micranthemum Michaux 1803

A family of 14-17 species, annual herbs, of s. North America, Central America, and South America. The recognition of *Hemianthus* as separate from *Micranthemum* is uncertain and needs additional study. References: Pennell (1935)=P; Fischer in Kadereit (2004).

Micranthemum umbrosum (J.F. Gmelin) Blake, Shade Mudflower. Shallow pools, stagnant streams, wet depressions in swamp forests. May-October. Se. VA south to FL, west to TX, and south into tropical America (Mexico, Central America, West Indies, e. South America). [= RAB, C, F, G, GW, K, P, WH; = *Globifera umbrosa* J.F. Gmelin – S]

Torenia Linnaeus 1753 (Blue-wings)

A genus of about 40 species of the Old World tropics. References: Fischer in Kadereit (2004)

* ***Torenia fournieri*** Linden ex E. Fournier, Bluewings, Wishbone-flower. Disturbed areas, flowerbeds; native of China. Also reported for Mountains of NC (Pittillo & Brown 1988), but it appears that it was a short-lived waif there. Likely to be found sporadically, especially southwards. [= K, WH]

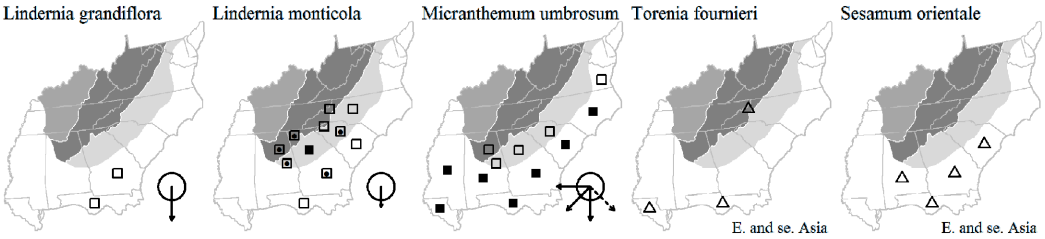
372. PEDALIACEAE R. Brown 1810 (Sesame Family) [in LAMIALES]

A family of about 13 genera and 70 species, herbs, shrubs, and trees, of the Old World tropics.

Sesamum Linnaeus 1753 (Sesame)

A genus of about 19 species, of the old World tropics.

* ***Sesamum orientale*** Linnaeus, Sesame. Disturbed areas; native of the East Indies. January-December. Also reported for AL. [= K, WH; = *S. indicum* Linnaeus – S]



373. LAMIACEAE Lindley 1836 ***or LABIATAE*** A.L. de Jussieu 1789 (Mint Family) [in LAMIALES]

A family of about 230-250 genera and 6700-7170 species, herbs, shrubs, vines, and trees, cosmopolitan. The placement in the Lamiaceae of several genera traditionally placed in Verbenaceae (e.g. *Clerodendrum*) is strongly supported by several lines of evidence. References: Harley et al. in Kadereit (2004).

incertae sedis: *Callicarpa*.
subfamily Viticoideae: *Vitex*.
subfamily Ajugoideae: *Ajuga, Clerodendrum, Teucrium, Trichostema*.
subfamily Scutellarioideae: *Scutellaria*.
subfamily Lamioideae:
  tribe Synandreae: *Synandra, Macbridea, Physostegia*
  tribe Stachydeae: *Galeopsis, Stachys, Sideritis*
  tribe Leonuridae: *Leonurus*
  tribe Marrubieae: *Marrubium*
  tribe Lammieae: *Lamium*
subfamily Nepetoideae:
  tribe Elsholtzieae: *Collinsonia, Elsholtzia, Mosla, Perilla*.
  tribe Mentheae:
    subtribe Salviinae: *Rosmarinus, Salvia*.

subtribe Menthinae: *Blephilia, Clinopodium, Conradina, Cunila, Dicerandra, Hedeoma, Stachydeoma, Hyssopus, Lycopus, Mentha, Monarda, Origanum, Piloblephis, Prunella, Pycnanthemum, Thymus*.
subtribe Nepetinae: *Agastache, Dracocephalum, Glechoma, Meehania, Nepeta*.
incertae sedis: *Melissa*.
tribe Ocimeae:
subtribe Hyptidinae: *Hyptis*.
subtribe Ociminae: *Ocimum*.

1. Callicarpa Linnaeus 1753 (Beautyberry)

A genus of about 140 species, small trees, shrubs, and lianas, mainly tropical and subtropical. References: Moldenke (1980)=Z; Harley et al. in Kadereit (2004).

1 Leaves 7-23 cm long, stellate-scurfy beneath; peduncles 1-5 mm long ..... ***C. americana***
1 Leaves 2-6.5 (-7) cm long, glabrous or nearly so beneath (except on the midrib); peduncles 10-20 mm long.
2 Inflorescence supra-axillary, diverging from the twig 1-4 mm above the leaf axil ..... ***C. dichotoma***
2 Inflorescence axillary, borne directly in the axil of the leaf ..... ***C. japonica***

Callicarpa americana Linnaeus, Beautyberry, American Beautyberry, French-mulberry. Cp (FL, GA, NC, SC, VA), Pd (GA, NC, SC), Mt (GA, NC, SC): hammocks, other forests (especially with sandy or rocky soils), maritime forests (the main habitat northwards), disturbed areas; common (rare in Mountains). June-July; August-October (persisting into the winter). MD and AR south to s. FL, TX, Mexico; West Indies. [= RAB, C, F, G, K, S, W, WH]

* ***Callicarpa dichotoma*** (Loureiro) K. Koch, Chinese Beautyberry. Pd (NC, VA), Cp (DE, NC, VA), Mt (NC), {SC}: roadsides, powerline rights-of-way, woodland edges, suburban woodlands, bogs; uncommon (rare in DE and VA), native of Asia. September-November. This species is beginning to spread more rapidly in the Southeast. [= RAB, C, K]

* ***Callicarpa japonica*** Thunberg, Japanese Beautyberry. Pd (NC): suburban woodlands; rare, native of e. Asia. Reported for Durham County, NC by Moldenke (1980); corroborated by specimens from Orange County, NC (Giencke, prs. comm., 2005). [= K, Z]

2. Vitex Linnaeus 1753 (Chaste Tree)

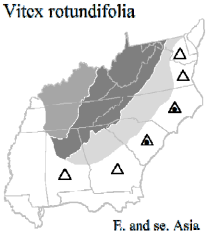
A genus of about 250 species, trees and shrubs, tropical to temperate. References: Chen & Gilbert (1994)=Z; Harley et al. in Kadereit (2004).

1 Leaves palmately 5-7-foliolate; leaflets lanceolate; plant an upright small tree ..... ***V. agnus-castus***
1 Leaves unifoliolate (or palmately 3-foliolate); leaflets orbicular or obovate; plant a sprawling and spreading shrub/vine ..... ***V. rotundifolia***

* ***Vitex agnus-castus*** Linnaeus, Chaste Tree. Cp (FL, GA, NC, VA), Pd (GA, NC, VA), Mt (VA): pastures, woodland edges, suburban woodlands; rare, native of Mediterranean Europe. June-July. [= RAB, C, G, S, WH; > *V. agnus-castus* var. *agnus-castus* – K; > *V. agnus-castus* var. *caerulea* Rehder – K]

* *Vitex negundo* Linnaeus, Chinese Chaste-tree. Reported for FL, MS, LA, KY. June-July; August-November. [= WH; > *V. negundo* var. *intermedia* (S.J. Pei) Moldenke – K; > *V. negundo* var. *negundo* – K, Z; > *V. negundo* var. *heterophylla* (Franchet) Rehder – K, Z; *V. negundo* var. *cannabifolia* (Siebold & Zuccarini) Handel-Mazzetti – Z] {not keyed; rejected as not definitively naturalized in Flora area}

* ***Vitex rotundifolia*** Linnaeus f., Beach Vitex, Roundleaf Chaste-tree. Coastal dunes, planted for ornament and stabilization and now spreading aggressively as an invasive species; native of e. Asia, se. Asia, and nearby islands. See Cousins et al. (2010) and Roecker & Socha (2004) for additional information. The runners are reported to reach 10 m in length. [= K, Z; < *V. trifolia* Linnaeus ssp. *littoralis* Steenis]



3. Ajuga Linnaeus 1753 (Bugle, Bugleweed)

A genus of about 40-50 species, herbs, of the temperate Old World. References: Harley et al. in Kadereit (2004)

1 Leaves deeply cleft into narrow segments; corolla yellow; annual ..... ***A. chamaepitys***
1 Leaves entire to shallowly lobed; corolla blue (to white or pink); perennial.
2 Plants not stoloniferous; stems hairy all around ..... ***A. genevensis***
2 Plants stoloniferous; stems hairy in lines ..... ***A. reptans***

* ***Ajuga chamaepitys*** (Linnaeus) Schreber, Yellow Bugle, Ground-pine Bugle. Cp (VA): disturbed areas; rare, native of Europe. May-September. [= C, F, G, K]
* ***Ajuga genevensis*** Linnaeus, Standing Bugle. Mt (WV): disturbed areas; rare, native of Europe. Cultivated and rarely escaped in ne. North America, reported as naturalized as far south as PA (Rhoads & Klein 1993), MD (Kartesz 1999), and WV (Harmon, Ford-Werntz, & Grafton 2006), where considered "not confirmed as naturalized." [= C, F, G, K, WV]
* ***Ajuga reptans*** Linnaeus, Carpet Bugle. Pd (DE, NC, VA), Mt (NC, VA, WV), Cp (DE, FL, VA): lawns and roadsides; uncommon (rare in DE Coastal Plain, rare in FL, NC, and VA), native of Europe. March-June. [= RAB, C, F, G, K, WH]

4. Teucrium Linnaeus 1753 (Germander)

A genus of about 100-250 species, herbs and shrubs, nearly cosmopolitan in distribution. References: Harley et al. in Kadereit (2004).

* ***Teucrium botrys*** Linnaeus, Cutleaf Germander. Mt (WV): disturbed areas; rare, native of Europe. July-September. [= C, K] {add to synonymy}
Teucrium canadense Linnaeus *var.* ***canadense***. Mt (WV), Cp (DE), {GA, NC, SC, VA}: rich bottomlands; common. Mainly coastal, NS south to FL, west to TX and OK. [= C, F, G, K; < *T. canadense* – RAB, GW, W; = *T. littorale* Bicknell – S]
Teucrium canadense Linnaeus *var.* ***hypoleucum*** Grisebach. {GA, NC, SC}. E. NC south to FL, west to TX. [= K; < *T. canadense* – RAB, GW, W; = *T. nashii* Kearney – S]
Teucrium canadense Linnaeus *var.* ***occidentale*** (A. Gray) McClintock & Epling. Mt (VA, WV*). Reported for VA (Kartesz 1999). {investigate} Occurs at least as far south and east as PA (Rhoads & Klein 1993) and ne.WV. [= C, G, K; > *T. occidentale* A. Gray var. *occidentale* – F; > *T. occidentale* A. Gray var. *boreale* (Bicknell) Fernald – F, WV]
Teucrium canadense Linnaeus *var.* ***virginicum*** (Linnaeus) Eaton. Pd (DE), {AL, GA, MS, NC, SC, VA}: {habitat}; common. NY, QC, and MN south to GA, AL, MS, and TX. [= C, F, G, K; < *T. canadense* – RAB, GW, W; = *T. canadense* – S]
Teucrium cubense Jacquin *var.* ***cubense***. AL. [= K] {synonymy incomplete}

5. Clerodendrum Linnaeus 1753 (Glory-bower)

A genus of about 400-500 species, trees and shrubs, mostly tropical and warm temperate, African and Asian (after removal of the "Pantropical Coastal" clade into *Volkameria* (Yuan et al. 2010). References: Yuan et al. (2010); Steane et al. (1999); Hsiao & Lin (1995); Steane, de Kok, & Olmstead (2004); Harley et al. in Kadereit (2004).

1 Corolla tube > 8 cm long ..... ***C. indicum***
1 Corolla tube < 3 cm long.
  2 Calyx 5-8 mm long ..... ***C. bungei***
  2 Calyx > 10 mm long.
    3 Corolla double ..... ***C. chinense***
    3 Corolla single ..... ***C. trichotomum*** *var.* ***ferrugineum***

* ***Clerodendrum bungei*** Steudel, Rose Glory-bower. Cp (FL, GA), Pd (GA, SC): roadsides and suburban woodlands; rare, native of e. Asia. August-September. First reported from South Carolina by Hill & Horn (1997); also reported for our area by W. Duncan (pers. comm.). [= K, WH]
* ***Clerodendrum chinense*** (Osbeck) Mabberley, Stickbush. Cp (FL): disturbed areas; rare, native of Asia. Cultivated and naturalized in FL, including the Panhandle (Escambia County) (Wunderlin & Hansen 2004). [= K, WH; *? Clerodendrum japonicum* (Thunberg) Sweet var. *pleniflorum* (Schauer) Maheshwari]
* *Clerodendrum japonicum* (Thunberg) Sweet. Also cultivated and is reported to be naturalized in MD (Staff of the Bailey Hortorium 1976). [= K] {not yet keyed]
* ***Clerodendrum indicum*** (Linnaeus) Kuntze, Tubeflower, Turk's-turban. Cp (FL, GA, SC): disturbed areas, roadsides; rare, native of the Malaysian Archipelago. August-October; November-December. [= K, WH; = *Clerodendron indicum* – RAB, orthographic variant]
* ***Clerodendrum trichotomum*** Thunberg *var.* ***ferrugineum*** Nakai, Harlequin Glory-bower. Pd (NC), Mt (NC), Cp (FL), {GA}: roadsides, streambanks; rare, cultivated and strongly naturalized, native of e. Asia. [= K; < *Clerodendrum trichotomum* – WH]

6. Trichostema Linnaeus 1753 (Blue Curls)

A genus of about 18 species, shrubs, annual and perennial herbs, of temperate North America (especially diverse in w. North America, with a second center of diversity in se. North America). Morphology, pollen, and phytogeography suggest the plausible recognition of *Trichostema* section *Orthopodium* (which includes this species and several from w. North America) as *Isanthus*, a genus distinct from section *Trichostema* (which includes all other eastern North American species). References: Weakley (in prep.)=Z; Lewis (1945)=Y; Harley et al. in Kadereit (2004).

1 Calyx lobes essentially equal; stamens straight, < 10 mm long; leaves acute to slightly acuminate, the two main lateral veins reconnecting to the midvein; [section *Orthopodium*] ..... ***T. brachiatum***
1 Calyx strongly bilabiate; stamens strongly arched, 12-20 mm long; leaves obtuse, the two main lateral veins not reconnecting to the midvein; [section *Trichostema*].
2 Plants annual; larger leaves 3-7 cm long (including the petiole); plants with long internodes near the base, near-basal branches absent, the best-developed branches from the mid or upper stem; hairs on the upper stem long (0.5-2.0 mm long) or short (0.1-0.4 mm long); [collectively widespread, in a wide variety of habitats, primarily inland, though occasionally occurring as a weed in coastal areas].
3 Leaves 2.5-4× as long as wide; longer hairs of the upper stem (0.3-) 0.5-2.0 mm long..... ***T. dichotomum***
3 Leaves 5-15× as long as wide; longer hairs of the upper stem 0.1-0.3 (-0.4) mm long..... ***T. setaceum***
2 Plants perennial; larger leaves 1-4 cm long (including the petiole); plants with short internodes near the base, near-basal branches well-developed, these often branching again; hairs on the upper stem short (0.1-0.4 mm long); [of the Coastal Plain].
4 Corolla deep blue (almost black in bud); flowers stems typically virgate, not branched above the base; hairs of the stem not longer at each node; [of peninsular FL, inland as well as on sand ridges near the coasts] ..... ***T. suffrutescens***
4 Corolla pastel blue or pink; stems typically rebranching above the base, the plant more-or-less bushy; hairs of the stem longer at the node (in a line between the 2 petioles); [of NC south to s. FL and west to s. MS; restricted to barrier islands, coastal peninsulas, and other maritime situations within 10 km of the ocean]
5 Anthers lemon yellow; leaves ovate-rhombic, 1-1.5× as long as wide; corolla lavender (definitely with a pinkish tint); bark on older stems dark, tight; plants 1-4 dm tall, forming a tight, compact, hemispheric bush; [of maritime dunes, grasslands, and forest openings from 10 km north of Cape Hatteras (Dare County, NC) south to near Cape Romain (Georgetown County, SC] ..... ***T. species 1***
5 Anthers blue; leaves spatulate, the petiole relatively well-developed, 1.5-3× as long as wide; corolla bluish (lacking a well-developed pinkish tint); bark on older stems yellow to tan, somewhat papery; plants 3-7 dm tall, often gangly and irregularly shaped; [of maritime dunes, grasslands, and coastal scrub from e. GA around the FL peninsula west to s. MS]..... ***T. species 2***

Trichostema brachiatum Linnaeus, Glade Blue Curls, False Pennyroyal. Mt (GA, NC, VA, WV), Pd (NC, SC, VA): shale barrens, outcrops of calcareous or mafic rock, diabase barrens, calcareous dry prairies, disturbed rocky areas; uncommon (rare in NC). August-September. VT and s. ON west to MN and NE, south to c. NC, nw. GA, AL, TX, and AZ. [= W, Y; = *Isanthus brachiatus* (Linnaeus) Britton, Sterns, & Poggenburg – C, F, K, S, WV; > *Isanthus brachiatus* var. *brachiatus* – G]

Trichostema dichotomum Linnaeus, Common Blue Curls. Cp (DE, FL, GA, NC, SC, VA), Pd (DE, GA, NC, SC, VA), Mt (GA, NC, SC, VA, WV): dry woodlands, disturbed areas, thin soils around rock outcrops; common. August-November. ME, ON, QC, MI, and IA, south to FL and TX. [= RAB, C, K, S, W, WV, Z; > *T. dichotomum* var. *dichotomum* – F; >< *T. dichotomum* var. *puberulum* Fernald & Griscom – F; = *T. dichotomum* var. *dichotomum* – G; < *T. dichotomum* – WH]

Trichostema setaceum Houttuyn, Narrowleaf Blue Curls. Pd (GA, NC, SC, VA), Mt (GA, NC, SC, VA, WV), Cp (DE, FL, GA, NC, SC, VA): thin soils around rock outcrops, especially granite flatrocks, dry sandy soils of the Coastal Plain; uncommon (rare in DE, NC, VA, and WV). August-November. CT west to OH, south to FL and TX, primarily on the Coastal Plain. [= RAB, C, F, K, W, WH, Y, Z; = *T. dichotomum* var. *lineare* (Walter) Pursh – G; = *T. lineare* Walter – S]

Trichostema species 1, Dune Blue Curls, Carolina Blue Curls. Cp (NC, SC): dunes on barrier islands, vegetated with perennial grasses (especially *Uniola paniculata*), openings in maritime scrub; rare. August-November. Endemic to barrier islands from slightly north of Cape Hatteras, Dare County, NC south to North Island, Georgetown County, SC, north of Cape Romain. When growing together, the flowering period of *T. species 1* is about 2-3 weeks later than that of *T. dichotomum*. Despite a considerable overlap of blooming period, only one hybrid has been seen, and that in common-garden cultivation in the Piedmont. [= Z]

Trichostema species 2, Florida Blue Curls. Cp (AL, FL, GA, MS): maritime dunes, grasslands, and coastal scrub; uncommon. August-November. E. GA around the FL peninsula west to s. MS; Bahamas. [= Z; >< *T. dichotomum* var. *puberulum* Fernald & Griscom – F; < *T. dichotomum* – WH; < *T. dichotomum* – Y ("pubescence type B"); < *T. suffrutescens* – Y]

Trichostema suffrutescens Kearney, Scrub Blue Curls. Cp (FL): scrub, sandhills; rare. August-November. Ne. FL (Clay County) south to s. peninsular FL. [= S, Z; < *T. dichotomum* – WH; < *T. suffrutescens* – Y]

7. Scutellaria Linnaeus 1753 (Skullcap)
(contributed by Bruce A. Sorrie and Alan S. Weakley)

A genus of about 350-360 species, herbs and shrubs, almost cosmopolitan. References: Pittman (1988)=Z; Collins (1976)=Y; Epling (1942)=X; Leonard (1892); Harley et al. in Kadereit (2004).

Identification notes: Recognizable by the "tractor seat"-shaped protuberance on the upper calyx. *Note: in key break 22b, corollas of *S. alabamensis* may reach 22 mm long; its calyces are both stipitate glandular and punctate glandular, thus differing from *S. arenicola* and *S. mellichampii*. In key break 22a, corollas of *S. mellichampii* may be as short as 21 mm; its calyces are punctate glandular only, unlike *S. incana* var. *australis* which has both punctate glands and stipitate glands on calyces.

1 Flowers axillary, bracts resembling stem leaves; stem leaves sessile **or** petioles < 4 mm.
2 Corollas 12-32 mm long ..... ***Sc. galericulata***
2 Corollas 5-10 mm long.
3 Lower leaves hastate; plants glabrous..... ***Sc. racemosa***
3 Lower leaves ovate or deltoid-ovate; plants puberulent or pubescent.
4 Stems glabrate, the pubescence ascending, curled or appressed, eglandular.
5 Median leaves 10-15 mm long; corolla 6.5-9 mm long..... ***Sc. leonardii***
5 Median leaves 20-40 mm long; corolla 8-10 mm long..... ***Sc. nervosa***
4 Stems obviously hairy, pubescence spreading, glandular or not (or both).

6 Lower leaf surface with glandular hairs only; leaf veins tending to anastomose along leaf margins ..... ***Sc. australis***
6 Lower leaf surface with glandular hairs or eglandular; leaf veins usually unbranched along margins ..... ***Sc. parvula***
1 Flowers in racemes, bracts much reduced (not leaf-like); stem leaf petioles > 4 mm.
7 Corolla tube glabrous within or sparsely hairy, lacking a sharply defined ring of hairs at bend of tube (non-annulate).
8 Racemes secund.
9 Corollas ca. 6 mm long; racemes terminal and axillary ..... ***Sc. lateriflora***
9 Corollas ca. 10 mm long; racemes terminal or terminating axillary branches ..... ***Sc. saxatilis***
8 Racemes not secund, flowers on more than one side of axis.
10 Stems and petioles with ascending hairs; at least some racemes from axillary branches; mid to upper leaves truncate basally ..... ***Sc. saxatilis***
10 Stems and petioles with spreading or retrorse hairs; racemes terminal or in panicles; mid to upper leaves strongly cordate.
11 Margins of lower lip cleft and erose; lower lip with large lateral auricles (flabelliform) ..... ***[Sc. ovata*** *ssp.* ***bracteata]***
11 Margins of lip entire; lip undulate or weakly auriculate.
12 Lower lip entirely white with a few blue spots; leaf surface smooth with sparse glandular hairs ..... ***Sc. ovata*** *ssp.* ***ovata***
12 Lower lip blue with two longitudinal white bands; leaf surface rugose, usually densely glandular hairy (but may be eglandular).
13 [Ridge and Valley (especially shale barrens) of VA, WV, MD] ..... ***Sc. ovata*** *ssp.* ***rugosa*** *var.* ***rugosa***
13 [Blue Ridge (moist talus slopes) of NC, TN] ..... ***Sc. ovata*** *ssp.* ***rugosa*** *var.* ***1***
7 Corolla tube with sharply defined ring of hairs (annulus) at bend of tube.
14 At least some upper leaves entire.
15 Leaves with stipitate glands ..... ***Sc. multiglandulosa***
15 Leaves without stipitate glands.
16 Corolla glabrous, lower lip with immaculate white central band; leaf bases long-attenuate ..... ***Sc. glabriuscula***
16 Corolla short pilose, lower lip with blue spots or lines on white central band; leaf bases cuneate to deltoid.
17 Lowest pedicels of main axis of inflorescence >4 mm, or if less, then subtending bracts < 13 mm ..... ***Sc. arenicola***
17 Lowest pedicels < 4 mm, or if more, then bracts >13 mm ..... ***Sc. integrifolia***
14 All leaves serrate or crenate.
18 Second internode below base of inflorescence stipitate glandular.
19 Corollas 24-33 mm long **and** upper surfaces of leaves punctate glandular ..... ***Sc. pseudoserrata***
19 Corollas 14-23 mm long, or if longer, then upper surfaces of leaves eglandular.
20 Corollas 25-36 mm long; bracts elliptic to oblanceolate, apices acute ..... ***Sc. montana***
20 Corollas 14-23 mm; bracts obovate to broadly oblanceolate, apices obtuse.
21 Bases of upper leaves cuneate to rounded; corollas 14-18 (-21) mm ..... ***Sc. elliptica*** *var.* ***hirsuta***
21 Bases of upper leaves cordate to rounded; corollas 18-23 mm ..... ***Sc. ocmulgee***
18 Second internode below base of inflorescence eglandular.
22 Corollas > 21 mm long*.
28 Stems glabrous or glabrate below inflorescence; calyces eglandular; [Mountains and Piedmont] ..... ***Sc. serrata***
28 Stems canescent below inflorescence; calyces stipitate glandular or punctate glandular; [mainly Coastal Plain].
29 Lower lip with 20+ blue spots; calyces stipitate glandular; [peninsular FL and s. GA] ..... ***Sc. arenicola***
29 Lower lip lacking blue spots; calyces punctate glandular; [s. SC to se. GA; disjunct to c. AL] ..... ***Sc. mellichampii***
22 Corollas < 21 mm long*.
23 Calyces densely to sparsely canescent, eglandular or with punctate glands (stipitate glands may also be present).
24 Leaves softly villous beneath; calyces and bracts eglandular ..... ***Sc. incana*** *var.* ***incana***
24 Leaves glabrate, with appressed hairs on veins.
25 Stems canescent; calyces and bracts densely punctate glandular ..... ***Sc. incana*** *var.* ***1***
25 Stems glabrate (rarely puberulent); calyces and bracts eglandular ..... ***Sc. incana*** *var.* ***punctata***
23 Calyces pilose with spreading stipitate glandular hairs.
26 Bracts with stipitate glands; leaves eglandular ..... ***Sc. elliptica*** *var.* ***elliptica***
26 Bracts without stipitate glands; leaves densely punctate glandular.
27 Corollas 19-22 mm long; [Mountains of AL] ..... ***[Sc. alabamensis]***
27 Corollas 11-16 mm long; [Coastal Plain of SC and GA] ..... ***Sc. altamaha***

Scutellaria altamaha Small, Altamaha Skullcap. Cp (GA, SC), Pd (GA, SC): sandy or rocky, dry forests; rare (GA Special Concern). Nc. SC to ec. GA and se. GA. [= K, S, Y; < *S. mellichampii* Small – RAB]

Scutellaria arenicola Small, Sandhill Skullcap. Cp (FL, GA): sandy scrub; rare. GA and ne. FL south to s. FL. [= K, S, WH, Y]

Scutellaria australis (Fassett) Epling, Southern Skullcap. Pd (GA, NC, SC, VA), Mt (WV), Cp (FL, GA): bottomland forests; rare. VA, s. WV, KY, IN, IL, MO, and KS, south to Panhandle FL, LA, and e. TX. [= G, WV, X; < *S. parvula* – RAB, S, WH; = *S. parvula* Michaux var. *australis* Fassett – F, K]

Scutellaria elliptica Muhlenberg ex Sprengel *var.* ***elliptica***. Mt (GA, NC, SC, VA, WV), Pd (DE, GA, NC, SC, VA), Cp (DE, FL, GA, NC, SC, VA): mesic to dry forests; common (rare in FL). Late May-June; June-July. NY, KY and MO, south to s. GA, Panhandle FL, LA, and e. TX. [= C, F, G, K, W, WV, Y; < *S. elliptica* – RAB, WH; < *S. ovalifolia* – S; = *S. ovalifolia* ssp. *mollis* Epling – X]

Scutellaria elliptica Muhlenberg ex Sprengel *var.* ***hirsuta*** (Short & Peter) Fernald. Mt (GA, NC, VA, WV), Pd (VA): mesic to dry forests; uncommon. Late May-June; June-July. PA and MI south to w. VA, w. NC, nw. GA, s. AL, and e. TX. [= C, F, G, K, W, WV, Y; < *S. elliptica* – RAB; < *S. ovalifolia* – S; = *S. ovalifolia* ssp. *hirsuta* (Short & Peter) Epling – X]

Scutellaria galericulata Linnaeus, Hooded Skullcap. Mt (NC, VA, WV), Cp (DE): spring-fed seepage, freshwater tidal marshes; rare. Circumboreal, south in North America to DE, MD, VA, ne. WV, w. NC, IN, MO, and CA. The NC occurrence is based on a single specimen from the 19th century. Reported recently from MD (Steury, Tyndall, & Cooley 1996). [= C, G, K, X; > *S. epilobiifolia* A. Hamilton – F, S, WV]

Scutellaria glabriuscula Fernald, Georgia Skullcap. Cp (AL, FL, GA, MS): sandhills; rare. Sw. GA and w. FL Panhandle west through s. AL to s. MS. [= K, S, WH, Y]

Scutellaria incana Biehler *var. **1***. Cp (FL, GA, NC): dry sandy open woods or woodland margins; rare. July-August. Gulf Coastal Plain of sw. GA, nw. FL, s. AL, and c. MS; disjunct to Brunswick County, NC. [= *S. altamaha* Small ssp. *australis* Epling; < *S. incana* – WH; = *S. incana* var. *australis* (Epling) Collins comb. nov. ined.]

Scutellaria incana Biehler *var. **incana***. Pd (NC, VA), Cp (NC, VA), Mt (WV): dry to mesic forests and woodlands; uncommon. NY, OH, IN, and IL, south to e. VA, c. NC, KY, w. TN, MS, and AR. [= C, F, G, K, WV, Y; < *S. incana* – RAB, S; = *S. incana* – X]

Scutellaria incana Biehler *var. **punctata*** (Chapman) C. Mohr. Mt (GA, NC, SC, VA): dry to mesic forests and woodlands; common (rare in WV). A southern Appalachian endemic: sw. VA and WV south through w. NC, nw. SC, e. TN to n. GA and ne. AL. [= C, F, G, K, W, WV, Y; < *S. incana* – RAB, S; ? *S. punctata* (Chapman) Leonard – X]

Scutellaria integrifolia Linnaeus. Cp (DE, FL, GA, NC, SC, VA), Pd (DE, GA, NC, SC, VA), Mt (GA, NC, SC, VA, WV): wet pine savannas, seeps in forests, bottomlands, other moist sites; common (uncommon in VA Mountains). May-July; July-August. MA south to c. peninsular FL, west to TX, northward in the interior to OH, KY, and TN. [= C, G, GW, K, S, W, WH, Y; > *S. integrifolia* var. *hispida* Bentham – RAB, F; > *S. integrifolia* var. *integrifolia* – RAB, F]

Scutellaria lateriflora Linnaeus, Mad Dog Skullcap. Cp (DE, FL, NC, SC, VA), Pd (DE, GA, NC, SC, VA), Mt (GA, NC, SC, VA, WV): alluvial forests, bogs, seeps, marshes; common (rare in FL). July-November. NL (Newfoundland) west to BC, south to GA, Panhandle FL, and CA. [= RAB, C, F, G, GW, S, W, WH, WV; > *S. lateriflora* var. *lateriflora* – K]

Scutellaria leonardii Epling, Shale-barren Skullcap, Glade Skullcap. Mt (GA, VA, WV), Pd (NC, VA), Cp (DE, VA): limestone glades, diabase barrens, shale barrens and woodlands, dry sandy soils; rare. April-May; May-June. MA west to MI and ND, south to se. VA, nc. NC, AR, and OK. [= C, G, W, WV, X; < *S. parvula* – RAB; > *S. nervosa* Pursh var. *ambigua* (Nuttall) Fernald – F; = *S. parvula* Michaux var. *missouriensis* (Torrey) Goodman & Lawson – K; = *S. ambigua* Nuttall – S; > *S. parvula* Michaux var. *leonardii* (Epling) Fernald – F]

Scutellaria mellichampii Small, Mellichamp's Skullcap. Cp (GA, SC): sandy deciduous forests on river bluffs; rare (GA Special Concern). June; July. Se. SC south to e. GA; seemingly disjunct in c. AL. [= S, X, Y; < *S. mellichampii* – RAB; = *S. incana* Biehler var. *australis* (Epling) Collins, comb. nov. – K, misapplied]

Scutellaria montana Chapman, Large-flowered Skullcap. Mt (GA): mesic hardwood (or hardwood-shortleaf pine) forests; rare. Se. TN south to nw. GA. [= K, S, Y; = *S. serrata* Andrzedowski var. *montana* (Chapman) Penland – F]

Scutellaria multiglandulosa (Kearney) Small ex R.M. Harper. Cp (FL, GA, SC), Pd (GA, SC): sandhills, dry sandy bluff forests; rare. SC (Abbeville and Anderson counties) to e. GA, south to e. Panhandle FL and c. peninsular FL. [= K, S, WH, Y; = *S. integrifolia* Linnaeus var. *multiglandulosa* Kearney – F]

Scutellaria nervosa Pursh, Bottomland Skullcap, Veined Skullcap. Pd (DE, NC, SC, VA), Cp (NC, VA), Mt (VA, WV), {GA}: alluvial forests, mesic forests; common (uncommon in VA Mountains and Piedmont, rare in DE, GA, NC, and SC, rare in VA Coastal Plain). May-June; June-July. NY, MI, and IA, south to GA, AL, and LA. [= RAB, K, S, W, WV; > *S. nervosa* var. *nervosa* – C, F, G; > *S. nervosa* var. *calvifolia* Fernald – C, F, G]

Scutellaria ocmulgee Small, Ocmulgee Skullcap. Cp (GA): bluff forests and other mesic hardwood forests; rare (GA Threatened). Endemic to e. GA. [= K, S, Y]

Scutellaria ovata Hill *ssp. **bracteata*** (Bentham) Epling. Mt (GA), Cp (FL): dry forests and woodlands, hammocks; rare. MO south through AR and OK to c. TX; disjunct eastward in s. MS, c. and n. AL, w. Panhandle FL, and nw. GA. [= K, W, WH, X; < *S. ovata* var. *ovata* – C, F, G; = *S. ovata* var. *bracteata* Bentham; > *Scutellaria ovata* Hill ssp. *cuthbertii* (Alexander) Epling – K, X; > *S. cuthbertii* Alexander – S; = *S. ovata* ssp. *bracteata* (Bentham) Epling var. *bracteata* – Z] {synonymy incomplete}

Scutellaria ovata Hill *ssp. **ovata** var. **ovata***. Mt (VA, WV), Cp (VA): {GA, NC, SC}. {overall distribution}. [= Z; > *S. ovata* ssp. *ovata* – K; < *S. ovata* – RAB, S; >< *S. ovata* var. *ovata* – C, F, G; > *S. ovata* var. *calcarea* (Epling) Gleason – C, G; > *S. ovata* var. *versicolor* (Nuttall) Fernald – C, G, WV; = *S. ovata* ssp. *ovata* – W; > *S. ovata* ssp. *calcarea* Epling – X; > *S. ovata* ssp. *versicolor* (Nuttall) Epling – X; > *Scutellaria ovata* Hill *ssp. venosa* Epling – K, X]

Scutellaria ovata Hill *ssp. **rugosa*** (Wood) Epling *var. **rugosa***. Mt (VA, WV): shale barrens, other dry woodlands; uncommon. {overall distribution} [= *S. ovata* var. *rugosa* – F; > *S. ovata* ssp. *rugosa* – K, W, X; > *Scutellaria ovata* Hill ssp. *pseudoarguta* Epling – K, X; < *S. ovata* – RAB, S; = *S. ovata* ssp. *rugosa* (Wood) Epling var. *rugosa* – Z; > *Scutellaria ovata* Hill *ssp. virginiana* Epling – K, X; > *S. ovata* var. *rugosa* – WV; > *S. ovata* var. *pseudoarguta* (Epling) Core – WV; > *S. ovata* var. *virginiana* (Epling) Core – WV]

Scutellaria ovata Hill *ssp. **rugosa*** (Wood) Epling *var. **1***, Appalachian Skullcap. Mt (GA, NC): moist boulderfields at high elevations; rare. Endemic to the high Blue Ridge of w. NC and e. TN. [= *Scutellaria arguta* Buckley – C, G, K, S, W, X; = *S. saxatilis* Riddell var. *pilosior* Bentham – F; = "*S. ovata* Hill ssp. *rugosa* (Wood) Epling var. *arguta* (Buckley) Pittman" – Z (not published)]

Scutellaria parvula Michaux, Dwarf Skullcap. Pd (SC, VA). ME west to MN, south to GA and TX. In c. TN and scattered locations in e. TN (Chester, Wofford, & Kral 1997). [= G, W, X; = *S. parvula* var. *parvula* – C, F, K; < *S. parvula* – RAB, S]

Scutellaria pseudoserrata Epling. Mt (GA), Pd (GA), {NC?, SC}: rich, rocky forests; rare. Also in e. TN (Chester, Wofford, & Kral 1997), nc. and c. GA (Jones & Coile 1988). Cultivated in Highlands, Macon Co., NC. [= K, W, X, Y]

* ***Scutellaria racemosa*** Persoon, South American Skullcap. Cp (FL, GA, SC), Pd (NC): disturbed areas; uncommon (rare in GA, NC, and SC), native of South America. Reported from FL, AL, GA, and SC by Kral (1981). Krings & Neal (2001a, 2001b) report it for Chatham Co., NC and discuss its occurrence in se. United States. [= GW, K, WH]

Scutellaria saxatilis Riddell, Rock Skullcap. Mt (GA, NC, SC, VA, WV), Pd (DE, VA): rocky forests; uncommon (rare in GA, NC, SC, and WV, rare in Piedmont). June-August. DE to OH and IN, south to SC and TN. [= RAB, C, G, K, S, W, WV, X, Z; = *S. saxatilis* var. *saxatilis* – F]

Scutellaria serrata Andrzedowski, Showy Skullcap, Serrate Skullcap. Mt (NC, VA, WV), Pd (NC, VA), {GA, SC?}: rich forests; uncommon. Mid May-late June. NY, OH, and KY south to GA and AL. [= RAB, C, G, K, S, W, WV, X, Y; = *S. serrata* var. *serrata* – F]

Scutellaria alabamensis Alexander. AL (Epling 1942, Kartesz 1999). [= K, S, X, Y]

Scutellaria drummondii Bentham *var.* ***drummondii***, Drummond's Skullcap. Cp (FL*, GA): blackland prairies, dry disturbed areas; rare. GA west to LA, south into Mexico. First reported for GA by Lee Echols in 2005 (pers. comm.). [= K; < *S. drummondii* – WH] {not yet keyed}

Scutellaria floridana Chapman, Florida Skullcap. Cp (FL): pine flatwoods; rare. Endemic to FL Panhandle. [= K, S, WH] {not yet keyed}

8. Synandra Nuttall 1818 (Synandra)

A monotypic genus, an herb, of e. North America. References: Cantino (1985); Harley et al. in Kadereit (2004).

Synandra hispidula (Michaux) Baillon, Synandra, Gyandotte Beauty. Mt (NC, VA, WV): moist, rich forests; rare. Late April-May; May-June. A broad Appalachian endemic: s. OH west to s. IL, south to sw. VA, w. NC, and n. AL. [= RAB, C, F, G, K, S, W, WV]

9. Macbridea Elliott in Nuttall 1818 (Birds-in-a-nest, Macbridea)

A genus of 2 species, herbs, of se. North America. References: Harley et al. in Kadereit (2004).

1 Corolla white (faintly marked with purple in the throat); leaf tips obtuse to rounded; [FL Panhandle] ..... ***M. alba***
1 Corolla lavender or pink; leaf tips acute; [se. NC south to s. GA] ..... ***M. caroliniana***

Macbridea alba Chapman, White Birds-in-a-nest, White Macbridea. Cp (FL): wet pine savannas, pitcherplant bogs; rare. Endemic to Panhandle FL. [= GW, K, S, WH]

Macbridea caroliniana (Walter) Blake, Carolina Birds-in-a-nest, Carolina Macbridea. Cp (GA, NC, SC): swamp forests, especially in sphagnous seepage areas away from direct flooding, savanna edges, ditches; rare). July-November. Se. NC to s. GA; reported but undocumented from n. FL, AL, and MS. Apparently rare throughout its range. [= RAB, GW, K; = *M. pulchra* Elliott – S]

10. Physostegia Bentham 1829 (Obedient-plant)

A genus of about 12 species, perennial herbs, of North America. References: Cantino (1982)=Z; Harley et al. in Kadereit (2004). Key adapted from Z and GW.

1 Leaves, 1 or more of them, conspicuously or inconspicuously clasping the stem.
  2 Perennating buds borne directly on the primary rhizome or at the ends of short, vertical secondary rhizomes (horizontal secondary rhizomes lacking), the plant thus forming clumps
    3 Most or all of the larger leaves sharply serrate; larger leaves usually < 2.5 cm wide and > 5× as long as wide ..... ***Ph angustifolia***
    3 Most or all of the larger leaves bluntly serrate to entire; larger leaves usually > 3 cm wide or < 5× as long as wide ..... ***P. purpurea***
  2 Perennating buds borne at the ends of elongate, horizontal, secondary rhizomes, the plant thus forming clonal patches.
    4 Flowers 22-35 mm long; larger stem leaves acute to attenuate at the tip; axis of raceme with at least some of the hairs 0.13-0.25 mm long; larger stem leaves mostly sharply serrate ..... ***P. angustifolia***
    4 Flowers smaller, **or** most of the leaves obtuse at the tip, **or** hairs of the raceme axis < 0.13 mm long; larger stem leaves bluntly toothed to entire.
      5 Flowering calyx tube (1-) 2-4 mm long; flowers < 20 mm long ..... ***P. intermedia***
      5 Flowering calyx tube 3-7 (-8) mm long; flowers usually > 20 mm long.
        6 Uppermost pair of leaves below the terminal raceme usually considerably larger than the floral bracts, the next pair of leaves down the stem (1.5-) 2.0-12.8 cm long and 0.3-2× as long as the internode above; principal stem leaves usually widest at or below the middle of the blade ..... ***P. leptophylla***
        6 Uppermost pair of leaves below the terminal raceme often no larger than the floral bracts, the next pair of leaves down the stem 0.4-3.2 cm long, generally 0.1-0.3× as long as the internode above; principal stem leaves usually widest at or above the middle of the blade ..... ***P. purpurea***
1 Leaves petiolate or sessile, none of them clasping the stem.
  7 All or most of the largest leaves sharply serrate; apex of the leaves acute to attenuate.
    8 Axis of raceme with at least some of the hairs 0.13-0.25 mm long; nutlets 2-3 mm long; flowering April to early July (or later if burned) ..... ***P. angustifolia***
    8 Axis of raceme with hairs < 0.1 mm long; nutlets usually 3-4 mm long; flowering July-October.
      9 Perennating buds usually borne directly on the primary rhizome or at the ends of short, vertical secondary rhizomes (horizontal secondary rhizomes usually lacking), the plant thus forming clumps; nonglandular trichomes of the raceme axis < 0.1 (-0.13) mm long; sterile floral bracts usually present below lowest flowers; flowers (16-) 18-37 mm long ..... ***P. virginiana*** *ssp.* ***praemorsa***
      9 Perennating buds usually borne at the ends of elongate, horizontal, secondary rhizomes, the plant thus forming clonal patches; nonglandular trichomes of the raceme axis frequently 0.15 (0.20) mm long; sterile floral bracts usually not present below lowest flowers; flowers (13-) 14-28 mm long ..... ***P. virginiana*** *ssp.* ***virginiana***
  7 Half or more of the larger leaves bluntly toothed to entire; apex of the leaves obtuse, or acute to attenuate.
    10 Calyx and rachis of the inflorescence bearing stalked glands (visible at 10× magnification or greater); nutlets 1.7-2.0 mm long, usually warty over the surface ..... ***P. godfreyi***

10 Calyx and rachis lacking stalked glands; nutlets 2.0-3.6 mm long, smooth.
11 Uppermost pair of leaves below the terminal raceme often no larger than the floral bracts, the next pair of leaves down the stem 0.4-3.2 cm long, generally 0.1-0.3× as long as the internode above ..... ***P. purpurea***
11 Uppermost pair of leaves below the terminal raceme usually considerably larger than the floral bracts, the next pair of leaves down the stem (1.5-) 2.0-12.8 cm long and 0.3-2× as long as the internode above.
12 Leaves (some of them) present at or after anthesis usually petiolate, the petioles often > 2 cm long, the petiolate leaves typically the lowest and among the largest leaves present ..... ***P. leptophylla***
12 Leaves present at or after anthesis usually sessile (rarely a few petiolate, but these with petioles < 2 cm long and the petiolate leaves usually not among the largest leaves present) ..... ***P. virginiana*** *ssp.* ***virginiana***

Physostegia angustifolia Fernald, Narrowleaf Obedient-plant. Cp (GA): calcareous openings; rare. Sw. GA and AL west to KS and TX. [= GW, K, Z]

Physostegia godfreyi Cantino, Apalachicola Dragonhead. Cp (FL): wet savannas and flatwoods, adjacent ditches; rare. Endemic to Panhandle FL. [= GW, K, WH, Z]

Physostegia intermedia (Nuttall) Engelmann & A. Gray. Swamps; moist forests, ditches. IL, KY, AR, and LA west to OK and TX. Also mapped as widespread in Coastal Plain of GA (Jones & Coile 1988); {investigate}. [= C, GW, K, Z; = *Dracocephalum intermedium* Nuttall]

Physostegia leptophylla Small, Tidal Marsh Obedient-plant, Swamp Obedient-plant. Cp (FL, GA, NC, SC, VA): bottomland hardwood forests, swamps, tidal freshwater or slightly brackish (oligohaline) marshes, rarely wet savannas (GA); uncommon. Late May-early August; June-September. Se. VA south to sc. peninsular FL, west to sw. GA and Panhandle FL. *P. leptophylla* is a tetraploid; Cantino (1982) suggests that this species may be an allotetraploid, perhaps originating from *P. purpurea* × *virginiana*. [= C, GW, K, WH, Z; < *Dracocephalum purpureum* (Walter) McClintock ex Gleason – RAB, G; > *P. denticulata* (Aiton) Britton – F, misapplied; > *P. aboriginorum* Fernald – F; > *Dracocephalum leptophyllum* Small – S; > *Dracocephalum veroniciformis* Small – S]

Physostegia purpurea (Walter) Blake, Savanna Obedient-plant. Cp (FL, GA, NC, SC): wet savannas, savanna-swamp ecotones, ditches adjacent to former pinelands; common (uncommon in GA, NC, and SC). Late May-early August; June-September. Ec. NC south to s. FL, west to sw. GA and Panhandle FL. Cantino (1982) discusses clinal variation within *P. purpurea*. [= GW, K, WH, Z; < *Dracocephalum purpureum* (Walter) McClintock ex Gleason – RAB (also see *P. leptophylla*); = *P. obovata* (Elliott) Godfrey ex Weatherby – F; = *Dracocephalum denticulatum* Aiton – S]

Physostegia virginiana (Linnaeus) Bentham *ssp.* ***praemorsa*** (Shinners) Cantino, Southern Obedient-plant. Mt (NC, SC, VA), Pd (NC, SC, VA), Cp (FL, NC, SC, VA), {GA}: woodlands, glades, seepages, especially over calcareous or mafic rock; common. July-October. OH west to n. IL, south to c. NC, n. FL, TX, NM, and Mexico. [= K, W, Z; < *Dracocephalum virginianum* Linnaeus – RAB, G, S; = *P. virginiana* var. *arenaria* Shimek – C; >< *P. virginiana* var. *virginiana* – F; >< *P. virginiana* var. *speciosa* – F; < *P. virginiana* – GW, WH]

Physostegia virginiana (Linnaeus) Bentham *ssp.* ***virginiana***, Northern Obedient-plant. Mt (NC, SC, VA, WV), Pd (NC, SC, VA), Cp (NC, SC, VA), {DE}: streambanks, seepages, marshes, grassy balds (native occurrences usually over mafic or calcareous rocks), other open or semi-open moist to wet habitats, disturbed areas, ditches; rare as a native, more common as an escape from cultivation. July-October. Native from QC west to MB, south to e. VA, nc. TN, and ne. KS; escaped elsewhere (as in most of our area). Cantino (1982) discusses ambiguous plants from a zone of intergradation between the 2 subspecies in sw. NC, n. GA, ne. AL, e. TN, and sc. KY. Moreover, garden escapes show some intermediacy between the 2 subspecies, and Cantino (1982) suggests that cultivars are likely inter-subspecific hybrids, stating "because the genetic background of modern cultivars is unknown, they cannot be reasonably placed in either subspecies and should not be identified below the species level." [= K, Z; < *Dracocephalum virginianum* Linnaeus – RAB, G, S; = *P. virginiana* var. *virginiana* – C; >< *P. virginiana* var. *virginiana* – F; >< *P. virginiana* var. *speciosa* (Sweet) A. Gray – F; > *P. virginiana* var. *granulosa* (Fassett) Fernald – F; < *P. virginiana* – GW; > *Dracocepalum virginianum* var. *virginianum* – WV; > *Dracocephalum virginianum* var. *granulosum* (Fassett) Core – WV]

11. Galeopsis Linnaeus 1753 (Hemp-nettle)

A genus of about 10 species, herbs, of Eurasia. References: Stace (2010)=Z; Harley et al. in Kadereit (2004). Key adapted from Stace (2010).

1 Stem with soft, appressed hairs; stem not swollen at the nodes ..... ***G. ladanum*** *var.* ***ladanum***
1 Stem with rigid, bristly hairs; stem swollen at the nodes.
2 Terminal lobe of lower lip of corolla clearly emarginate and also convex (the sides revolute); corolla 13-16 mm long ..... ***G. bifida***
2 Terminal lobe of the lower lip of the corolla entire to very slightly emarginate, essentially planar, not revolute; corolla 13-20 (-25) mm long ..... ***G. tetrahit***

* ***Galeopsis bifida*** Boenninghausen, Bifid Hemp-nettle. Mt (NC, VA, WV): streamsides, pastures, roadsides; rare, native of Eurasia. June-frost. [= K, Z; < *G. tetrahit* – RAB, S; = *G. tetrahit* Linnaeus var. *bifida* (Boenninghausen) Lejeune & Courtois – C, F, G, WH]

* ***Galeopsis ladanum*** Linnaeus *var.* ***ladanum***, Red Hemp-nettle. Disturbed areas; native of Eurasia. June-September. Naturalized in ne. North America, south at least to se. PA (Rhoads & Klein 1993) and s. NJ. [= F, K; > *G. ladanum* Linnaeus var. *angustifolia* (Ehrhart ex Hoffmann) Wallroth – C, G, misapplied]

* ***Galeopsis tetrahit*** Linnaeus, Common Hemp-nettle. Disturbed areas; native of Eurasia. June-September. Naturalized in ne. North America and may occur in our area. [= Z; = *G. tetrahit* var. *tetrahit* – C, F, G; > *G. tetrahit* var. *tetrahit* – K]

12. Stachys Linnaeus 1753 (Hedge-nettle)

(contributed by John B. Nelson, Gary P. Fleming, Derick B. Poindexter)

A genus of about 300 species, herbs and shrubs, mainly temperate, nearly cosmopolitan (except Australia and New Zealand). References: Nelson (1981)=Z; Nelson & Fairey (1979); Mulligan & Munro (1989); Pringle (2002); Harley et al. in Kadereit (2004). Key adapted from various manuscript keys of the contributors.

1 Herbage softly and densely white-woolly; [rare escapes from cultivation].
  2 Perennial; leaf blades heavily lanate, narrowed to the base, the dentations (if any) concealed by the felt; calyx lobes concealed by tomentum ..... ***S. byzantina***
  2 Biennial; leaf blades silky-pilose or tomentose, rounded to cordate at the base, obviously dentate; calyx lobes projecting beyond the pubescence ..... ***S. germanica***
1 Herbage variously pubescent or glabrous, but never white-woolly.
  3 Annuals from fibrous roots, typically freely branching from the base or from lower nodes; leaf blades 1-5 cm long, with rounded or obtuse apices (except acute to acuminate in *S. annua*); [aliens].
    4 Leaves cuneate at base, acute to acumiate at tip; corolla 10-16 mm long (well exceeding the calyx), white to yellow..... ***S. annua***
    4 Leaves cordate or truncate at base, rounded or obtuse at tip; corolla 4-9 mm long (barely or not exceeding the calyx), white to pink.
      5 Calyx 7-9 mm long; corolla 7-9 mm long ..... ***S. arvensis***
      5 Calyx 3-5 mm long; corolla 4-6 mm long ..... ***S. agraria***
  3 Perennials from rhizomes, not branching in the lower portion (unless damaged); leaf blades often > 5 cm long, with acute apices; [natives, except *S. floridana* and *S. palustris*].
    6 Petioles well developed and obvious, at least some of those of the principal stem leaves at least one-fifth as long as the blades or longer.
      7 Calyx strongly glandular with atomiferous glands or gland-tipped hairs, or both.
        8 Calyx lobes narrowly lanceolate, about as long as the calyx tube; leaf blades lance-ovate to lanceolate, < 3 cm wide; stem angles glabrate to short retrorse pubescent; root tips with moniliform tubers; [adventive weed of the Coastal Plain]..... ***S. floridana***
        8 Calyx lobes deltoid to deltoid-lanceolate, shorter than the calyx tube; leaf blades broadly cordate-ovate, usually > 3 cm wide; stem angles hispid; roots without tubers; [native species of rich mountain forests].
          9 Calyx lobes deltoid; leaves broadly rounded with a cordate base and crenulate margins..... ***S. cordata***
          9 Calyx lobes deltoid-lanceolate; leaves various.
            10 Leaves ovate to elliptic with long acuminate apex and truncate base, margins strongly dentate..... ***S. clingmanii***
            10 Leaves elliptic-oblong with an acute apex and a rounded to slightly cordate base, margins serrate to crenate..... ***S. nuttallii***
      7 Calyx sparsely glandular or eglandular.
        11 Leaves ovate to broadly ovate, deeply cordate at base..... ***S. cordata***
        11 Leaves oblong, lanceolate, elliptic, or ovate-elliptic, not cordate or only slightly so.
          12 Calyx hispidulous to strongly hispid with long, stiff, deflexed hairs; stem moderately to densely pubescent on the angles with hairs to 3 mm; leaves usually pubescent above (some forms glabrate); petioles rarely 1-2 cm long ..... ***S. hispida***
          12 Calyx glabrous to moderately pubescent with short, soft hairs; stem glabrous to moderately pubescent on the angles; leaves sparsely pubescent or glabrate; petioles well developed (1 to 3 cm long), especially in shade forms.
            13 Leaf blades wider, ovate-oblong to elliptic; calyx lobes deltoid-acuminate to an apiculate tip, ½ to 2/3 as long as the calyx tube; bracts of the inflorescence usually conspicuous and only gradually reduced upward; plants generally more pubescent ..... ***S. subcordata***
            13 Leaf blades oblanceolate, oblong, or narrowly elliptic; calyx lobes lanceolate, usually recurved-spreading in fruit, about as long as the calyx tube; bracts of the inflorescence inconspicuous, rapidly reduced upward; plants generally glabrate..... ***S. tenuifolia***
    6 Petioles poorly developed, less than one-fifth as long as the blade or absent.
      14 Stem below the inflorescence pubescent on the sides, as well as the angles.
        15 Calyx lobes deltoid, no more than half as long as the calyx tube; leaf blades pubescent but never velvety.
          16 Calyx lobes strongly deltoid; stem and abaxial leaf surface densely atomiferous glandular and with few eglandular hairs..... ***S. eplingii***
          16 Calyx lobes deltoid-lanceolate; stem and abaxial leaf surface moderately glandular and with frequent soft eglandular hairs ..... ***S. nuttallii***
        15 Calyx lobes lanceolate, more than half as long as the tube; leaf blades velvety-pubescent.
          17 Stem hairs spreading; leaf blades strongly velvety-pubescent; corolla pink..... ***S. arenicola***
          17 Stem hairs strongly reflexed; leaf blades slightly velvety-pubescent; corolla purple ..... ***S. palustris***
      14 Stem below the inflorescence glabrous on the sides (rarely with a few remote hairs and/or glands) or atomiferous-glandular only.
        18 Leaves linear-lanceolate to lanceolate or lance-elliptic, often widest below the middle, 3-15(-20) mm wide; leaf margins entire to crenuate or finely serrate.
          19 Leaf blades very narrow, 3-6(-10) mm wide, the margins entire to obscurely crenulate; herbage glabrous to moderately pubescent ..... ***S. hyssopifolia***
          19 Leaf blades broader, 5-15(-19) mm wide, the margins crenulate to finely serrate; herbage hispidulous to strongly pubescent..... ***S. aspera***
        18 Leaves ovate-oblong to elliptic, usually widest near the middle, (1.6-)2.0-5.0(-6.0) cm wide; leaf margins crenate to sharply serrate.
          20 Stem (including the sides) and usually the leaves with minute but copious atomiferous glands..... ***S. eplingii***
          20 Leaves and stem eglandular or with a few scattered glands.
            21 Mature calyx lobes triangular deltoid and abruptly apiculate, less than half as long as the calyx tube.
              22 Leaf margins serrulate or serrate; stem nodes not bearded (sometimes obscurely fine-hairy); stem angles with scattered, pustulate, short deflexed hairs; [high-elevation montane habitats] ..... ***S. latidens***
              22 Leaf margins crenulate or crenate; stem nodes bearded; lower stem angles copiously pubescent with 3-celled spreading hairs; [low-elevation Piedmont and Coastal Plain habitats] ..... ***S. species 1***

21 Mature calyx lobes lanceolate or deltoid-acuminate to an apiculate tip, more than half as long as the calyx tube.
23 Calyx sparsely to moderately pubescent with short, soft hairs; stem angles moderately pubescent to nearly glabrous; leaves sparsely pubescent or glabrate; principal leaves on petioles 1 to 3 cm long; bracts of the inflorescence usually conspicuous and only gradually reduced upward, the cilia ± incurved-ascending.....***S. subcordata***
23 Calyx hispidulous to strongly hispid with long, stiff hairs; stem angles moderately to densely pubescent; leaves usually pubescent above (some forms glabrate); principal leaves usually subsessile, with very short petioles; bracts of the inflorescence usually inconspicuous and rapidly reduced upward; if conspicuous, bracts ciliate with long, stiffly spreading hairs.
24 Calyx erect at maturity, sparsely short glandular to eglandular; stem faces usually with a few atomiferous glands only.....***S. hispida***
24 Calyx flaring at maturity, conspicuously glandular with long stipitate trichomes and shorter sessile and subsessile glandular hairs; stem faces with occasional glandular and/or eglandular trichomes.....***S. species 3***

Stachys agraria Chamisso & Schlechtendahl, Mouse's-ear, Shade Betony. Cp (FL, SC): calcareous hammocks; rare. SC south to s. FL, west to TX. [= *Stachys crenata* Rafinesque – K, WH] {add synonymy}

* ***Stachys annua*** (Linnaeus) Linnaeus, Annual Woundwort, Annual Hedge-nettle. Cp (VA): disturbed areas; rare, probably only a waif (Virginia Botanical Associates 2009). [= C, F, G, K]

Stachys arenicola Britton, Woundwort. Mt (VA, WV), Pd (VA), Cp (SC): marl fens, roadsides, banks of waterfowl impoundments; rare, possibly adventive in part from further west, but at least some populations native. NS and QC west to AK, south to VA, KY, AR, OK, NM, AZ, and CA. [< *S. palustris* Linnaeus var. *pilosa* (Nuttall) Fernald – C, F, G; < *S. palustris* Linnaeus ssp. *pilosa* (Nuttall) Epling; = *S. pilosa* var. *arenicola* (Britton) Mulligan & Monroe – K; < *S. palustris* – WV]

* ***Stachys arvensis*** (Linnaeus) Linnaeus, Staggerweed. Cp? (VA?): disturbed areas; rare, native of {}. Reported for VA by C, G, and K; documentation uncertain (Virginia Botanical Associates 2009). [= C, F, G, K]

Stachys aspera Michaux, Rough-leaved Hedge-nettle. Cp (DE, GA, NC, SC, VA), Pd (GA, NC, SC, VA), Mt (VA, WV): moist or wet sandy soil of savannas, marshes, or swamp forests, sinkhole ponds in the Great Valley; uncommon (rare in DE and VA). June-August; August-September. NJ and NY west to IL and IA, south to GA, MS, and MO. [= C, G, K, WV; = *S. hyssopifolia* Michaux var. *ambigua* A. Gray – RAB, F, GW, Z; = *S. ambigua* (A. Gray) Britton – S; *? S. grayana* House]

* ***Stachys byzantina*** K. Koch ex Scheele, Lamb's-ear. Pd (VA), Mt (NC): roadsides; rare, doubtfully established. Reported for Prince Edward County, VA (Virginia Botanical Associates 2010). [= C, K; = *S. olympica* Poiret – F, G]

Stachys clingmanii Small, Clingman's Hedge-nettle. Mt (NC), Cp? (VA?), {SC?}: cove forests, especially periglacial boulderfields, mostly at high elevations (and see comments below); rare. June-August; September-October. A narrow Southern Appalachian endemic, known only from sw. NC and se. TN. Some plants similar to and perhaps referable to this species occur in Surry County VA (calcareous bushy thickets and ravines) and in IN. [= C, F, G, K, S, W, Z; < *S. clingmanii* – RAB]

Stachys cordata Riddell, Heart-leaved Hedge-nettle. Mt (GA, NC, VA), Pd (NC, VA): moist forests, especially alluvial bottomlands or over calcareous rocks; uncommon (rare in GA). June-August; September-October. NY west to IL, south to SC, GA, AL, and AR. Primarily montane, but extending east to Stokes County, NC, and Campbell County, VA. See Pringle (2002) for a discussion of nomenclature. [= S; < *S. nuttallii* Shuttleworth ex Bentham – K, W, Z; > *S. cordata* – C; = *S. riddellii* House – F, G; > *S. salvioides* Small – S]

Stachys eplingii J. Nelson, Epling's Hedge-nettle. Mt (GA, NC, SC, VA, WV), Pd (VA): mesic forests, bogs, wet meadows over calcareous or mafic substrates; rare. June-August; August-September. W. VA and WV south to e. TN, w. NC, and w. SC. This species has a scattered and sporadic range in the southern and central Appalachians; material in the Interior Highlands previously included in *S. eplingii* has been separated as *S. iltisii* J. Nelson (Nelson 2008). See Nelson & Fairey (1979) for a discussion of the nomenclatural change. [< C, GW, K, W, Z; < *S. nuttallii* – RAB, F, G, S, WV, misapplied]

* ***Stachys floridana*** Shuttleworth ex Bentham, Florida Betony, Rattlesnake-weed. Cp (FL, GA*?, NC*, SC*?, VA*), Pd* (GA, NC, SC, VA): disturbed sites, roadsides; uncommon (rare in VA), probably not native northwards, native of Florida. April-July; May-August. Native from n. FL and Panhandle FL south to s. FL. The common name "Rattlesnake-weed" refers to the moniliform rhizomes. [= RAB, GW, K, S, WH, Z]

* ***Stachys germanica*** Linnaeus. Mt (VA, WV): disturbed areas, roadsides; rare, doubtfully established, native of {}. Reported for VA, TN, FL (Kartesz 1999). [= C, F, G, K, WV]

Stachys hispida Pursh, Hispid Hedge-nettle. Mt (NC, VA), Pd (DE, VA), Cp (DE, VA), ?? (GA): wet meadows and mesic forests; common (uncommon in NC and VA, rare in GA). {distribution} A highly variable taxon. [= C, G; = *S. tenuifolia* Willdenow var. *hispida* (Pursh) Fernald – F; < *S. tenuifolia* var. *tenuifolia* – K, Z]

Stachys hyssopifolia Michaux *var.* ***hyssopifolia***, Hyssop-leaved Hedge-nettle. Cp (DE, GA, NC, SC, VA), Pd (GA, NC, SC, VA), Mt (VA): moist soils of savannas, marshes, seasonally flooded sinkhole ponds, roadside ditches; uncommon (rare in VA). June-August; August-September. {distribution} [= RAB, F, GW, Z; = *S. hyssopifolia* – C, G, K, S, W; *? S. atlantica* Britton]

Stachys latidens Small ex Britton, Broad-toothed Hedge-nettle. Mt (GA, NC, SC, VA, WV), Pd (GA, NC, SC, VA): mesic forests in coves and on mountain slopes, mountain pastures and forest edges; common (rare in GA, SC, and WV). June-August; September-October. A Southern Appalachian endemic: w. VA and WV south to GA, AL, and TN. [= RAB, C, F, G, S, WV; = *S. tenuifolia* Willdenow var. *latidens* (Small ex Britton) J. Nelson – K, W, Z; < *S. tenuifolia* – GW]

Stachys nuttallii Shuttleworth ex Bentham, Nuttall's Hedge-Nettle. Mt (GA, NC, VA, WV), Pd (NC, VA): moist forests, especially alluvial bottomlands or over calcareous rocks; uncommon (rare in GA and NC). June-August; September-October. {distribution} Primarily montane, but extending east to Stokes County, North Carolina. See Pringle (2002) for a discussion of nomenclature. [= S; = *S. nuttallii* Shuttleworth ex Bentham – K, W, Z; < *S. clingmanii* – RAB; = *S. riddellii* House – F, G; > *S. salvioides* Small – S]

* ***Stachys palustris*** Linnaeus. Cp (DE): disturbed areas; uncommon. {distribution} South to MD, PA, NJ. [= K; > *S. palustris* var. *palustris* – C, F, G]

Stachys species 1, Yadkin Hedge-nettle. Pd (NC, VA): in sandy alluvium along forest edges in river floodplains; rare. Known from Brunswick, Charlotte, Halifax, Pittsylvania, and Surry counties, VA, and Montgomery County, NC. Under study by Gary Fleming, John Nelson, and Johnny Townsend. [= *S. matthewsii* G.P. Fleming, J. Nelson, and J.F. Townsend, in press]

Stachys species 3. Mt (NC, VA): bogs, rare. Ashe County NC and Grayson County, VA. Under study by Derick Poindexter and John Nelson.

Stachys subcordata Rydberg. Mt (VA): moist forests over calcareous or mafic rocks; common. Wc. VA south to ne. TN. [= C, G]

Stachys tenuifolia Willdenow, Smooth Hedge-nettle. Mt (NC, WV), Pd (DE, VA), Cp (DE, FL, NC, SC, VA): wooded alluvial river bottoms, swamp forests, and roadsides; uncommon (rare in DE, NC, SC, and WV). June-August; September-October. {distribution} [= RAB, C, G, K, S; > *S. tenuifolia* var. *tenuifolia* – F, Z; > *S. tenuifolia* var. *perlonga* Fernald – F, WH, Z; > *S. tenuifolia* var. *platyphylla* Fernald – F; < *S. tenuifolia* – GW; = *S. tenuifolia* var. *tenuifollia* – W]

Stachys hyssopifolia Michaux *var.* ***lythroides*** (Small) J. Nelson. Cp (FL, GA): floodplain forests; rare. E. Panhandle of FL and adjacent GA. [= WH, Z; < *S. hyssopifolia* – K; = *S. lythroides* Small – S] {not yet keyed}

* ***Stachys officinalis*** (Linnaeus) Trevis, Common European Hedge-nettle. Mt (NC): persisting and spreading clonally from cultivation; rare, native of Europe. [= K] {not yet keyed}

Stachys species 2. Cp (SC): {habitat}; rare. Santee River, SC. Under study by John Nelson. {not yet keyed}

13. Sideritis Linnaeus 1753

A genus of about 140-150 species, herbs and shrubs, of temperate Eurasia. References: Harley et al. in Kadereit (2004).

* ***Sideritis romana*** Linnaeus, Ironwort. Introduced and naturalized as far south as PA (Rhoads & Klein 1991, Cronquist 1991) and WV (Cronquist 1991). [= C, K] {synonymy incomplete}

14. Leonurus Linnaeus 1753 (Motherwort)

A genus of 25 species, herbs, of temperate Eurasia. Though *L. marrubiastrum* and *L. sibiricus* are documented in our area only from VA, they are also documented from south of our area; they likely will be found to occur in all four states. [also see *Chaiturus*]

1 Calyx strongly 5-angled, the lower 2 lobes deflexed; upper corolla lip white-villous; leaves lacerately toothed and the larger shallowly lobed . ..... ***L. cardiaca***
1 Calyx slightly 5-angled, no lobes notably deflexed; upper corolla lip with densely and finely puberulent; leaves **either** entire to few-toothed (but not lobed) **or** deeply 3-parted, the 3 divisions further lacerately toothed or lobed.
  2 Leaves entire to few-toothed (but not lobed) ..... ***[see Chaiturus marrubiastrum]***
  2 Leaves deeply 3-parted, the 3 divisions further lacerately toothed or lobed ..... ***L. sibiricus***

* ***Leonurus cardiaca*** Linnaeus, Motherwort, Lion's-tail. Pd (DE, SC, VA), Mt (GA, VA, WV), Cp (DE, VA), {NC}: roadsides, pastures, disturbed areas; common (rare in DE), native of c. Asia. May-August; July-October. Nelson (1993) reports the occurrence of this species in SC. [= RAB, C, F, G, S, W, WV; *? L. cardiaca* ssp. *cardiaca* – K]

* ***Leonurus sibiricus*** Linnaeus, Siberian Motherwort. Cp (DE, FL, VA), Mt (WV): disturbed areas; rare, native of Asia. May-September. [= C, F, G, K, S; ? *L. japonicus* Houttuyn – WH] {for FL, Wunderlin & Hansen have *L. japonicus* and state that *L. sibiricus* is misapplied – investigate}

15. Marrubium Linnaeus 1753 (Horehound)

A genus of about 30-40 species, herbs, of Mediterranean Europe and Asia. References: Harley et al. in Kadereit (2004).

* ***Marrubium vulgare*** Linnaeus, Horehound. Mt (GA, NC, SC, VA, WV), Pd (DE, NC, SC, VA), Cp (DE): fencerows, disturbed places; uncommon, native of Eurasia. Used for cough-syrups in folk medicine. [= RAB, C, F, G, K, S, W, WV]

16. Lamium Linnaeus 1753 (Dead-nettle, Henbit)

A genus of about 17-40 species, herbs, of n. Africa and Eurasia. References: Mennema (1989)=Z; Harley et al. in Kadereit (2004).

1 Corolla yellow; anthers glabrous; bracts present, reflexed..... ***L. galeobdolon***
1 Corolla blue or white; anthers with tufts of hairs; bracts absent or present (if present not reflexed).
  2 Perennial, with rhizomes or stolons; corolla 18-35 mm long, the tube curved; leaves all petioled; [section *Lamiotypus*].
    3 Corolla white; leaves not blotched with white; lower corolla lip with 2-3 teeth on each side; pollen light yellow..... ***L. album ssp. album***

3 Corolla pinkish-purple (rarely white); leaves usually marked with white; lower corolla lip with 1 tooth on each side; pollen orange..... ***L. maculatum***

2 Annual, lacking rhizomes or stolons; corolla 10-18 (-20) mm long, the tube straight; leaves all petioled **or** upper leaves sessile and clasping.

4 Leaves subtending flower clusters sessile; [section *Amplexicaule*] ..... ***L. amplexicaule*** *var.* ***amplexicaule***

4 Leaves all petiolate; [section *Lamium*].

5 Leaves subtending whorls deeply serrate, with many teeth > 2 mm long; nutlets (2.5-) 2.7-3.0 (-3.3) mm long ..... ***L. dissectum***

5 Leaves subtending whorls crenate-serrate, with teeth < 2 mm long; nutlets (2.0-) 2.2-2.5 (-2.8) mm long ..... ***L. purpureum***

* ***Lamium album*** Linnaeus *ssp.* ***album***, White Dead-nettle, Snowflake. Disturbed areas; native of Eurasia. April-September. Reported from our area (VA) by many earlier manuals; not documented in Harvill et al. (1992). [= Z; < *L. album* – C, F, G, K]

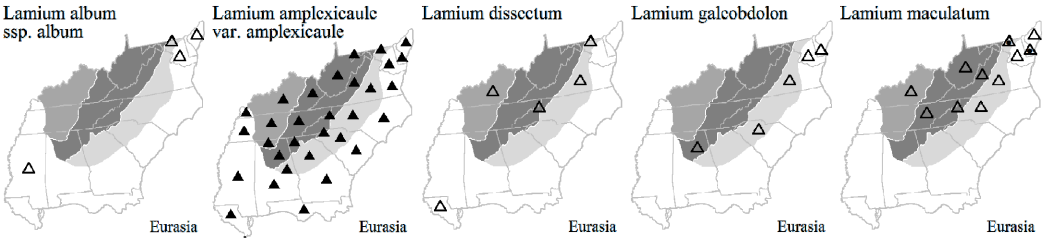
* ***Lamium amplexicaule*** Linnaeus *var.* ***amplexicaule***, Henbit, Henbit Dead-nettle. Lawns, fields, roadsides, disturbed areas, gardens, pastures; native of Eurasia and n. Africa. January-December. [= Z; < *L. amplexicaule* – RAB, C, F, G, K, S, W, WH, WV]

* ***Lamium dissectum*** Withering, Cutleaf Dead-nettle. Lawns, fields, roadsides, disturbed areas; native of Eurasia. April-May. This taxon is apparently an allopolyploid derivative (2n=36), resulting from hybridization of *L. purpureum* and another species, perhaps *L. amplexicaule*. Because of its allopolyploid status, this taxon should not be treated as a variety of *L. purpureum*. It is, however, possible that some individuals identified here may be sterile hybrids (2n=18). [= *L. hybridum* Villars – RAB, C, F, G, misapplied; = *L. purpureum* Linnaeus var. *incisum* (Willdenow) Persoon – K, Z]

* ***Lamium galeobdolon*** (Linnaeus) Linnaeus, Yellow Archangel. Disturbed areas; native of Europe and e. Asia. Several subspecies are recognized in Europe. [= *Lamiastrum galeobdolon* (Linnaeus) Ehrendorfer & Polatschek – FNA, K; = *Lamium galeobdolon* (Linnaeus) Linnaeus – Z; = *Galeobdolon luteum* Hudson]

* ***Lamium maculatum*** Linnaeus, Spotted Dead-nettle. Lawns, fields, roadsides, disturbed areas; native of Eurasia. April-September. [= RAB, C, F, G, K, S, WV, Z]

* ***Lamium purpureum*** Linnaeus, Red Dead-nettle, Purple Dead-nettle. Mt (GA, NC, SC, VA, WV), Pd (DE, GA, NC, SC, VA), Cp (DE, FL, GA, NC, VA): lawns, fields, roadsides, disturbed areas, pastures; common (uncommon in DE, rare in FL, rare in GA Coastal Plain), native of Eurasia. March-October. Only recently documented in the Coastal Plain of GA and in FL (Carter, Baker, & Morris 2009; Wunderlin & Hansen 2008). [= RAB, C, F, G, S, W, WV; = *L. purpureum* var. *purpureum* – K, Z]



17. Collinsonia Linnaeus 1753 (Horsebalm, Richweed, Stoneroot)

A genus of about 4 species, perennial herbs, of e. North America. References: Peirson, Cantino, & Ballard (2006)=Y; Shinners (1962b)=Z; Harley et al. in Kadereit (2004). Key adapted from Y and Z.

1 Inflorescence an unbranched thyrse, the lower nodes with (3-) 6 flowers per node; floral bracts absent; pedicels flattened at base; leaves (2-) 4 (-6), the 4 upper (or only) leaves subverticillate; flowers light pink to lavender; flowering April-June; [subgenus *Micheliella*] .... ***C. verticillata***

1 Inflorescence a panicle (rarely unbranched), the flowers 2 per node; floral bracts present, minute to large; pedicels not enlarged basally; leaves 6 or more, opposite; flowers cream to yellow; flowering July-September; [subgenus *Collinsonia*].

2 Fertile stamens 4; fresh plants with anise scent; [GA southward and westward] ..... ***C. anisata***

2 Fertile stamens 2; fresh plants with lemon scent; [collectively widespread in our area].

3 Blades of the larger stem leaves 4.0-10.5 cm long, with 5-15 teeth on each margin, glabrous or hispidulous on the main veins beneath; plant from a small, rounded tuber-like crown, to 6 cm long and 5 cm in diameter ..... ***C. tuberosa***

3 Blades of the larger stem leaves 8-25 cm long, with 11-42 teeth on each margin, glabrous or variously pubescent beneath; plant from an elongate, woody, rhizome-like crown, to 15 cm long.

4 Calyx 2-5 mm long; calyx teeth lance-subulate to narrowly lanceolate; flowers 8-13 mm long ..... ***C. canadensis***

4 Calyx 4.5-7 mm long; calyx teeth broadly lanceolate; flowers 12-17 mm long ..... ***C. punctata***

Collinsonia anisata Sims, Southern Horsebalm, Anise Horsebalm. Pd (GA), Cp (FL, GA): rich forests; uncommon. Late July-September; September-October. C. GA south and west to Panhandle FL and west to s. MS, on the Piedmont and Coastal Plain. This species is apparently distinct, but Shinners's concept of it included hybrids with *C. canadensis* and aberrant *C. canadensis* (Peirson, Cantino, & Ballard 2006). [= Y; < *Collinsonia serotina* Walter – K, W, WH, Z; < *C. canadensis* var. *punctata* (Elliott) A. Gray –F, misapplied; < *C. punctata* Elliott – S; *? Micheliella anisata* (Sims) Briquet – S]

Collinsonia canadensis Linnaeus, Richweed, Northern Horsebalm. Mt (GA, NC, SC, VA, WV), Pd (DE, GA, NC, SC, VA), Cp (DE, FL, GA, NC, SC, VA): cove forests, rich forests, especially over calcareous or mafic substrates; common (rare in VA Coastal Plain). Late July-September; September-October. QC, MI, and WI, south to Panhandle FL and LA. [= RAB, C, F, G, K, S, W, WV, Z; < *C. canadensis* – Y (also see *C. tuberosa*)]

Collinsonia punctata Elliott, Florida Horsebalm. Cp (FL, GA, SC): rich woods; rare. Late August-mid October; September-October. S. SC (Barnwell County) to e. LA, on the Coastal Plain. [= Y; < *Collinsonia serotina* – K, WH, Z]

Collinsonia species 1. Pd (GA). Under study by Steve Bowling. {not yet keyed}

Collinsonia tuberosa Michaux, Stoneroot. Pd (GA, NC, SC), Mt (GA): rich forests, over calcareous or mafic substrates; rare (NC Watch List). Late July-September; September-October. C. NC west to c. TN, south to n. GA and MS (or LA?). Peirson, Cantino, & Ballard (2006) conclude that *C. tuberosa* should be merged into *C. canadensis*, a conclusion not followed here. [= RAB, K, S, W, Z; < *C. canadensis* – Y; = *C. canadensis* Linnaeus var. *tuberosa* (Michaux) A. Wood]

Collinsonia verticillata Baldwin, Whorled Horsebalm. Pd (GA, NC, SC, VA), Mt (GA): rich forests, ranging from moist (cove) forests to rather dry oak forests over mafic or calcareous rocks; rare. Late April-early June; June-July. Sc. VA west to e. TN, south to w. NC, nw. SC, c. GA, and MS; disjunct in s. OH. The range is strangely scattered and fragmented. [= RAB, C, G, K, W, Y, Z; = *Micheliella verticillata* (Baldwin) Briquet – F, S]

18. Elsholtzia Willdenow 1790

A genus of about 35-40 species, herbs, of temperate e. hemisphere. References: Harley et al. in Kadereit (2004).

* ***Elsholtzia ciliata*** (Thunberg) Hylander. Mt (NC, WV): disturbed areas; rare, native of Asia. First reported for NC by Leonard (1971b). [= C, F, G, K, WV]

19. Mosla (Bentham) Buchanan-Hamilton ex Maximowicz 1875 (Mosla)

A genus of about 10-22 species, of e. Asia. References: Harley et al. in Kadereit (2004).

* ***Mosla dianthera*** (Buchanan-Hamilton ex Roxburgh) Maximowicz, Mosla. Mt (GA, NC), Pd (VA): disturbed areas; rare, native of e. Asia. August-September. This species is becoming a noxious weed west of our area (in KY and TN); it should be expected to become more widespread in our area. [= RAB, F, G, K; = *Orthodon dianthera* (Buchanan-Hamilton) Handel-Mazzetti – C]

20. Perilla Linnaeus 1764 (Perilla, Beefsteak-plant)

A genus of about 1-6 species, herbs, of s. and e. Asia. References: Harley et al. in Kadereit (2004).

* ***Perilla frutescens*** (Linnaeus) Britton, Perilla, Beefsteak-plant. Pd (DE, GA, NC, SC, VA), Mt (GA, NC, SC, VA, WV), Cp (DE, FL, GA, NC, SC, VA): moist disturbed areas; common (uncommon in DE Coastal Plain, rare in FL), native of India. August-October; October-December. Two varieties are sometimes recognized. Var. *crispa* (Bentham) Deane (leaves purple above and below; leaf margins laciniate-dentate and also crisped) and var. *frutescens* (leaves purple below; leaf margins dentate, not crisped). These probably represent cultivars more than taxonomically distinct entities. [= RAB, C, G, S, W, WH; > *P. frutescens* var. *frutescens* – F, K, WV; > *P. frutescens* (Linnaeus) Britton var. *crispa* (Bentham) Deane – F, K, WV]

Agastache Clayton ex Gronovius 1762 (Giant-hyssop)

A genus of about 22 species, herbs, of c. and e. Asia, and North America to Mexico. References: Vogelmann (1985); Lint & Epling (1945); Harley et al. in Kadereit (2004).

1 Leaves densely white tomentose below; corolla blue; [cultivated as an ornamental and rarely naturalized] ..... ***A. foeniculum***
1 Leaves glabrous to villous beneath, appearing green; corolla yellow, greenish-yellow, or pinkish; [native].
  2 Corolla yellow or greenish-yellow; calyx lobes obtuse or subacute, 1-1.5 mm long at anthesis; calyx lobes and bracts green; midstem internodes glabrous or minutely pubescent; lower surface of the leaf pubescent on the veins and surface..... ***A. nepetoides***
  2 Corolla pinkish; calyx lobes acute or acuminate, 2-2.5 mm long at anthesis; calyx lobes and bracts with white or pink margins; midstem internodes at least sparsely long-pubescent; lower surface of the leaf pubescent mainly on the veins ..... ***A. scrophulariifolia***

* ***Agastache foeniculum*** (Pursh) Kuntze, Lavender Giant-hyssop. Pd (DE, NC): disturbed areas, spread from cultivatiuon; rare, native of w. North America. Cultivated as an ornamental and naturalized in scattered locations in PA (Rhoads & Klein 1993), KY (Kartesz 1999), and elsewhere. [= C, F, G, K]

Agastache nepetoides (Linnaeus) Kuntze, Yellow Giant-hyssop. Pd (DE, NC, SC, VA), Cp (DE, NC, VA), Mt (GA, NC, VA, WV): woodlands and forests, generally over calcareous or mafic rocks; uncommon (rare in DE, rare in Coastal Plain of NC and VA). July-September; September-October. VT west to MN, south to nw. GA and OK. In our area, this species occurs mostly in the Piedmont. [= RAB, C, F, G, K, S, W]

Agastache scrophulariifolia (Willdenow) Kuntze, Purple Giant-hyssop. Mt (GA, NC, VA, WV), Pd (DE, NC, VA): rich woodlands and forests, bottomlands; uncommon (rare in GA and DE). July-September; September-October. VT west to MN, south to NC, e. TN, n. GA, and e. KS. [= K; = *A. scrophulariaefolia* – RAB, C, G, S, W, an orthographic variant; > *A. scrophulariaefolia* var. *scrophulariaefolia* – F; > *A. scrophulariaefolia* var. *mollis* (Fernald) Heller – F]

Blephilia Rafinesque 1819 (Woodmint, Pagoda-plant)

A genus of 3 species, herbs, of e. North America. References: Simmers & Kral (1992)=Z; Harley et al. in Kadereit (2004).

1 Stem glabrate below the middle; leaf lower surface glabrous or with a few unicellular hairs on the midvein; [of moist forests over limestone in n. AL] ..... ***B. subnuda***
1 Stem strongly pubescent below the middle; leaf lower surface distinctly pubescent, at least on the larger nerves; [of various moist to dry forests, woodlands, and meadows, collectively widespread in our area].
2 Lobes of the lower lip of the calyx linear, approaching the sinuses of the upper lip; outer bracteoles acute; leaves with rounded to acutish tips (rather *Prunella*-like); petioles 1-7 (-12) mm long; stem canescent, rarely with intermixed long trichomes; [primarily in the Piedmont] ..... ***B. ciliata***
2 Lobes of the lower lip of the calyx deltoid, not reaching the sinuses of the upper lip; outer bracteoles long-acuminate; leaves with acuminate to acute tips (rather *Monarda*-like); petioles 9-42 mm long; stem densely to sparsely pubescent with long, spreading trichomes; [primarily in the Mountains]..... ***B. hirsuta***

Blephilia ciliata (Linnaeus) Bentham. Pd (DE, GA, NC, SC, VA), Mt (GA, NC, SC, VA, WV), Cp (NC, SC, VA): woodlands, meadows, forests, usually in circumneutral soils (over diabase, limestone, etc.); uncommon (rare in DE, rare in Coastal Plain of VA). May-early July; August-October. MA and WI south to c. GA and AR. [= RAB, C, F, G, K, S, W, Z]

Blephilia hirsuta (Pursh) Bentham. Mt (NC, VA, WV), Pd (DE, NC, VA), {GA}: rocky or alluvial forests, montane forests up to at least 5000 feet elevation; common (uncommon in Mountains of VA, rare in DE and Piedmont of VA). Late June-October; August-November. QC and MN south to NC, AL, AR, and e. TX. [= RAB, C, G, S, W, Z; > *B. hirsuta* var. *hirsuta* – F, K]

Blephilia subnuda R.W. Simmers & Kral. Moist calcareous forests. Endemic (so far as is known) to the Cumberland Plateau of nc. AL (Jackson and Madison counties). [= K, Z]

Chaiturus Willdenow 1787 (Horehound Motherwort)

A monotypic genus, an herb, of Europe and n. Asia.

* ***Chaiturus marrubiastrum*** (Linnaeus) Reichenbach, Horehound Motherwort. Mt (VA, WV), Pd (DE, VA): disturbed areas; rare, native of Europe and n. Asia. June-September. [= K; = *Leonurus marrubiastrum* Linnaeus – C, F, G, S]

Clinopodium Linnaeus 1753 (Calamint)

A genus of about {??} 20 species (as here circumscribed), herbs and shrubs, of temperate and subtropical areas of the w. and e. hemispheres. References: Cantino & Wagstaff (1998)=Y; Shinners (1962a)=Z; Shinners (1962f)=X. Key adapted in part from Z.

1 Flowers 1 per leaf axil ..... ***C. brownei***
1 Flowers > 1 per leaf axil.
2 Plant a shrubby perennial, not flowering the first year; [of sandy or rocky habitats of the Coastal Plain and Piedmont, from s. NC southward].
3 Corolla bright scarlet, 27-50 mm long; calyx 8-18 mm long ..... ***C. coccineum***
3 Corolla light lavender or pink with darker spots, 10-20 mm long; calyx 5.0-7.5 mm long.
4 Leaves ovate or elliptic, sharply serrate, not revolute; leaves distinctly petioled; leaf surfaces glabrous ..... ***C. georgianum***
4 Leaves linear to linear-elliptic, entire, strongly revolute; leaves subsessile; leaf surfaces minutely and densely pubescent..... ***C. ashei***
2 Plant an herbaceous to suffrutescent perennial, often flowering the first year; [of various habitats, collectively widely distributed in our area].
5 Stem glabrous or pubescent at the nodes only; leaves of flowering stems linear to oblanceolate; [native, of limestone glades, barrens, and bluffs].
6 Plant stoloniferous, bearing leafy stolons with ovate leaves; leaves of the flowering stems 1-2 cm long, 1-5 mm wide, entire..... ***C. arkansanum***
6 Plant not bearing leafy stolons; leaves of the flowering stems oblanceolate, 2.5-5 cm long, 5-17 mm wide, with several teeth on each side ..... ***C. glabellum***
5 Stem pubescent; leaves of flowering stems elliptic to ovate; [alien or native, generally of disturbed or weedy situations].
7 Axillary flower clusters in peduncled, contracted cymes.
8 Calyx 6.0-10.2 mm long, the hairs inside the throat barely or not exserted; blades of larger stem leaves 2-5 cm long ..... ***C. ascendens***
8 Calyx 2.8-6.0 mm long, the hairs inside the throat exserted, prominent; blades of the larger stem leaves 0.8-2.4 cm long..... ***C. calamintha***
7 Axillary flower clusters sessile, dense.
9 Corolla 4-5 mm long; calyx 2.5-5.5 mm long ..... ***C. gracile***
9 Corolla 7-22 mm long; calyx 4.5-10 mm long.
10 Whorls with 8 or fewer flowers; calyx 4.5-7 mm long; corolla 7-10 mm long..... ***C. acinos***
10 Whorls with > 8 flowers; calyx 7-10 mm long; corolla 12-22 mm long ..... ***C. vulgare***

* ***Clinopodium acinos*** (Linnaeus) Kuntze, Mother-of-thyme, Basil-thyme. Mt (VA, WV): cultivated, rarely escaped or persisting; rare, native of Europe. [= *Satureja acinos* (Linnaeus) Scheele – C, F, G; = *Acinos arvensis* (Lamarck) Dandy – K]

Clinopodium arkansanum (Nuttall) House, Arkansas Calamint. Mt (VA): dry limestone glades; rare (VA Rare). ON west to MN, south to w. NY, nw. PA, w. VA, WV, IL, c. TN, and s. WI; also in MO, OK, AR, and TX. There appears to be confusion about the identities and distributions of this taxon and *C. glabellum*. [= K, Y; = *Satureja glabella* (Michaux) Briquet var. *angustifolia* (Torrey) Svenson – C, G; = *Satureja arkansana* (Nuttall) Briquet – F; < *Calamintha arkansana* (Nuttall) Shinners – GW (also see *Clinopodium glabellum*); = *Calamintha arkansana* (Nuttall) Shinners – Z; < *Clinopodium glabellum* (Michaux) Kuntze – S]

* ***Clinopodium ascendens*** (Jordan) Sampaio, Common Calamint. Cp (VA): rich calcareous slope; rare, native of Europe. August. [= *Calamintha sylvatica* Bromfield ssp. *ascendens* (Jordan) P.W. Ball – K; *? Calamintha officinalis* – Z]

Clinopodium ashei (Weatherby) Small, Ashe's Calamint, Ashe's Savory, Ohoopee Dunes Wild Basil. Cp (GA): xeric sandhills; rare. Peninsular FL (south of our area); disjunct in e. GA (Candler and Tatnall counties). [= K, S, Y; = *Calamintha ashei* (Weatherby) Shinners – WH, Z; = *Satureja ashei* Weatherby]

Clinopodium brownei (Swartz) Kuntze, Browne's Savory. Cp (FL, GA, SC): floodplain forests, pondshores; uncommon (rare in GA and SC). In sw. GA (Jones & Coile 1988). Reported for SC (Beaufort County, SC) (Daniel Payne, pers.comm. 2006, specimen at CLEMS). [= K; > *Micromeria pilosiuscula* (A. Gray) Small – S; > *Micromeria brownei* (Swartz) Bentham var. *pilosiuscula* A. Gray – GW, WH, X]

* ***Clinopodium calamintha*** (Linnaeus) Stace, Lesser Calamint, Basil-thyme. Mt (NC, VA), Pd (NC, VA), Ip (KY), Cp (NC, VA), {GA}: disturbed areas; common (uncommon in NC), native of Europe. July-October. [> *Satureja calamintha* (Linnaeus) Scheele var. *nepeta* (Linnaeus) Briquet – RAB, F, G, W; = *Satureja calamintha* (Linnaeus) Scheele – C; > *Satureja calamintha* var. *calamintha* – F; > *Satureja calamintha* var. *nepetoides* (Jordan) Briquet – F, G; > *Satureja calamintha* var. *glandulosa* (Riquien) Briquet – F; > *Calamintha nepeta* (Linnaeus) Savi ssp. *nepeta* – K; > *Calamintha nepeta* ssp. *glandulosa* (Riquien) P.W. Ball – K; = *Clinopodium nepeta* (Linnaeus) Kuntze – S; > *Calamintha officinalis* Moench – Z; > *Calamintha nepeta* (Linnaeus) Savi – Z]

Clinopodium coccineum (Nuttall ex Hooker) Kuntze, Scarlet Calamint, Scarlet Wild Basil, Red Mint Shrub. Cp (FL, GA): sandhills and flatwoods; uncommon. E. GA south to c. peninsular FL, west to s. MS. [= K, S, Y; = *Calamintha coccinea* (Nuttall ex Hooker) Bentham – WH, Z; = *Satureja coccinea* (Nuttall ex Hooker) Bertolini]

Clinopodium georgianum R.M. Harper, Georgia Calamint. Cp (FL, GA, NC, SC), Pd (GA, NC, SC): longleaf pine sandhills, dry rocky or sandy woodlands; uncommon (rare in FL and NC). July-September. S. NC south to Panhandle FL and west to LA. [= K, S, Y; = *Satureja georgiana* (R.M. Harper) Ahles – RAB; = *Calamintha georgiana* (R.M. Harper) Shinners – WH, Z]

Clinopodium glabellum (Michaux) Kuntze. Ip (KY): dry-mesic to mesic shaley forests, limestone barrens; uncommon. Nc. KY, c. TN, south to c. AL; MO and AR. Reports of this for VA (Kartesz 1999) are apparently based on confusion with *Clinopodium arkansanum*. [= Y; = *Satureja glabella* (Michaux) Briquet var. *glabella* – C; = *Clinopodium glabellum* (Michaux) Kuntze – K; < *Calamintha arkansana* (Nuttall) Shinners – GW; < *Clinopodium glabellum* (Michaux) Kuntze – S; = *Calamintha glabella* (Michaux) Bentham]

* ***Clinopodium gracile*** (Bentham) Kuntze, Slender Wild Basil. Cp (AL, FL, LA, MS): disturbed areas, bottomland forests; rare, native of Asia. June-August; August-October. Introduced in s. AL, FL, LA (Kartesz 1999; Woods, Diamond, & Searcy 2003) and MS (S.W. Leonard, pers. comm. 2005). [= K, WH] {add to synonymy}

Clinopodium vulgare Linnaeus, Wild Basil. Mt (KY, NC, VA, WV), Pd (DE, NC, VA), Cp (DE, NC, VA), Ip (KY): pastures, roadbanks, forests, thin soils around rock outcrops; common (uncommon in DE Piedmont, rare in DE Coastal Plain). July-September. NL (Newfoundland) to MB, south to NC, sc. TN, and KS, scattered in the west, widespread in Europe. Plants in our area may reflect both native and introduced genotypes. [= K, S, Y, Z; = *Satureja vulgaris* (Linnaeus) Fritsch – RAB, C, F, G, W; > *Satureja vulgaris* var. *vulgaris* – F; > *Satureja vulgaris* var. *diminuta* (Simon) Fernald & Wiegand – F; > *Satureja vulgaris* var. *neogaea* Fernald – F; > *Clinopodium vulgare* var. *neogaea* (Fernald) C.F. Reed]

Clinopodium dentatum (Chapman) Kuntze, Florida Calamint, Toothed Savory. Cp (FL, GA): sandhills and xeric steepheads; rare. Endemic to sw. GA and Panhandle FL. [= K, S; = *Satureja dentata* (Chapman) Briquet; = *Calamintha dentata* Chapman – WH] {not yet keyed; add to synonymy}

Clinopodium species 1, Indian Grave Mountain Wild Basil. It occurs in montane longleaf pine/chestnut oak/Georgia oak woodlands on Hollis quartzite along the main Pine Mountain ridge. Under study by Jim Allison. {not yet keyed}

Conradina A. Gray 1870 (Conradina, Rosemary)

A genus of 6 species, shrubs and suffrutescent herbs, of temperate se. North America. References: Edwards et al. (2009)=Y; Shinners (1962g)=Z; Harley et al. in Kadereit (2004). Key based in part on Y.

1 Leaves oblanceolate, slightly revolute, the leaf undersurface mostly visible and showing 1-4 raised lateral veins; [Putnam County, FL, adjacent to the coverage area].
  2 Calyx 8.5-11 mm long, the upper lobe 3.6-4.4 mm long; cyme 1-5-flowered; unicellular hairs of the lower leaf surface thin-walled, collapsing and flattened in drying; [ec. Putnam County, FL] ..... ***C. cygniflora***
  2 Calyx 7-8.5 mm long, the upper lobe 1.8-3.5 mm long; cyme 3-7-flowered; unicellular hairs of the lower leaf surface thick-walled, terete to conical, unchanged in drying; [nw. Putnam County, FL] ..... ***C. etonia***
1 Leaves either linear and strongly revolute such that essentially only the midvein is visible on the undersurface (*C. canescens*) or linear to narrowly oblanceolate, slightly to strongly revolute, some leaf surface sometimes showing on the leaf undersurface, but lacking raised lateral veins (*C. glabra* and *C. verticillata*); [collectively more widespread].
  3 Leaves densely gray-pubescent above and below; midrib on lower leaf surface densely gray-pubescent to gray-pilose..... ***C. canescens***
  3 Leaves green above, glabrous or inconspicuously short-pubescent; midrib on lower leaf surface glabrous or glabrate, contrasting with the more densely pubescent lower leaf surface.
    4 Plants upright to 8 dm tall; calyx tube glabrous or minutely and inconspicuously puberulent; [Coastal Plain of Panhandle FL and s. AL] ..... ***C. glabra***

4 Plants decumbent, rooting at the nodes; calyx tube densely short-pubescent and also pilose with longer glandular hairs; [Cumberland Plateau of KY and TN]..... ***C. verticillata***

Conradina canescens A. Gray, Gray Rosemary. Cp (AL, FL, MS): sandhills, scrub, flatwoods; uncommon. January-May. Panhandle FL and s. AL west to s. MS. [= K, WH, Y, Z; > *C. canescens* – S; > *C. puberula* Small – S]

Conradina cygniflora C.E. Edwards, Judd, Ionta, & Herring, Swan-flowered Rosemary. Cp (FL): sand pine scrub and sandhills; rare. September-October. Endemic to ec. Putnam County, FL. [= Y; < *C. etonia* – WH]

Conradina etonia Kral & McCartney, Etoniah Rosemary. Cp (FL): sand pine scrub and sandhills; rare. Endemic to nw. Putnam County, FL. [= Y; < *C. etonia* – WH]

Conradina glabra Shinners, Apalachicola Rosemary. Cp (AL, FL): sandhills; rare. Panhandle FL and s. AL. [= K, WH, Y, Z]

Conradina verticillata Jennison, Cumberland Rosemary. Mt (KY, TN): flood-scoured cobble bars of large rivers; rare. Endemic to the Cumberland Plateau area of ne. TN and se. KY. It has an odor similar to rosemary, and showy purplish flowers. [= K, Y, Z; = *C. montana* Small – S]

Cunila D. Royen ex Linnaeus 1759 (Stone-mint, American-dittany, Wild-oregano)

A genus of about 15 species, herbs, from e. North America to South America. References: Harley et al. in Kadereit (2004).

Cunila origanoides (Linnaeus) Britton, Stone-mint, American-dittany, Wild-oregano. Mt (GA, NC, SC, VA, WV), Pd (DE, NC, SC, VA), Cp (DE, NC, VA): dry rocky slopes, other dry slopes; common (rare in DE and NC Coastal Plain, rare in DE Piedmont). S. NY and PA west to MO, south to c. SC, n. GA, OK, and ne. TX (Singhurst & Holmes 2004). [= RAB, C, F, G, K, W, WV; = *Mappia origanoides* (Linnaeus) House – S]

Dicerandra Bentham 1830 (Dicerandra)

A genus of 9 species, herbs, endemic to se. North America. References: Huck (1987)=Z; Huck (1984)=Y; Ward (2009d)=X; Huck & Chambers (1997); Harley et al. in Kadereit (2004).

1 Corolla tubular, straight or slightly curved; superior lobe cucullate (hoodlike); stamens and style arching under the hooded upper lobe of the corolla, included or slightly exserted beyond its apex; filaments inserted at 2 levels within the corolla; odor of fresh plant cinnamon-like, spicy; [section *Lecontea*].
  2 Corolla tube ca. 18 mm long, the orifice ca. 2 mm wide; leaves (15-) avg. 25 (-45) mm long, linear, the margins entire; [s. SC south through much of the Coastal Plain of GA]..... ***D. odoratissima***
  2 Corolla tube >20 mm long, the orifice ca. 4 mm wide; leaves (19-) avg. 40 (-55) mm long, narrowly oblong, the margins often dentate; [endemic to McIntosh County, GA]..... ***D. radfordiana***
1 Corolla funnel-shaped, the tube geniculate; superior corolla lobe a lobed, flaring standard; stamens and style exserted, the stamens either widely flaring to the sides or declined along the lower lobe of the corolla; filaments inserted at the same level within the corolla; odor of fresh plant minty; [section *Dicerandra*].
  3 Cymes epedunculate; flowers nearly sessile in compact verticils; pollen white to pale yellow; anther spurs obtuse to barely acute, with domes of minute hairs..... ***D. densiflora***
  3 Cymes on peduncles 3-6 mm long; flowers on pedicels (3-) avg. 5 (-9) mm long; pollen bright yellow; anther spurs acuminate, glabrous.
    4 Leaves linear; cymes 3-flowered; corolla white to pale purple; anthers vivid yellow; [widespread in the Coastal Plain of GA south to ne. FL and s. AL]..... ***D. linearifolia*** *var.* ***linearifolia***
    4 Leaves narrowly rhombic; cymes 5-7-flowered; corolla purplish red to vivid purple; anthers strongly reddish brown; [extreme s. GA south into e. Panhandle FL and ne. FL]..... ***D. linearifolia*** *var.* ***robustior***

Dicerandra densiflora Bentham, Florida Balm. Cp (FL): longleaf pine sandhills; rare. October-early November. Reported for GA by Small (1933), but this report is apparently in error; Huck (1987) regards it as endemic to n. peninsular FL. This taxon is tetraploid. [= K, S, WH, X, Y, Z]

Dicerandra linearifolia (Elliott) Bentham *var.* ***linearifolia***. Cp (AL, FL, GA): sandhills and flatwoods; uncommon. Mid September-late November. W. and ec. Coastal Plain of GA south to ne. FL and s. AL. This taxon is hexaploid. [= K, WH, X, Y, Z; < *D. linearifolia* – S]

Dicerandra linearifolia (Elliott) Bentham *var.* ***robustior*** R.B. Huck. Cp (FL, GA): sandhills and flatwoods; uncommon. Late September-late November. Sc. Coastal Plain of GA (Brooks, Echols, Lowndes counties) (Huck 1987) south to e. Panhandle FL and ne. FL. This taxon is tetraploid. [= K, WH, X, Y, Z; < *D. linearifolia* – S]

Dicerandra odoratissima R.M. Harper. Cp (GA, SC): sandhills; uncommon (SC Rare). Late August-early October. S. SC south to se. GA. This taxon is tetraploid. [= RAB, K, S, Y, Z]

Dicerandra radfordiana R.B. Huck, Radford's Dicerandra. Cp (GA): dry flatwoods and sandhills; rare (GA Special Concern). September-October. Endemic to e. GA (McIntosh County). This species was postulated to be a polyploid derivative of *D. odoratissima* by Huck (1984, 1987); later study has shown that this is not the case (Huck & Chambers 1997). Both taxa are tetraploid. [= K, Y, Z]

Dracocephalum Linnaeus 1753 (Dragon's-head)

A genus of about 45-70 species, herbs, of Eurasia and North America. References: Harley et al. in Kadereit (2004). [also see *Physostegia*]

* ***Dracocephalum parviflorum*** Nuttall, Dragon's-head. Pd (DE, NC), WV (Mt): cultivated ground; rare, native west of the Appalachians. May-July; July-September. [= C, F, G, K, WV; = *Moldavica parviflora* (Nuttall) Britton – RAB]

Glechoma Linnaeus 1753 (Gill-over-the-ground)

A genus of about 4-10 species, herbs, of temperate Eurasia. References: Harley et al. in Kadereit (2004).

* ***Glechoma hederacea*** Linnaeus, Gill-over-the-ground, Ground-ivy. Mt (GA, NC, SC, VA, WV), Pd (DE, GA, NC, SC, VA), Cp (DE, FL, NC, SC, VA): lawns, gardens, disturbed areas; common (rare in FL, rare in DE Coastal Plain), native of Eurasia. Late March-June; May-July. [= C, K, WH; = *Glecoma hederacea* – RAB, S, W, misspelled; > *G. hederacea* var. *hederacea* – F, WV; > *G. hederacea* var. *micrantha* Moricand – F, WV; > *Glecoma hederacea* var. *parviflora* (Bentham) House – G]

Hedeoma Persoon 1807 (American Pennyroyal)

A genus of about 38-42 species, herbs, of North America, Central America, and South America. References: Irving (1980)=Z; Harley et al. in Kadereit (2004).

1 Leaves elliptic, 4-11 mm wide, slightly to strongly crenate; nutlets subspherical, 0.7-1.0 mm long, 0.6-0.9 mm wide, the surface smoothish, mottled, not glaucous; [subgenus *Hedeoma*] ..... ***H. pulegioides***
1 Leaves linear to narrowly elliptic, 1-4 mm wide, entire; nutlets narrowly ovoid, 1.0-1.3 mm long, 0.4-0.6 mm wide, the surface areolate and strongly glaucous; [subgenus *Saturejoides*].
  2 Calyx teeth convergent, closing the orifice at maturity; bracteoles subtending the individual flower pedicels 1-2 mm long, about ½ as long as the pedicel; leaves (5.0-) avg. 7.7 (-11.0) mm long, (1.2-) avg. 2.2 (-4.0) mm wide, 3-5× as long as wide ..... ***[H. drummondii]***
  2 Calyx teeth spreading (the upper) to slightly convergent (th lower), not closing the orifice at maturity; bracteoles subtending the individual flower pedicels (1.5-) 2.5-6 mm long, generally as long as or longer than the pedicel; leaves (11.0-) avg. 16.4 (-21.0) mm long, (1.0-) avg. 2.2 (-3.0) mm wide, > 5× as long as wide ..... ***H. hispida***

*? ***Hedeoma hispida*** Pursh, Rough Pennyroyal. Pd (GA, SC, VA), Mt (GA, WV*), Cp (FL, GA): disturbed areas, pastures, granitic flatrocks; rare, apparently adventive from further south and west. Irving (1980) shows *H. hispida* east to e. Panhandle FL, c. AL, nc. TN, and s. OH; it may be recently arrived further east or previously overlooked. First reported for SC by Hill & Horn (1997). [= C, F, G, K, WV, Z; = *H. hispidum* – WH (orthographic variant)]

Hedeoma pulegioides (Linnaeus) Persoon, American Pennyroyal. Mt (GA, NC, SC, VA, WV), Pd (DE, GA, NC, SC, VA), Cp (DE, NC, SC, VA): dry soils of woodlands, roadbanks, woods-roads, especially common in shaly parts of the VA and WV mountains; common (uncommon in NC and SC). Late July-October. NS, s. QC, s. ON, MI, WI, and IA south to c. SC, c. GA, and AR. The fragrant oil is apparently very similar to that of the European Pennyroyal, *Mentha pulegium* Linnaeus. The oil is a powerful insect repellent and insecticide, often used on pets to repel fleas. It is also poisonous to humans, however, at least in substantial quantities. It is sometimes used as a tea; native Americans are reputed to have used it as an abortion inducer. This plant should be used with great caution, if at all. [= RAB, C, F, G, K, S, W, WV, Z]

Hedeoma drummondii Bentham. Cp (AL, MS): black belt prairies; rare. MN and MT south to TX and CA; disjunct eastwards to AR, MS, and AL, where it occurs in black belt prairies. [= K, Z]

Hyptis Jacquin 1786 (Cluster Bushmint)

A genus of about 280-300 species, herbs and shrubs, of warm temperate, subtropical, and tropical America. References: Harley et al. in Kadereit (2004).

1 Flowers borne in large, globose heads, 1.5-2.5 cm across, borne on peduncles 2-6 cm long; leaves lanceolate, narrowed to a narrowly cuneate, subpetiolar base ..... ***H. alata***
1 Flowers borne in irregular verticillate spikes, sessile to pedunculate on peduncles 1-2 mm long; leaves **either** ovate to deltate, narrowed to a broadly cuneate to truncate base and well-developed petiole (4-6 cm long on larger leaves), **or** lanceolate and narrowed to a cuneate, subpetiolar base.
  2 Stem scabrous on the angles; corolla blue-purple; leaves ovate to deltate ..... ***H. mutabilis***
  2 Stem glabrous or pubescent; corolla white; leaves lanceolate ..... ***H. verticillata***

Hyptis alata (Rafinesque) Shinners, Musky Mint, Cluster Bushmint. Cp (FL, GA, NC, SC): wet pine savannas, margins of swamp forests, wet powerline rights-of-way, ditches; common. Late June-September. Ne. NC south to s. FL, west to se. TX; West Indies. [= RAB, GW, K, WH; = *H. radiata* Willdenow – S]

* ***Hyptis mutabilis*** (A. Richard) Briquet, Tropical Bushmint. Cp (FL, GA, SC, VA); moist disturbed areas; common (uncommon in GA, rare in SC and VA), native of South America. [= GW, K, S, WH]

* ***Hyptis verticillata*** Jacquin, John Charles. Cp (FL): hammocks, disturbed areas; rare, native of tropical America. [= K, S, WH]

Hyssopus Linnaeus 1753 (Hyssop)

A genus of 2-5 species, herbs, of s. Europe to c. Asia. References: Harley et al. in Kadereit (2004).

* ***Hyssopus officinalis*** Linnaeus, Hyssop. {NC} Reported for NC (see G and S); documentation not known. Native of Eurasia. July-October. [= RAB, C, F, G, K, S]

Leonotis (Persoon) R. Brown 1810 (Lion's-ears)

A genus of about 9 species, herbs, shrubs, and small trees, of sub-Saharan Africa. References: Iwarsson & Harvey (2003)=Z.

* ***Leonotis nepetifolia*** (Linnaeus) Aiton f. *var.* ***nepetifolia***, Lion's-ears, Lightning-rod-plant. Cp (FL, GA, NC, SC), Pd (GA, NC, SC): pastures, disturbed areas; uncommon, native of s. Africa. Late August-October. [= Z; < *L. nepetifolia* – K, WH; < *L. nepetaefolia* – RAB, S, orthographic variant]

Lycopus Linnaeus 1753 (Bugleweed, Water-horehound)

A genus of about 10-14 species, herbs, of temperate Eurasia, North America, and Australia. References: Sorrie (1997)=Z; Harley et al. in Kadereit (2004). Key adapted from Sorrie.

1 Calyx lobes acute at the apex, shorter than or equaling the nutlets.
  2 Plant without tubers; leaf base tapered to a long, winged petiole; corolla lobes 4, erect; leaf teeth (6-) avg. 8.6 (-11) per side ... ***L. virginicus***
  2 Plant usually with tubers; leaf base subsessile or tapered to a short, winged petiole; corolla lobes 4 or 5, all or some spreading; leaf teeth (2-) avg. 5.0 (-7) per side.
    3 Corolla lobes 4, one erect and three spreading; nutlet tubercles well-developed, deeply toothed; leaf teeth (2-) avg. 4.5 (-6) per side; [fall-line sandhills of NC and SC] ... ***L. cokeri***
    3 Corolla lobes 5, spreading; nutlet tubercles weakly developed, undulate; leaf teeth (4-) avg. 5.4 (-7) per side; [Mountains, upper Piedmont, and VA Coastal Plain] ... ***L. uniflorus***
1 Calyx lobes acuminate to subulate-tipped, much exceeding the nutlets.
  4 Nutlet tubercles not developed or only weakly so.
    5 Calyx 2.0-3.3 mm long; stems and branches glabrous to sparsely pubescent with hairs < 0.5 mm long; leaf teeth sharply acute to short-acuminate ... ***L. americanus***
    5 Calyx 3.0-4.5 mm long; stems and branches densely to sparsely pubescent with hairs 0.5-1.6 mm long; leaf teeth blunt to acute ... ***L. europaeus***
  4 Nutlet tubercles well developed.
    6 Leaves evidently petiolate, the petioles narrowly winged ... ***L. rubellus***
    6 Leaves sessile or subsessile.
      7 Leaves ovate to lanceolate, usually rounded at the base, scarcely reduced upward on the stem ... ***L. amplectens***
      7 Leaves lanceolate to linear, cuneate at the base, upper leaves conspicuously narrower (and often also shorter) than the lower leaves ... ***L. angustifolius***

Lycopus americanus Muhlenberg ex W. Barton, American Bugleweed. Cp (DE, FL, GA, NC, SC, VA), Pd (DE, NC, VA), Mt (GA, VA, WV): marshes, bottomlands; common (rare in FL and GA). June-November. NL (Newfoundland) west to BC, south to FL Panhandle and CA. See comment under *L. europaeus* about hybridization between *L. americanus* and *L. europaeus*. [= RAB, C, GW, K, S, W, WH, WV, Z; > *L. americanus* var. *americanus* – F, G; > *L. americanus* var. *longii* Benner – F, G; > *L. americanus* var. *scabrifolius* Fernald – F]

Lycopus amplectens Rafinesque, Clasping Water-horehound. Cp (DE, FL, GA, NC, SC), Mt? (NC?), {VA}: clay-based Carolina bays, other moist habitats; uncommon (rare in DE). June-November. MA south to ne. FL; disjunct inland around the Great Lakes and (allegedly) in w. NC. [= RAB, C, GW, K, W, WH, Z; > *L. amplectens* var. *amplectens* – F, G; > *L. amplectens* var. *pubens* (Britton) Fernald – F, G; > *L. pubens* Britton – S; > *L. sessilifolius* A. Gray – S]

Lycopus angustifolius Elliott, Narrowleaf Bugleweed, Southern Bog Water-horehound. Cp (FL, GA, NC, SC, VA): bogs, marshes; uncommon. June-November. Se. VA south to FL, west to e. TX, north in the interior to s. TN and s. MO. [= C, Z; = *L. rubellus* Moench var. *angustifolius* (Elliott) Ahles – RAB, GW; = *L. rubellus* Moench var. *lanceolatus* Benner – F; < *L. rubellus* – G, K, W, WH]

Lycopus cokeri Ahles ex Sorrie, Coker's Bugleweed, Carolina Bugleweed. Cp (NC, SC): sandhill pocosins, boggy streamheads, seepage bogs; uncommon. July-November. Endemic to the fall-line sandhill region of sc. NC and SC. See Sorrie (1997) for a detailed discussion of this species. [= RAB, K, Z; < *L. uniflorus* Michaux – GW]

* ***Lycopus europaeus*** Linnaeus, Gypsywort, European Bugleweed. Cp (DE, NC, VA), Pd (DE), Mt (WV): marshes, ditches; common (uncommon in NC and VA, rare in WV), native of Europe. June-November. In the Great Lakes and St. Lawrence River regions, hybrid swarms involving *L. americanus* and *L. europaeus* are numerous (Webber & Ball 1980). However, to date there is no evidence that these species have hybridized within the Flora region. [= RAB, C, G, K, S, Z; > *L. europaeus* var. *europaeus* – F; > *L. europaeus* var. *mollis* (Kern.) Briq. – F]

Lycopus rubellus Moench, Stalked Bugleweed. Cp (DE, FL, GA, NC, SC, VA), Pd (NC, SC, VA), Mt (GA, VA, WV*): marshes, swamp forests, bottomlands; common (rare in WV, rare in VA Mountains). June-November. ME west to MI, south to FL and TX. [= C, S, Z; = *L. rubellus* var. *rubellus* – RAB, GW; < *L. rubellus* – G, K, W, WH (also see *L. angustifolius*); > *L. rubellus* – S; > *L. velutinus* Rydberg – S]

Lycopus uniflorus Michaux, Northern Bugleweed. Mt (NC, SC, VA, WV), Pd (DE, NC, VA), Cp (DE): bogs, seeps, wet forests; common. July-October. NL (Newfoundland) west to AK, south to w. NC, AR, and CA. [= RAB, C, F, G, S, W, WV, Z; < *L. uniflorus* – GW (also see *L. cokeri*); > *L. uniflorus* var. *uniflorus* – K]

Lycopus virginicus Linnaeus, Virginia Bugleweed. Cp (DE, FL, GA, NC, SC, VA), Pd (DE, GA, NC, SC, VA), Mt (GA, NC, SC, VA, WV): swamps, bottomlands, other wet habitats; common. July-November. MA west to PA, s. IN, MO, and OK, south to n. peninsular FL, Panhandle FL, and e. TX. [= RAB, C, F, G, GW, K, S, W, WH, WV, Z]

Meehania Britton 1894 (Meehania)

A genus of 2-6 species, herbs, ours in temperate e. North America, and the other species in e. Asia. References: Harley et al. in Kadereit (2004).

Meehania cordata (Nuttall) Britton, Meehania. Mt (NC, VA, WV): moist, rocky, forested slopes; common (uncommon in VA, rare in NC). Late May-July; June-July. A Central and Southern Appalachian endemic: sw. PA and OH south to sw. VA, nw. NC, and ne. TN. [= RAB, C, F, G, K, S, W, WV]

Melissa Linnaeus 1753 (Balm)

A genus of 3-4 species, herbs, from Europe to Iran and c. Asia. References: Harley et al. in Kadereit (2004).

* ***Melissa officinalis*** Linnaeus, Lemon Balm, Common Balm. Mt (NC, SC, VA, WV), Pd (DE, NC, SC, VA), Cp (VA): disturbed areas; uncommon (rare in NC, SC, and VA), native of w. Asia. [= RAB, C, F, G, K, S, W]

Mentha Linnaeus 1753 (Mint)

A genus of about 20-25 species, herbs, of temperate Eurasia and n. North America. References: Stace (2010)=Z; Tucker & Naczi (2007)=Y; Denslow & Poindexter (2009); Harley et al. in Kadereit (2004). Key largely adapted from C, Y, and Z.

Identification notes: The distribution, habitats, phenology, and abundance of all *Mentha* species need substantial additional herbarium investigation.

1 Flowers in axillary verticils subtended by ordinary foliage leaves, and separated by internodes of ordinary length.
- 2 Calyx glabrous throughout, or pubescent toward the tips only; calyx 2-3.5 mm long; plants usually sterile; fresh plant usually with spearmint odor or flavor ..... ***M. ×gracilis***
- 2 Calyx pubescent throughout its length; calyx 1.5-2.5 mm long; plants usually fertile; fresh plant usually with a rather unpleasant odor of flavor.
  - 3 Leaves subtending the inflorescence mostly broadly rounded at the base; leaves of the inflorescence relatively narrow; [alien] ..... ***M. arvensis ssp. arvensis***
  - 3 Leaves subtending the inflorescence mostly cuneate at the base; leaves of the inflorescence relatively broad; [native, though often in weedy situations] ..... ***M. canadensis***

1 Flowers in terminal spikes or heads, the subtending leaves absent or distinctly smaller than the foliage leaves.
- 4 Inflorescence a terminal globose to ovoid head of 1-3 verticils.
  - 5 Pedicels, calyx, and leaves pubescent; plants usually fertile ..... ***M. aquatica*** *var.* ***aquatica***
  - 5 Pedicels and clayx glabrous, leaves glabrous or nearly so; plants usually sterile ..... ***M. aquatica*** *var.* ***citrata***
- 4 Inflorescence a spike of several to many verticils.
  - 6 Bracteal leaves much longer than the flowers, resembling the foliage leaves, but smaller or narrower ..... ***M. ×gracilis***
  - 6 Bracteal leaves linear to laneolate, little surpassing the flowers.
    - 7 Calyx tube glabrous; leaves glabrous, or with scattered hairs on the lower surface.
      - 8 Petioles of the main leaves 4-15 mm long; spikes stout; plants sterile; fresh plant with peppermint odor or flavor ..... ***M. ×piperita*** *var.* ***piperita***
      - 8 Petioles of the main leaves 0-3 mm long; spikes slender; plants fertile; fresh plant with spearmint odor or flavor ..... ***M. spicata*** *var.* ***spicata***
    - 7 Calyx tube pubescent; leaves moderately to densely hairy on the lower surface.
      - 9 Leaves lanceolate to oblong-lanceolate, > 3× as long as wide.
        - 10 Hairs of the leaf undersurface unbranched; leaves widest near the middle, slightly rugose; fertile anthers 0.28-0.38 mm long; fresh plant with musty flavor or odor ..... ***M. longifolia*** *ssp.* ***longifolia***
        - 10 Hairs of the leaf undersurface dendritic; leaves oblong lanceolate, widest towards the base, conspicuously rugose; fertile anthers 0.38-0.52 mm long; fresh plant with spearmint odor or flavor ..... ***M. spicata*** *var.* ***spicata***
      - 9 Leaves oblong to ovate, 1-3× as long as wide.

11 Leaves generally 1-2× as long as wide, ovate-orbicular, broadly rounded to subcordate at the base, obtuse at the apex; leaf serrations rounded and often turned downward (thus appearing crenate); leaf surface strongly rugose, with scattered dendritic hairs below; fresh plant with sickly or sweet flavor or odor ..... ***M. suaveolens***

11 Leaves generally 1-3× as long as wide, ovate to oblong, broadly cuneate to rounded at the base, acute at the apex; leaf serrations sharp; leaf surface moderately rugose; fresh plant with spearment odor.

12 Leaves generally oblong, with nearly parallel sides and a broadly rounded base; flowers consistently with 4 fertile anthers .... ***M. ×rotundifolia***

12 Leaves generally ovate, infrequently oblong; flowers typically with all or mostly sterile anthers ..... ***M. ×villosa***

* ***Mentha aquatica*** Linnaeus *var.* ***aquatica***, Water Mint, Lemon Mint. Cp (DE), Mt (WV), {NC, VA}: disturbed areas; uncommon, native of Europe. [= Y; = *M. aquatica* – C, F, G, S, Z; < *M. aquatica* – K (also see *Mentha aquatica* var. *citrata*)]

* ***Mentha aquatica*** Linnaeus *var.* ***citrata*** (Ehrhart) Fresen., Lemon Mint, Orange Mint, Bergamot Mint. {VA} native of Europe. [= Y; = *M. ×piperita* Linnaeus (pro sp.) var. *citrata* (Ehrhart) Briquet (pro sp.) – Z; = *M. ×citrata* Ehrhart – C; = *M. citrata* – F, G, S; < *M. aquatica* – K]

* ***Mentha arvensis*** Linnaeus *ssp.* ***arvensis***, Field Mint. Pd (DE), Mt (VA, WV): marshes, disturbed areas; uncommon (rare in VA and WV), native of Europe. [= Y; = *M. arvensis* var. *arvensis* – C, F, G; = *M. arvensis* Linnaeus – S, Z; = *M. arvensis* ssp. *arvensis* – Y; < *M. arvensis* – K]

Mentha canadensis Linnaeus, Canada Mint. Mt (VA, WV), Cp (DE, VA), Pd (DE, VA), {NC}: moist soils; common. {distribution} [= S, Y; = *M. arvensis* Linnaeus var. *canadensis* (Linnaeus) Kuntze – C; ? *M. arvensis* – RAB, misapplied; ? *M. gentilis* Linnaeus – RAB; = *M. arvensis* var. *villosa* (Bentham) S.R. Stewart – F, WV; > *M. arvensis* var. *glabrata* (Bentham) Fernald – G; > *M. arvensis* var. *lanata* Piper – G; = *M. arvensis* Linnaeus ssp. *canadensis* (Linnaeus) H. Hara; < *M. arvensis* – K]

* ***Mentha ×gracilis*** Sole (pro sp.) [*Mentha arvensis* × *spicata*], Spearmint. Mt (VA, WV), Pd (VA), Cp (VA), {NC, SC}: moist soils; rare, native of Europe. [= K, Y, Z; > *M. cardiaca* (S.F. Gray) Gerarde ex Baker – RAB, F, G, WV; ? *M. gentilis* Linnaus (pro sp.) – C; > *M. gentilis* Linnaeus – F, WV]

* ***Mentha longifolia*** (Linnaeus) Linnaeus *ssp.* ***longifolia***, Horse Mint. {VA} Native of Europe. [= Y; < *M. longifolia* – RAB, C, G, WV; > *M. longifolia* (Linnaeus) Hudson var. *longifolia* – F; > *M. longifolia* var. *undulata* (Willdenow) Fiori & Paoletti – F]

* ***Mentha ×piperita*** Linnaeus (pro sp.) *var.* ***piperita*** [*Mentha aquatica* × *spicata*], Peppermint. Cp (DE, FL, VA), Pd (DE, VA), Mt (VA), {GA, NC, SC}: disturbed areas; uncommon, native of Europe. [= C, K, Y, Z; = *M. piperita* – RAB, G, S, WV; > *M. piperita* – F; > *M. crispa* Linnaeus – F; < *M. ×piperita* – WH]

* ***Mentha ×rotundifolia*** (Linnaeus) Hudson (pro sp.) [*Mentha longifolia* × *suaveolens*]. Mt (NC, VA), Pd (VA), Cp (VA), {GA, SC}; rare, native of Europe. [= C, K, Y; = *M. rotundifolia* – G, S, WV]

* ***Mentha spicata*** Linnaeus *var.* ***spicata***, Spearmint. Mt (VA), Pd (DE, VA), Cp (FL, VA), {GA, NC, SC}: disturbed areas; uncommon (rare in FL and VA Coastal Plain), native of Europe. [= Y; < *M. spicata* – RAB, C, F, G, K, S, WH, WV, Z]

* ***Mentha suaveolens*** Ehrhart *ssp.* ***suaveolens***, Apple Mint, Pineapple Mint, Round-leaved Mint. Cp (DE, FL, NC), Mt (NC), Pd (DE, NC?), {SC, VA?}: disturbed areas; rare, native of Europe. See Denslow & Poindexter (2009) for helpful information on distinguishing *M. suaveolens* from *M. ×rotundifolia*. [= Y; < *M. suaveolens* – C, K, WH, Z]

* ***Mentha ×villosa*** Hudson (pro sp.) [*Mentha spicata* × *suaveolens*]. Introduced south to PA and KY. [= C, K, Z; > *M. alopecuroides* Hull – F; > *M. ×villosa* var. *villosa* – Y; > *M. ×villosa* var. *alopecuroides* (Hull) Briquet – Y] {not yet keyed}

* *Mentha pulegium* Linnaeus var. *pulegium*, European Pennyroyal. Introduced in MD, PA, and NJ (Kartesz 1999). [= Y; < *M. pulegium* – C, G, K, Z] {not yet keyed}

* ***Mentha ×verticillata*** Linnaeus (pro sp.) [*Mentha arvensis* × *aquatica*]. Mt (WV): most soils; rare, native of Europe. [= C, K, WV, Z] {add synonymy; not yet keyed}

Monarda Linnaeus 1753 (Bergamot)

A genus of about 12-20 species, herbs, of North America. Many of our species are cultivated, especially *M. didyma* in various selected forms. Additional studies are needed on a number of taxonomic problems in *Monarda*. Most of the varieties recognized above have been considered valid by a succession of workers; they do seem to describe morphologically distinguishable (if not entirely discrete) entities which make phytogeographic sense. References: McClintock & Epling (1942)=Z; Scora (1967)=Y; Fosberg & Artz (1953)=X; Gill (1977); Prather & Keith (2003); Harley et al. in Kadereit (2004).

1 Flowers in 2-6 glomerules, terminal and at 2-5 successive nodes down the stem; stamens included; leaves lanceolate to narrowly elliptic, usually broadest near the middle and tapered to a cuneate base, (2.5-) 3-8× as long as wide.

2 Calyx lobes attenuated into a spinose awn 2-7 mm long; corolla white to pink; inner bracts subtending the flowers 4-9 mm wide, abruptly acuminate into a spinose bristle ..... ***M. citriodora* var. *citriodora***

2 Calyx lobes narrowly to broadly triangular, acute or long-acuminate but not awned; corolla yellow, spotted with purple; inner bracts 8-14 mm wide, acuminate.

3 Lower leaf surface moderately to densely silvery-tomentose; stem densely villous with spreading or downwardly-curved coarse hairs, lacking coarse, horizontal bristles and short downwardly-curved hairs..... ***M. punctata* var. *villicaulis***

3 Lower leaf surface pubescent mainly on the midvein and other main veins, appearing green; stem pubescent with short downwardly-curved hairs, also with coarse, horizontal bristles and/or upwardly-curved hairs.

4 Stem with many coarse horizontal bristles, also pubescent with short, downwardly-curved hairs; leaves (40-) 50-70 (-95) mm long, 10-28 mm wide (at least some over 15 mm wide), averaging ca. 3× as long as wide ..... ***M. punctata* var. *arkansana***

4 Stem with few or no coarse horizontal bristles, also pubescent with a mixture of upwardly-curved and downwardly-curved hairs; leaves (25-) 35-55 (80) mm long, 5-17 mm wide (the widest very rarely over 15 mm wide), averaging ca. 4× as long as wide .... ***M. punctata* var. *punctata***

1 Flowers in 1 (-2) glomerule, terminal (rarely also 1 at the next node down the stem); stamens exserted; leaves ovate to ovate-lanceolate, broadest near the rounded, truncate, or subcordate base, 1.5-3 (-4)× as long as wide.
5 Corolla 30-45 mm long, scarlet-red, (3-) 4-8 mm broad at the expanded portion of the throat; [primarily of mountain seepages, streambanks, and boggy places] ..... ***M. didyma***
5 Corolla 14-33 (-36) mm long, white, lavender, or purple, 1-3 (-4) mm broad at the expanded portion of the throat; [of various habitats, usually dryish to mesic].
6 Leaves deltoid-ovate to ovate, 2-6 cm wide, usually ca. 2× as long as wide; orifice of the calyx glabrous to slightly hirsute with a few long hairs; upper lip of the corolla 5-8 mm long and not bearded (*M. clinopodia*) or 13-16 mm long and slightly bearded (*M. media*) near its apex; outer surface of the corolla glabrous to evenly pubescent with short curled hairs.
7 Corolla white, greenish, or pale pink, the lower lip purple-spotted; outer bracts subtending the inflorescence green or pale (rarely with a purplish midvein); upper lip of the corolla 5-8 mm long, not bearded..... ***M. clinopodia***
7 Corolla deep purple, the lower lip usually not spotted; outer bracts subtending the inflorescence purple to red; upper lip of the corolla 13-16 mm long and slightly bearded near its apex..... ***M. media***
6 Leaves narrowly-deltoid, ovate-lanceolate to lanceolate, 1-4 cm wide, usually ca. 3× as long as wide; orifice of the calyx densely hirsute with numerous erect, stiff, white hairs; upper lip of the corolla prominently bearded near its apex; outer surface of the corolla evenly pubescent with short curled hairs.
8 Corolla deep purple; middle lobe of the lower corolla lip 4-6 mm long; outer bracts subtending the inflorescence reddish ..... ***M. fistulosa*** *var.* ***rubra***
8 Corolla lavender, rose, or nearly white; middle lobe of the lower corolla lip 2-4 mm long; outer bracts subtending the inflorescence green (rarely the midvein only reddish).
9 Plants 10-30 cm tall; leaves subcoriaceous, glabrous, dark green, shiny; calyx 5-8 mm long, the lobes conspicuously pustulate-glandular; [of limestone glades and barrens]..... ***M. fistulosa*** *var.* ***brevis***
9 Plants 30-130 cm tall; leaves herbaceous, pubescent, light to medium green, not shiny; calyx 7-11 mm long, the lobes not pustulate-glandular; [of various habitats].
10 Pubescence of the petioles and lower leaf surface hirsute or villous, the trichomes spreading, 1-3 mm long ..... ***M. fistulosa*** *var.* ***fistulosa***
10 Pubescence of the petioles and lower leaf surface canescent, the trichomes appressed (sometimes also with an admixture of longer, spreading trichomes) ..... ***M. fistulosa*** *var.* ***mollis***

* ***Monarda citriodora*** Cervantes ex Lagasca y Segura *var.* ***citriodora***, Lemon Bergamot. Cp (FL, GA, SC): disturbed places: rare, native of sc. United States (centered in TX). June-July; July-August. [= Y; < *M. citriodora* – RAB, F, G, WH; = *M. citriodora* ssp. *citriodora* var. *citriodora* – K; *? M. dispersa* – S; = *M. citriodora* ssp. *citriodora* – Z]

Monarda clinopodia Linnaeus, Basil Bergamot. Mt (NC, SC, VA), Pd (DE, NC, SC, VA): mesic, forested slopes; common (uncommon in VA Piedmont, rare in DE). Late May-September; July-October. NJ, w. NY, and IL, south to n. GA and c. AL (some of the range perhaps accountable to cultivation). There appear to be a number of chemical races in *M. clinopodia* which may warrant taxonomic status. [= RAB, C, F, G, K, S, W, Y, Z; = *M. fistulosa* Linnaeus var. *clinopodia* (Linnaeus) Cooperrider]

Monarda didyma Linnaeus, Bee-balm, Oswego Tea. Mt (NC, SC, VA, WV), Pd (DE*, NC, VA), Cp* (NC*): seepage slopes, periglacial boulderfields with abundant seepage, streambanks, boggy places, usually in strong to moderately filtered sunlight; common (rare in Piedmont, rare in Coastal Plain, rare in SC). July-September; September-October. ME west to MI, south to PA and OH, and in the Appalachians south to sw. NC, se. TN, and ne. GA (part of the northern range is likely only by introduction). McClintock & Epling (1942) describe 2 forms of *M. didyma*: the "broad-leaved form," with leaves averaging 9.2 cm long and 5.2 cm wide and corollas averaging 35 mm long, ranging south to sc. PA and ne. WV, and the "narrow-leaved form," with leaves averaging 11.8 cm long and 4.4 cm wide and corollas averaging 39 mm long, occurring throughout the range of the species. Further study seems warranted. [= C, F, G, K, S, W, WV, Y, Z; < *M. didyma* – RAB (also see *M. media*)]

Monarda fistulosa Linnaeus *var.* ***brevis*** Fosberg & Artz, Smoke Hole Bergamot, Cedar Glade Bergamot. Mt (VA, WV): limestone outcrops, cliffs, barrens, and glades, and on limestone talus; rare. June-August; July-October. Apparently endemic to w. VA (Giles County) and e. WV. This variety is seemingly very distinct (Kimball et al. 2002). It had been collected only a very few times prior to the work of Bartgis (1993), who found it to be a characteristic plant of limestone barrens and woodlands in localized areas in the Ridge and Valley Province of WV. It flowers about a month earlier than *M. fistulosa* in the vicinity (Bartgis, pers. comm.). [= WV, X, Y; = *M. fistulosa* ssp. *brevis* (Fosberg & Artz) Scora, comb. nov. ined. – K; < *M. fistulosa* – W]

Monarda fistulosa Linnaeus *var.* ***fistulosa***, Appalachian Bergamot. Mt (NC, VA, WV), Pd (DE, NC, VA): moist wooded slopes, roadsides, woodland edges, old fields; common (rare in DE). June-September; August-October. CT south to sw. NC, nearly or entirely limited to the Appalachians. I have interpreted var. *fistulosa* and var. *mollis* somewhat differently than some previous workers. A more coherent geographic pattern is achieved by limiting var. *fistulosa* to plants with spreading hairs only. [= F, WV, X, Y; < *M. fistulosa* – RAB, W; = *M. fistulosa* ssp. *fistulosa* var. *fistulosa* – K; < *M. fistulosa* var. *fistulosa* – C, G, Z (also see var. *mollis*); = *M. fistulosa* – S]

Monarda fistulosa Linnaeus *var.* ***mollis*** (Linnaeus) Bentham, Eastern Bergamot. Mt (NC, SC, WV), Pd (DE, NC, SC), {GA, VA}: moist wooded slopes; common (rare in DE and WV). June-September; August-October. See comments under var. *fistulosa*. ME west to MN, south to GA, AL, and se. TX. [= F, WV, X, Y; < *M. fistulosa* – RAB, W; < *M. fistulosa* var. *fistulosa* – C, G, Z; = *M. fistulosa* ssp. *fistulosa* var. *mollis* (Linnaeus) Bentham – K; > *M. mollis* Linnaeus – S; > *M. scabra* Beck – S]

Monarda fistulosa Linnaeus *var.* ***rubra*** A. Gray, Purple Bergamot. Mt (NC, VA), {GA}: moist slope forests; rare (NC Watch List). ME to NJ, and from nw. NC to n. GA, in the Appalachians. Perhaps native only in the Southern Appalachians. A problematic taxon; see *M. media* for comments. [= X, Y, Z; < *M. fistulosa* – RAB, W; = *M. fistulosa* ssp. *fistulosa* var. *rubra* A. Gray - K; < *M. media* – C, F, S]

Monarda media Willdenow, Purple Bee-balm. Mt (GA, NC, VA, WV): grassy balds, moist slopes, mostly at high elevations; rare. July-September; September-October. VT west to IN, south to w. MD; disjunct in w. NC and sw. TN, part of the range perhaps the result of cultivation. *M. media* is a problematic taxon, especially in combination with *M. fistulosa* var. *rubra*.

Many have suggested that *M. media* is the result of hybridization or introgression of *M. didyma* with either *M. fistulosa* or *M. clinopodia*, or both (see Scora 1967). Scora (1967) implies that *M. media* consists of hybrids, backcrosses, and "introgressive elements" involving all three pairwise combinations, and the three-way combination, but that *M. fistulosa* var. *rubra* is not of hybrid origin. Needed are studies of *M. media*, *M. fistulosa* var. *rubra*, and their possible parents which go beyond the herbarium and determine the genetics, origin, and population structure of these taxa. It seems best for the moment to recognize (or to attempt to!) *M. media* and *M. fistulosa* var. *rubra* in order to foster additional observation and study, hopefully leading to a more definite understanding of their taxonomic status(es). [= G, K, Z; < *M. didyma* – RAB; < *M. media* – C, F, S, WV (also see *M. fistulosa* var. *rubra*); = *M.* ×*media* Willdenow (pro sp.) – W, Y]

Monarda punctata Linnaeus *var.* ***arkansana*** (McClintock & Epling) Shinners, Arkansas Horse-mint. Mt (NC), Pd (GA): dryish forests over mafic rock; rare. McClintock & Epling (1942) map and discuss this taxon as endemic to AR and immediately adjacent TX, but mention that "a specimen collected near Columbus, Polk County, North Carolina (Townsend, 1897) is scarcely different from subsp. *arkansana*." Scora (1967) treats var. *arkansana* as similarly endemic, though he cites (but does not map) a specimen from Cherokee County, GA and annotated (following the publication of his paper) a later collection from Polk County, NC as var. *arkansana*. The Polk County, NC material is manifestly var. *arkansana* and might be considered merely aberrant or a chance introduction, were it not for its repeated collection and the phytogeographic interest of the Blue Ridge Escarpment of Polk County, which harbors numerous Ozarkian and other Midwestern disjuncts, such as *Veratrum woodii.* [= Y; < *M. punctata* – RAB, S, W; = *M. punctata* ssp. *punctata* var. *arkansana* (McClintock & Epling) Shinners – K; = *M. punctata* ssp. *arkansana* McClintock & Epling – Z]

Monarda punctata Linnaeus *var.* ***punctata***, Eastern Horse-mint. Cp (DE, FL, GA, NC, SC, VA), Pd (GA, NC, SC, VA), Mt (GA, NC, SC, VA): maritime forests, dunes, roadsides, rocky or sandy woodlands; common (uncommon in Piedmont and GA, NC, and SC Mountains, rare in VA Mountains). Late July-September; September-October. NJ to s. FL, west to TX, mainly on the Coastal Plain, but extending inland southward. [= C, F, Y; < *M. punctata* – RAB, S, W, WH; = *M. punctata* ssp. *punctata* – G, Z; = *M. punctata* ssp. *punctata* var. *punctata* – K]

Monarda punctata Linnaeus *var.* ***villicaulis*** (Pennell) Palmer & Steyermark, Hairy-stem Horse-mint. Cp (NC): disturbed areas, rare, perhaps only adventive in our area. August; October. NY west to MN, south to TN, AR, and OK. [= C, F, Y; < *M. punctata* – RAB, S, W; = *M. punctata* ssp. *villicaulis* Pennell – G, Z; = *M. punctata* ssp. *punctata* var. *villicaulis* (Pennell) Palmer & Steyermark – K]

Monarda bradburiana Beck. East to c. TN (Chester, Wofford, & Kral 1997), KY, and AL. [= G, K; < *M. russeliana* – C, F] {not yet keyed; synonymy incomplete}

Monarda russeliana Nuttall ex Sims, White Beebalm. East to AL and KY. [= G, K; = *M. virgata* Rafinesque – C; < *M. russeliana* – F (also see *M. bradburiana*)] {not yet keyed; synonymy incomplete}

Nepeta Linnaeus 1753 (Catnip, Catmint)

A genus of about 250 species, herbs, of Eurasia and n. Africa. References: Harley et al. in Kadereit (2004).

* ***Nepeta cataria*** Linnaeus, Catnip, Catmint. Mt (GA, NC, VA, WV), Pd (DE, NC, VA), Cp (DE, NC, SC, VA): fencerows, barnyards, disturbed areas; common (uncommon in DE, GA, NC, and SC, uncommon in VA Piedmont, rare in VA Coastal Plain), native of Eurasia. [= RAB, C, F, G, K, S, W, WV]

Ocimum Linnaeus 1753 (Basil)

A genus of about 65 species, herbs and shrubs, of warm temperate and tropical areas. References: Harley et al. in Kadereit (2004).

* ***Ocimum basilicum*** Linnaeus, Basil. Cp (FL, GA, NC, SC), Pd (GA, NC, SC): commonly cultivated in gardens, rarely persistent for short times around gardens or as a waif on trash-heaps, probably not persistent; commonly cultivated, rarely persistent, native of tropical Asia and tropical Africa. [= C, G, K, S, WH]

Origanum Linnaeus 1753 (Oregano, Marjoram)

A genus of about 36-40 species, herbs and dwarf shrubs, of Eurasia. References: Harley et al. in Kadereit (2004).

* ***Origanum vulgare*** Linnaeus, Wild Marjoram. Mt (NC, VA), Pd (DE), Cp (DE): commonly cultivated in gardens, persistent around gardens or as a waif; rare, native of Eurasia. July-September. [= RAB, C, G, K, S]

Piloblephis Rafinesque 1838 (Florida Pennyroyal)

A monotypic genus, a shrub, of se. North America. References: Harley et al. in Kadereit (2004).

Piloblephis rigida (Bartram ex Bentham) Rafinesque, Florida Pennyroyal. Cp (GA): xeric oak scrub, with *Quercus myrtifolia*; rare. S. GA; c. to s. peninsular FL. [= K, WH; = *Pycnothymus rigidus* (Bartram ex Bentham) Small – S; = *Satureja rigida* Bartram ex Bentham]

Prunella Linnaeus 1753 (Self-heal, Heal-all)

A genus of about 4-7 species, herbs, of n. temperate areas. References: Harley et al. in Kadereit (2004).

1 Upper leaves pinnatifid; flowers creamy yellow or white (rarely pale blue) ..... ***P. laciniata***
1 Upper leaves entire to obscurely toothed; flowers blue-violet (rarely pink or whitish).
2 Principal or median cauline leaves lanceolate to oblong, (2-) avg. 3 (-5)× as long as wide; leaf cuneate at the base..... ***P. vulgaris*** *var.* ***lanceolata***
2 Principal or median cauline leaves ovate to ovate-oblong, (1.5-) avg. 2 (-2.5)× as long as wide; leaf broadly rounded at the base..... ***P. vulgaris*** *var.* ***vulgaris***

* ***Prunella laciniata*** (Linnaeus) Linnaeus, Cutleaf Self-heal. Mt (NC!, VA), {GA}: disturbed areas; rare, native of Eurasia. [= RAB, C, G, K, S]

Prunella vulgaris Linnaeus *var.* ***lanceolata*** (W. Barton) Fernald, American Self-heal. Pd (DE), Cp (DE), {Mt, Pd, Cp (FL, GA, NC, SC, VA, WV): disturbed areas, pastures, roadsides, bottomland forests; other forests and woodlands; common. April-December. Additional herbarium work is needed to determine the relative ranges, distributions, habitats, and abundances of the two varieties. NL (Newfoundland) west to AK, south to NC, SC?, TN, MO, KS, NM, AZ, and CA. [= C, F, G; < *P. vulgaris* – RAB, S, W; = *P. vulgaris* ssp. *lanceolata* (W. Barton) Hultén – K]

* ***Prunella vulgaris*** Linnaeus *var.* ***vulgaris***, Eurasian Self-heal. Pd (DE), {Mt, Pd, Cp (FL, GA, NC, SC, VA, WV): disturbed areas, pastures, roadsides, bottomland forests; other forests and woodlands; uncommon in DE, native of Eurasia. April-December. Additional herbarium work is needed to determine the relative ranges, distributions, habitats, and abundances of the two varieties, var. *vulgaris* and var. *lanceolata*. The possible additional recognition of var. *hispida* also needs assessment. Var. *hispida* Bentham, considered to have been originally e. Asian, is alleged to be widespread in se. United States. It differs from *P. vulgaris* var. *vulgaris* in having the "stems, petioles, and often the lower surfaces of leaves densely villous-hispid" (vs. "only sparingly and not conspicuously pilose" – F). [< *P. vulgaris* – RAB, S, W, WH; > *P. vulgaris* var. *vulgaris* – C, F, G; > *P. vulgaris* var. *hispida* Bentham – C, F, G; = *P. vulgaris* ssp. *vulgaris* – K]

Pycnanthemum Michaux 1803 (Mountain-mint, Wild-basil)

A genus of 20-25 species, herbs, of temperate North America. *Pycnanthemum* remains a complicated and difficult group, with speciation apparently having proceeded by allopolyploidy, autoploidy, and aneuploidy. Numerous aberrant forms and (probably) sterile hybrids complicate identification and understanding. References: Chambers (1993); Grant & Epling (1943)=Z; Chambers & Hamer (1992)=Y; Harley et al. in Kadereit (2004).

1 Leaves 1-15 mm wide (to 30 mm wide in *P. setosum*), mostly > 3× as long as wide (except in *P. nudum*); calyx lobes not tipped with a tuft of long, jointed bristles (except *P. clinopodioides*).
2 Longer calyx lobes 1.5-5 mm long, attenuate-aristate, stiff, whitened; [Coastal Plain pinelands, rarely in Mountain bogs with Coastal Plain affinities].
3 Principal stem leaves 5-15 mm wide ..... ***P. flexuosum***
3 Principal stem leaves 10-30 mm wide ..... ***P. setosum***
2 Longer calyx lobes 0.5-1.6 mm long, deltoid to narrowly triangular, not notably stiff (except in *P. tenuifolium*) or whitened; [widespread in our area, but mainly of the Piedmont and Mountains].
4 Leaves 10-15 mm wide (or more often even wider, to 25 mm wide, in *P. clinopodioides*); longer calyx lobes 0.7-1.6 mm long, tipped with a few long (1-3 mm) jointed bristles (*P. clinopodioides*) or not tipped (*P. nudum*).
5 Leaves 3-5× as long as wide, herbaceous; stems and leaves pubescent; [NC northward] ..... ***P. clinopodioides***
5 Leaves 1-2.5× as long as wide, coriaceous; stems and leaves glabrous; [se. SC southward] ..... ***P. nudum***
4 Leaves 1-12 (-15) mm wide; longer calyx lobes 0.5-1.5 mm long, variously pubescent but not tipped with a tuft of long jointed bristles.
6 Leaves glabrous on the lower and upper surface, with 2-3 pairs of lateral veins; stems glabrous on the faces and angles (rarely with a few small upwardly-curled hairs on the angles).
7 Leaves 5-15 mm wide, 1-2.5× as long as wide; calyx lobes and inner bracts of the inflorescence herbaceous ..... ***P. nudum***
7 Leaves 1-4 (-5.5) mm wide, 8-15× as long as wide; calyx lobes and inner bracts of the inflorescence semi-spinose, their tips subulate, thickened, and stiff..... ***P. tenuifolium***
6 Leaves pubescent at least on the lower surface along the midrib and main veins; leaves with 4-5 pairs of lateral veins; stems glabrous or pubescent on the faces, pubescent on the angles.
8 Stems pubescent on the angles only (or distinctly less pubescent on the faces); leaves 3-10 mm wide ..... ***P. virginianum***
8 Stems pubescent on the faces and angles, the hairs distributed more-or-less evenly; leaves 8-12 (-15) mm wide.
9 Longer calyx teeth 1.0-1.5 mm long, lanceolate and attenuate; bracts of the inflorescence and leaves glabrous or very sparsely pubescent on the upper surface..... ***P. torreyi***
9 Longer calyx teeth 0.5-1.0 mm long, narrowly deltoid; bracts of the inflorescence (and usually also the leaves) canescent on the upper surface..... ***P. verticillatum*** *var.* ***verticillatum***
1 Leaves broad, 15-40 mm wide, mostly 1.5-3× as long as wide; calyx lobes usually tipped with a tuft of long, jointed bristles (except *P. curvipes, P. muticum, P. setosum*).

10 Bracts of the inflorescence glabrous (or very sparsely pubescent) on the upper surface, the margins long-ciliate; calyx lobes and upper part (at least) of the tube with long spreading hairs (independent of the apical tufts) ..... ***P. montanum***
10 Bracts of the inflorescence puberulent on the upper surface, the margins not ciliate; calyx lobes and tube variously glabrous or puberulent (independent of the apical tufts).
11 Calyx lobes not tipped with a tuft of long, jointed bristles.
12 Calyx lobes 1.5-3 mm long, attenuated into a subulate tip; [Coastal Plain] ..... ***P. setosum***
12 Calyx lobes 0.5-1.2 mm long, triangular to narrowly triangular, acute to acuminate, but not subulate; [collectively widespread in our area].
13 Petioles 5-15 mm long; inflorescence corymbose, loose, the branches apparent; [dry rocky woodlands, in sw. NC, w. SC, and southward] ..... ***P. curvipes***
13 Petioles 0-3 mm long; inflorescence capitate, tight, the branches within the clusters not apparent; [moist habitats, widespread in our area] ..... ***P. muticum***
11 Calyx lobes usually tipped with a tuft of long, jointed bristles.
14 Calyx not distinctly bilabiate, all of the calyx lobes about the same length, the sinuses about the same depth.
15 Longer calyx lobes 1-2 mm long; [Mountains] ..... ***P. beadlei***
15 Longer calyx lobes 2.5-3 mm long; [Coastal Plain] ..... ***P. monotrichum***
14 Calyx distinctly bilabiate, the lower 2 lobes 1.5-2.5× longer than the upper 3 lobes, and separated from each other and the upper 3 lobes by deeper sinuses.
16 Leaves lanceolate, (10-) 15-25 mm wide, > 3× as long as wide ..... ***P. clinopodioides***
16 Leaves ovate, 13-50 mm wide, < 3× as long as wide.
17 Leaves of the lower and middle stem with lower surfaces glabrate, glandular-punctate, similar in color to the dark green upper surface; calyx 5-7 mm long ..... ***P. beadlei***
17 Leaves of the lower and middle stems with lower surface canescent, distinctly paler than the dark green upper surface; calyx 3-6.5 mm long.
18 Calyx lobes broadly triangular, their apices obtuse, acute, or somewhat acuminate; calyx tube > 2× as long as the longest (lower) calyx lobes.
19 Pubescence of the stem of dense, very small downwardly-curved hairs, usually mixed with scattered longer and spreading hairs ..... ***P. incanum*** *var.* ***incanum***
19 Pubescence of the stem of sparse, coarse, downwardly-curved hairs ..... ***P. incanum*** *var.* ***puberulum***
18 Calyx lobes narrowly triangular, their apices acuminate to attenuate; calyx tube 1-2× as long as the longest (lower) calyx lobes.
20 Mericarps 0.5-1.3 mm long, with a smooth surface, glabrous or with a few short hairs at the tip ..... ***P. loomisii***
20 Mericarps 1.2-1.5 mm long, with a rugose or pitted surface, densely pubescent at the tip.
21 Stems and lower leaf surfaces canescent, the short hairs often intermixed with longer, spreading ones ..... ***P. pycnanthemoides*** *var.* ***pycnanthemoides***
21 Stems and lower leaf surfaces with coarse, spreading hairs only ..... ***P. pycnanthemoides*** *var.* ***viridifolium***

Pycnanthemum beadlei (Small) Fernald, Beadle's Mountain-mint. Mt (GA, NC, SC, VA), Pd (NC): forests, woodland borders; uncommon (rare in GA and VA). August-September. A Southern Appalachian endemic: sw. VA and ne. TN south to sw. NC, nw. SC, and n. GA. A tetraploid species (n = 38), probably an allotetraploid derived from *P. montanum* × *muticum*. [= C, K, W, Y, Z; < *P. incanum* – RAB; = *Koellia beadlei* Small – S]

Pycnanthemum clinopodioides Torrey & A. Gray. Cp (NC, VA), Pd (DE, NC, VA), Mt (WV): forests, woodland borders; rare. July-September. MA south to NC, mostly on the Coastal Plain. A tetraploid species (n = 38). Probably an allotetraploid hybrid. [= C, F, K, Y, WV, Z; < *P. verticillatum* – RAB; = *Koellia clinopodioides* (Torrey & Gray) Kuntze – S]

Pycnanthemum curvipes (Greene) E. Grant & Epling, Tennessee Mountain-mint, Stone Mountain Mountain-mint. Mt (GA, NC), Pd (GA): dry rocky woodlands and rock outcrops (granite or mafic); rare. June-August. Sw. NC and se. TN south nc. GA and n. AL; disjunct in nc. TN (Chester, Wofford, & Kral 1997). A diploid species (n= 20). [= K, Y, Z; = *Koellia curvipes* Greene – S]

Pycnanthemum flexuosum (Walter) Britton, Sterns, & Poggenburg, Savanna Mountain-mint. Cp (FL, GA, NC, SC, VA), Mt (NC): moist to wet pine savannas, pocosin margins, mountain bogs, seepage areas on low elevation granite domes; common (rare in Mountains). June-September; September-October. Se. VA south to ne. FL, west to Panhandle FL and s. MS (Sorrie & LeBlond 2008) on the Coastal Plain; disjunct inland in bogs and rock outcrops of sw. NC with Coastal Plain affinities and in sc. TN. A diploid species (n = 18). Sometimes mistaken in vegetative condition for *Eupatorium leucolepis*, *P. flexuosum* can be distinguished by its square stem and aromatic odor. *Koellia hugeri* Small, alleged to differ details of the calyx, was established for the plants of bogs of the Blue Ridge; it apparently is not morphologically segregated from other variation within the species (Grant & Epling 1943). [= RAB, C, F, K, W, Y; = *P. hyssopifolium* Bentham – G, GW, Z; > *Koellia hyssopifolia* (Bentham) Britton – S; > *Koellia hugeri* Small – S]

Pycnanthemum incanum (Linnaeus) Michaux *var.* ***incanum***. Mt (NC, VA, WV), Pd (DE, NC, VA), Cp (DE): forests and woodland borders; common (uncommon in NC, rare in DE). Late June-August; September-October. VT west to s. OH and s. IL, south to nc. NC, w. NC, and nc. TN. A tetraploid species (n = 38). [= F, K; < *P. incanum* – RAB (also see *P. beadlei*, *P. loomisii*, *P. pycnanthemoides*); < *P. incanum* – C, G, W, Y; > *Koellia incana* (Linnaeus) Kuntze – S; > *Koellia dubia* (Gray) Small – S; = *P. incanum* – WV, Z; = *P. incanum* (Linnaeus) Michaux ssp. *incanum*]

Pycnanthemum incanum (Linnaeus) Michaux *var.* ***puberulum*** (E. Grant & Epling) Fernald. Mt (GA, NC, SC, WV), Pd (NC): forests and woodland borders; rare. Late June-August; September-October. WV and NC south to FL and AL. A tetraploid species (n = 38). [= F, K; < *P. incanum* – RAB (also see *P. beadlei*, *P. loomisii*, *P. pycnanthemoides*); < *P. incanum* – C, G, W, Y; < *Koellia incana* (Linnaeus) Kuntze – S; = *P. puberulum* E. Grant & Epling – WV, Z]

Pycnanthemum loomisii Nuttall, Loomis's Mountain-mint. Pd (GA, NC, SC, VA), Mt (GA, NC, SC, VA, WV), Cp (GA, NC, VA): forests and woodland borders; rare. Late June-August; September-October. VA west to IL, south to n. FL. A diploid

species (n = 19). [= C, K, WV, Y, Z; < *P. incanum* – RAB; = *P. incanum* var. *loomisii* (Nuttall) Fernald – F; < *P. pycnanthemoides* var. *pycnanthemoides* – G]

Pycnanthemum monotrichum Fernald. Cp (VA): sandy woodlands; rare. Allegedly endemic to se. VA. Perhaps only a hybrid or else likely more widespread and merely overlooked. [= F, G, K]

Pycnanthemum montanum Michaux, Appalachian Mountain-mint. Mt (GA, NC, SC, VA, WV): balds, woodlands, forests, and forest edges; uncommon (rare in VA and WV). June-August; September-October. W. VA and WV south through w. NC and e. TN to nw. SC and n. GA, a Southern Appalachian endemic. A diploid species (n = 20). [= RAB, C, F, G, K, Y, Z; = *Koellia montana* (Michaux) Kuntze – S]

Pycnanthemum muticum (Michaux) Persoon. Mt (GA, NC, SC, VA, WV), Cp (DE, GA, NC, SC, VA), Pd (DE, GA, NC, SC, VA), {GA}: bogs, wet meadows, moist to wet forests; common (uncommon in Piedmont, uncommon in DE Coastal Plain, rare in WV). June-August; September-October. MA west to MI and MO, south to FL and LA. A diploid, tetraploid, and hexaploid (?) species (n = 20, 40, ca. 54). [= RAB, C, F, G, GW, K, Y; = *Koellia mutica* (Michaux) Kuntze – S]

Pycnanthemum nudum Nuttall, Smooth Mountain-mint. Cp (FL, GA, SC): wet pine flatwoods; uncommon (rare in GA and SC). Se. SC south to n. peninsular FL, Panhandle FL, and se. AL. Small (1933) attributes this species to NC; the documentation is unknown (and doubtful). This is a diploid species (n = 20). [= GW, K, WH, Z; = *Koellia nuda* (Nuttall) Kuntze – S]

Pycnanthemum pycnanthemoides (Leavenworth) Fernald *var.* ***pycnanthemoides***. Mt (GA, NC, SC, VA), Pd (NC, SC, VA): forests and woodland borders; common. July-August. VA and IL south to w. SC and n. GA. A tetraploid species (n = 36). [= F, K; < *P. incanum* – RAB; < *P. pycnanthemoides* – C, Y; < *P. pycnanthemoides* var. *pycnanthemoides* – G (also see *P. loomisii*); < *Koellia pycnanthemoides* (Leavenworth) Kuntze – S; > *P. tullia* Bentham – Z]

Pycnanthemum pycnanthemoides (Leavenworth) Fernald *var.* ***viridifolium*** Fernald. Mt (GA, NC, SC, VA), Pd (GA, NC, SC, VA), Cp (FL, NC, VA): forests and woodland borders; uncommon (rare in FL). July-August. VA and WV south to ec. GA, AL, and Panhandle FL. A tetraploid species (n = 36). The recognition of this variety is doubtful. [= F, G, K; < *P. incanum* – RAB; < *P. pycnanthemoides* – C, WH, Y; > *Koellia pycnanthemoides* (Leavenworth) Kuntze – S; > *Koellia dubia* (A. Gray) Small – S; = *P. viridifolium* (Fernald) E. Grant & Epling – Z]

Pycnanthemum setosum Nuttall. Cp (DE, FL, GA, NC, SC, VA): dry pinelands; uncommon (rare in NC and VA). Mid June-August; August-October. NJ south to ne. FL and Panhandle FL, on the Coastal Plain; not known from MS (Sorrie & LeBlond 2008). See Wieboldt et al. (1998) for discussion of the taxonomy and rarity of this species. A tetraploid species (n = 38), probably an allotetraploid derived from *P. flexuosum* × *muticum*. [= RAB, C, GW, K, WH, Y; > *P. setosum* – F, G; > *P. umbratile* Fernald – F, G; = *Koellia aristata* (Michaux) Kuntze – S; = *P. aristatum* Michaux – Z]

Pycnanthemum tenuifolium Schrader. Mt (GA, NC, SC, VA), Pd (DE, GA, NC, SC, VA), Cp (DE, GA, NC, SC, VA): bogs, wet meadows, moist to wet forests; common (rare in FL). June-August; September-October. ME west to MN, KS, and OK, south to FL and TX. A diploid and tetraploid species (n = 20 and 40). [= RAB, C, F, GW, K, W, WH, Y; = *P. flexuosum* – G, Z, misapplied; = *Koellia flexuosa* – S, misapplied]

Pycnanthemum torreyi Bentham, Torrey's Mountain-mint. Mt (NC, SC?, VA), Pd (DE, VA), Cp (DE, VA), {GA?}: dry rocky woodlands, over mafic, ultramafic, or calcareous rocks, dry powerline rights-of-way; rare. NH west to IL, south to NC (and SC?). A tetraploid and hexaploid species (n = 40 and ca. 60). The epithet spelling 'torrei' is a correctable error under the Vienna code. [= C, G, Y, Z; < *P. verticillatum* – RAB; = *P. torrei* – K, orthographic variant; > *P. torrei* var. *torrei* – F; > *P. torrei* var. *leptodon* (Gray) Boomhour – F; = *Koellia leptodon* (Gray) Small – S]

Pycnanthemum verticillatum (Michaux) Persoon *var.* ***verticillatum***. Mt (NC, SC, VA), Pd (DE, NC, VA), Cp (DE, VA): upland rocky woodlands; common (uncommon in DE). July-September. Var. *verticillatum* ranges from VT west to MI, south to NC and KY. A tetraploid species (n = 38-39). [= C, K; < *P. verticillatum* – RAB (also see *P. clinopodioides*, *P. torrei*); = *P. verticillatum* – F, G, Y, Z; > *Koellia verticillata* (Michaux) Kuntze – S; > *Koellia leptodon* (A. Gray) Small – S; < *P. verticillatum* – W]

Pycnanthemum virginianum (Linnaeus) T. Durand & B.D. Jackson ex B.L. Robinson & Fernald, Virginia Mountain-mint. Mt (GA, NC, VA), Pd (DE, NC, VA), Cp (DE, VA?, NC?): wet meadows and marshes over calcareous or mafic rocks; common (uncommon in VA Mountains, rare in VA Piedmont and VA Coastal Plain, rare in GA and NC). June-September; September-October. ME west to ND, south to NC, nw. GA, n. AL, and OK. A tetraploid species (n = 40). [= RAB, C, F, G, GW, K, W, Y, Z; = *Koellia virginiana* (Linnaeus) MacMillan – S]

Pycnanthemum albescens Torrey & A. Gray, White-leaved Mountain-mint. Cp (FL), Pd (GA): bluff forests, hammocks, other open, mesic forests; common (rare in GA). Reported for NC by Small, as *Koellia albescens*. It is known from nc. GA (Jones & Coile 1988). [= C, F, G, K, WH; = *Koellia albescens* (Torrey & A. Gray) Kuntze – S] {not yet keyed; synonymy incomplete}

Pycnanthemum floridanum E. Grant & Epling. Cp (FL, GA): sandhills; rare. Se. GA south to n. peninsular FL and e. Panhandle FL. [= K, WH] {not yet keyed; synonymy incomplete}

Pycnanthemum verticillatum (Michaux) Persoon *var.* ***pilosum*** (Nuttall) Cooperrider. Mt (WV): {GA}. Var. *pilosum* (Nuttall) Cooperrider ranges from s. ON west to MI and IA, south to TN, AR, and OK. It differs in having the stems thickly (vs. thinly pubescent), the lower surface of the leaves evenly pubescent (vs. pubescence chiefly restricted to the midrib). In c. TN, and reported from a single county in e. TN (Chester, Wofford, & Kral 1997), in se. PA (Rhoads & Klein 1993), and WV (Kartesz 1999). [= C, K; = *P. pilosum* Nuttall – F, G; = *Koellia pilosa* (Nuttall) Britton – S] {not yet keyed; synonymy incomplete}

Rosmarinus Linnaeus 1753 (Rosemary)

A genus of 2-3 species, herb/shrubs, of Mediterranean Europe. Closely related to *Salvia* (Walker et al. 2004), and probably to be combined there. References: Harley et al. in Kadereit (2004).

* ***Rosmarinus officinalis*** Linnaeus, Rosemary. Cp (NC, SC), Pd (NC, SC): gardens; commonly cultivated, rarely persistent or established, native of Mediterranean Europe. October-April. [= K]

Salvia Linnaeus 1753 (Sage, Clary)

A genus of about 900 species, shrubs and herbs, almost cosmopolitan. Walker et al. (2004) have determined that *Salvia* as traditionally circumscribed is polyphyletic. References: Epling (1938)=Z; Walker et al. (2004).

1 Leaves predominantly basal.
  2 Veins of the 3 upper calyx lobes parallel, the lobes themselves minute and widely-spaced (> 1 mm between the 2 lateral teeth), separated by flattish sinuses; basal leaves lobed; [native, though weedy, common throughout our area] ..... ***S. lyrata***
  2 Veins of the 3 upper calyx lobes converging, the lobes themselves minute and spaced within a distance of 1 mm; basal leaves lobed or toothed; cauline leaves toothed (rarely lobed); [alien weeds, rarely naturalized in our area].
    3 Upper corolla-lip strongly arched; leaves serrate ..... ***S. pratensis***
    3 Upper corolla-lip straight; leaves lobed ..... ***S. verbenacea***
1 Leaves predominantly cauline, not lobed.
  4 Leaves rhombic-ovate, the base cordate, subcordate, truncate, or broadly cuneate.
    5 Petiole not clearly differentiated from the leaf blade (leaf tissue decurrent on the petiole for most or all its length); corolla blue ..... ***S. urticifolia***
    5 Petiole clearly differentiated from the leaf blade; corolla blue, white, or scarlet.
      6 Corolla scarlet; larger leaves 3-6.5 cm long ..... ***S. coccinea***
      6 Corolla blue or whitish; leaves 5-20 cm long
        7 Upper calyx lip > ½× as long as the calyx tube; flowers 4-12 per node; leaves (8-) 12-20 cm long ..... ***S. sclarea***
        7 Upper calyx lip < 1/3× as long as the calyx tube; flowers 12-30 per node; leaves 5-10 cm long ..... ***S. verticillata***
  4 Leaves lanceolate, linear, or narrowly elliptic, the base cuneate to attenuate.
    8 Leaves canescent, gray; [introduced, rarely persistent from cultivation in gardens] ..... ***S. officinalis***
    8 Leaves puberulent, green; [native, of dry woodlands from sc. NC southward and westward].
      9 Flowers 2 (-4) per node; corolla 81-12 mm long ..... ***S. reflexa***
      9 Flowers 6-10 flowers per node; corolla > 13 mm long
        10 Stem usually with sparse, antrorse or somewhat spreading pubescence; calyx with antrorse hairs limited to major veins; flowers of mature inflorescences spaced out, most internodes elongate and ranging up to 25 (-34) mm; [Atlantic and Gulf Coastal Plain and adjacent piedmont, from south-central NC to central FL to southeast LA] ..... ***S. azurea*** *var.* ***azurea***
        10 Stem usually with dense, retrorse pubescence; calyx with dense antrorse pubescence; flowers of mature inflorescences densely arranged, internodes between flowers very short, only the lowermost 1-3 internodes elongate and ranging up to 12 (-17) mm; [inland and prairie sites, ranging from IL, IA, NE, and e. CO south to nw. GA, n. AL, ne. MS, LA, and se. and c. TX] ..... ***S. azurea*** *var.* ***grandiflora***

Salvia azurea Michaux ex Lamarck *var.* ***azurea***, Azure Sage. Cp (FL, GA, NC, SC), Pd (GA, NC, SC), Mt (GA): sandhills, hammocks, other sandy or rocky woodlands; common (rare in NC). Late August-October; October-November. S. NC south to Panhandle FL, west to TX. [= K; < *S. azurea* – RAB, S, WH]

Salvia azurea Michaux ex Lamarck *var.* ***grandiflora*** Bentham. Mt (GA): prairies, woodlands over calcareous or mafic rocks; rare. August-October; October-November. IL, IA, NE, and eastern CO south to nw. AL, ne. MS, LA, se. TX, and c. TX. [= F, K; = *S. pitcheri* Torrey ex Bentham – C, G; < *S. azurea* – S; = *S. azurea* ssp. *pitcheri* (Torrey ex Bentham) Epling]

Salvia coccinea P.J. Buc'hoz ex Etlinger, Scarlet Sage, Blood Sage. Cp (FL, GA, SC*?), Pd (GA*?): hammocks, disturbed areas; uncommon (rare in GA and SC), in the more northern part of its distribution (such as SC) perhaps only introduced from farther south and west. May-November. [= RAB, G, K, S, WH]

Salvia lyrata Linnaeus, Lyreleaf Sage. Cp (DE, FL, GA, NC, SC, VA), Pd (DE, GA, NC, SC, VA), Mt (GA, NC, SC, VA, WV): hammocks, lawns, roadsides, woodlands; common. April-May; May-July. CT west to MO, south to FL and TX. A common and familiar native weed. [= RAB, C, F, G, K, S, W, WH, WV]

* ***Salvia officinalis*** Linnaeus, Garden Sage. Cp (VA, WV), Pd (VA): cultivated as a garden herb, rarely persistent; rare, native of Europe. [= C, F, G, K, WV]

* ***Salvia pratensis*** Linnaeus, Meadow Sage, Meadow Clary. Cp (VA): fields and disturbed areas; rare, native of Europe. [= C, F, G, K]

* ***Salvia reflexa*** Hornemann, Lanceleaf Sage, Mintweed. Mt (WV): dry sandy soil, disturbed areas; rare, native of c. North America. In c. TN (Chester, Wofford, & Kral 1997). The apparent ascription by C of *S. reflexa* Hornemann to "N.C." is a typographic error for "N.D." This species is, however, sometimes adventive as far east as WV. [= C, F, G, K, Z] {not yet keyed}

* ***Salvia sclarea*** Linnaeus, Clary. Mt (NC?, VA): cultivated as a garden herb, rarely persistent; rare, native of Europe. [= C, G, K, S]

Salvia urticifolia Linnaeus, Nettle-leaf Sage. Pd (GA, NC, SC, VA), Mt (GA, NC, SC, VA), Cp (FL, GA, VA): woodlands and glades, usually over mafic or calcareous rocks; uncommon (rare in Coastal Plain). April-June; May-July. PA west to w. KY, south to SC, c. GA, Panhandle FL, and AL. Quite showy when in flower. [= RAB, C, F, G, K, S, W, WH, Z]

* ***Salvia verbenacea*** Linnaeus, Wild Clary. Mt (VA), {GA, NC?}: fields and disturbed areas; rare, native of Europe. [= C, G, K, S]

* ***Salvia verticillata*** Linnaeus, Whorled Clary. Mt (WV): disturbed areas; rare, native of Europe. Introduced as far south as scattered locations in PA (Rhoads & Klein 1993), MD, and WV (Kartesz 1999). [= C, F, G, K, WV]

Salvia chapmanii A. Gray. AL and FL. Uncertain taxonomic status, often included in *S. urticifolia*. [= K, S] {not yet keyed; synonymy incomplete}

Satureja Linnaeus 1753 (Savory)

A genus of ca. 38 species, herbs, of Mediterranean Europe west to c. Asia.

* ***Satureja hortensis*** Linnaeus, Summer Savory. Pd (DE), Mt (WV): disturbed areas; uncommon, native of Mediterranean Europe and sw. Asia. July-September. [= C, K]

Stachydeoma Small 1903

Stachydeoma graveolens (Chapman ex A. Gray) Small. Cp (FL): sandhills, pine flatwoods; rare. Endemic to Panhandle FL. [= K, S; = *Hedeoma graveolens* Chapman ex A. Gray – WH]

Thymus Linnaeus (Thyme)

A genus of about 220-350 species, herbs and shrubs, of temperate Eurasia. References: Harley et al. in Kadereit (2004).

* ***Thymus praecox*** Opiz *ssp.* ***arcticus*** (Dur.) Jalas, Mother-of-Thyme. Pd (DE, NC), Mt (GA, WV): commonly cultivated and sometimes escaped or persisting; uncommon (rare in DE and GA), native of Eurasia. July-September. [= K; ? *T. serpyllum* Linnaeus – RAB, C, F, G, WV, misapplied]

* ***Thymus pulegioides*** Linnaeus, Lemon Thyme. Pd (VA), Cp (VA): disturbed areas; rare, native of Eurasia. [= K]

374. PHRYMACEAE Schauer 1847 (Lopseed Family) [in LAMIALES]

As radically circumscribed, a family of about 20 genera and 240 species, herbs, cosmopolitan. See Tank et al. (2006). References: Lee et al. (1996)=Z; Tank, Beardsley, Kelchner, & Olmstead (2006); Thieret (1972); Wagstaff & Olmstead (1997); Fischer in Kadereit (2004); Cantino in Kadereit (2004).

1 Plant a rhizomatous aquatic; leaves spatulate, entire, 10-20 mm long and 0.3-2 mm wide (reminiscent of *Limosella* or *Lilaeopsis*)..... ***Glossostigma***
1 Plant terrestrial (though sometimes in wetlands) with an aerial; leaves ovate, elliptic, or obovate, > 20 mm long and > 2 mm wide.
  2 Inflorescence of a solitary, terminal flower; bracteal leaves alternate..... ***Mazus***
  2 Inflorescence **either** of axillary flowers **or** of terminal and axillary spikes; bracteal leaves or bracts opposite.
    3 Inflorescence of axillary flowers; flowers 17-30 mm long ..... ***Mimulus***
    3 Inflorescence of terminal and axillary spikes; flowers 6-8 mm long ..... ***Phryma***

Glossostigma Wight & Arnott 1836

A genus of 7-8 species of aquatics, native to Australia, East Africa, India, and New Zealand. References: Les, Capers, & Tippery (2006)=Z; Les & Capers in FNA (in prep.).

* ***Glossostigma cleistanthum*** W.R. Barker. Cp (DE): aquatic in oligotrophic lakes and reservoirs; rare, native of Australia. Introduced, naturalized, and invasive in NJ, PA, CT, and RI (Les, Capers, & Tippery 2006). [= Z]

Mazus Loureiro 1790

A genus of 10-15 species, herbs, of Asia to Australia. References: Pennell (1935)=P.

1 Plant stoloniferous, perennial; corolla ca. 15 mm long ..... ***M. miquelii***
1 Plant not stoloniferous, annual; corolla 7-10 mm long..... ***M. pumilus***

* ***Mazus miquelii*** Makino. Pd (NC, VA), Mt (WV): lawns; rare, native of e. Asia. April-June. [= C, K; = *M. miguelii* – RAB, misspelling; ? *M. reptans* N.E. Brown]

* ***Mazus pumilus*** (Burmann f.) Steenis. Cp (DE, FL, GA, NC, SC, VA), Pd (GA, NC, SC, VA), Mt (WV): lawns; uncommon (rare in DE and WV), native of e. Asia. December-June. [= C, K; ? *M. japonicus* (Thunberg) Kuntze – RAB, F, G, P, WV]

Mimulus Linnaeus 1753 (Monkey-flower)

A genus of about 150 species, herbs and shrubs, of w. North America, s. Africa, Asia, and e. North America. *Mimulus* reaches its greatest diversity in w. North America. References: Grant (1924)=Y; Pennell (1935)=P.

1 Corolla yellow; stem viscid glandular-pubescent; plant usually 2-4 dm tall ..... ***M. moschatus***
1 Corolla blue; stem glabrous; plant usually 3-15 dm tall; [section *Mimulus*].
2 Leaves petiolate (the upper sessile or nearly so); pedicels 2-15 mm long; stem with 4 winged angles ..... ***M. alatus***
2 Leaves sessile; pedicels 20-45 mm long; stem with 4 rounded angles ..... ***M. ringens*** *var.* ***ringens***

Mimulus alatus Aiton, Winged Monkey-flower. Cp (DE, FL, GA, NC, SC, VA), Pd (DE, GA, NC, SC, VA), Mt (GA, VA, WV): marshes, bottomlands, ditches; common (uncommon in FL and WV). July-November. MA and CT west to s. MI and s. IA, south to Panhandle FL and TX. [= RAB, C, F, G, GW, K, P, S, W, WV, Y]

Mimulus moschatus Douglas ex Lindley, Muskflower, Musky Monkey-flower. Mt (NC, VA, WV): streambanks, brookbanks, saturated soil of cold springs; rare. July; August. NL (Newfoundland) and QC west to MI, south to w. VA, WV, NC, and MI, and in w. North America. The native/naturalized status of *M. moschatus* in e. North America is controversial. Some at least of our populations appear to be native, not occurring in situations where likely to have been introduced. [= RAB, C, F, G, P, W, WV; > *M. moschatus* var. *moschatus* – K]

Mimulus ringens Linnaeus *var.* ***ringens***, Allegheny Monkey-flower. Mt (GA, NC, SC, VA, WV), Pd (DE, GA, NC, SC, VA), Cp (DE, NC, SC, VA): marshes, bogs, wet meadows, bottomlands; common. June-September. NS and QC west to SK, south to c. GA, LA, OK, and CO. [= G, K; < *M. ringens* – RAB, C, GW, S, W, WV; > *M. ringens* var. *minthodes* (Greene) A.L. Grant – F, Y; > *M. ringens* var. *ringens* – F, Y; = *M. ringens* var. *typica* – P]

Phryma Linnaeus 1753 (Lopseed)

A genus of 1-2 species, herbs, of e. North America and Asia. The disjunct populations have been variously treated as species, varieties, or races. References: Lee et al. (1996)=Z; Thieret (1972); Wagstaff & Olmstead (1997); Cantino in Kadereit (2004).

Phryma leptostachya Linnaeus *var.* ***leptostachya***, American Lopseed. Mt (GA, NC, SC, VA, WV), Pd (DE, GA, NC, SC, VA), Cp (DE, FL, GA, NC, SC, VA): bottomland forests, nutrient-rich slopes, mesic hammocks, in the Coastal Plain primarily in places underlain by coquina limestone ("marl") and essentially absent from the more acidic portions of the Coastal Plain; common (uncommon in Coastal Plain). June-August; August-October. The species is interpreted as occurring disjunctly in e. North America and e. Asia. Var. *leptostachya* ranges from QC west to MB, south to ne. FL, Panhandle FL, and TX; var. *asiatica* Hara occurs in e. Asia. The fruits "lopped down" against the stem are unmistakable. [= Z; < *P. leptostachya* – RAB, C, G, K, S, W, WH, WV; > *P. leptostachya* var. *leptostachya* – F; > *P. leptostachya* var. *confertifolia* Fernald – F]

375. PAULOWNIACEAE Nakai 1949 (Paulownia Family) [in LAMIALES]

A monogeneric family, trees, of e. Asia. There has been disagreement over whether *Paulownia* is best placed in Scrophulariaceae, Bignoniaceae, or its own family, Paulowniaceae; superficially it closely resembles *Catalpa* of the Bignoniaceae. Armstrong (1985) concluded that *Paulownia*'s affinities lie with the Scrophulariaceae, based on floral anatomy, embryo morphology, and seed morphology. A molecular study by Spangler & Olmstead (1999) conclude that *Paulownia* is best retained in its own family. Manning (2000) concurs with its removal from Bignoniaceae. Molecular evidence supports that it is sister to the reconstituted Orobanchaceae. References: Spangler & Olmstead (1999); Manning (2000).

Paulownia Siebold & Zuccarini 1835 (Princess-tree)

A genus of 6 species, trees, of e. Asia. References: Armstrong (1985).

* ***Paulownia tomentosa*** (Thunberg) Siebold & Zuccarini ex Steudel, Princess Tree, Empress Tree, Paulownia. Cp (DE, FL, GA, NC, SC, VA), Pd (DE, GA, NC, SC, VA), Mt (GA, NC, SC, VA, WV): roadsides, disturbed areas, roadcuts, forests; common (uncommon in DE Coastal Plain, rare in FL), native of China. April-June; September-October. *Paulownia* is becoming a nuisance, showing an ability to invade pristine woodlands. The very soft wood is highly prized in Asia. The leaves of stump sprouts can reach very large sizes (at least to 80 cm long and wide). The woody capsules are persistent, and the densely tomentose, tan flower buds are conspicuous through the winter. [= RAB, C, F, G, K, S, W, WH, WV]

376. OROBANCHACEAE Ventenat 1799 (Broomrape Family) [in LAMIALES]

A family of about 96 genera and 2060 species, root-parasitic herbs lacking chlorophyll (Orobanchaceae sensu stricto) and chlorophyllose hemi-parasites (formerly placed in the Scrophulariaceae), of temperate and subtropical regions of the Northern Hemisphere (Manen et al. 2004). References: Thieret (1971); Olmstead et al. (2001); Fischer in Kadereit (2004).

1 Plants lacking chlorophyll (parasitic), variously pink, purple, brown, tan, orange, or white.

2 Stem paniculately branched; flowers dimorphic, those low in the inflorescences small, pistillate, and fertile, those high in the inflorescence larger, apparently perfect but functionally staminate; [tribe *Orobancheae*]..... ***6. Epifagus***
2 Stem simple (rarely few-branched); flowers all alike.
3 Calyx deeply cleft on the lower side; stamens exserted; [tribe *Rhinantheae*]..... ***14. Conopholis***
3 Calyx either nearly regular, or deeply cleft above and below into 2 lateral halves; stamens included; [tribe *Orobancheae*] ..... ***7. Orobanche***

1 Plants with chlorophyll (hemiparasitic), with foliage and stems normally green.
4 Stem leaves alternate.
5 Leaves pinnately lobed; [tribe *Rhinantheae*] ..... ***12. Pedicularis***
5 Leaves entire or 3-5-lobed at the tip.
6 Bracts subtending flowers orange, red, or yellow; calyx 4-lobed; capsule loculicidal; pedicel lacking bracteoles; seeds broad, wingless; [tribe *Castillejeae*] ..... ***11. Castilleja***
6 Bracts subtending flowers green; calyx 5-lobed; capsule septicidal and tardily also loculicidal; pedicel with 2 bracteoles; seeds narrow, winged; [tribe *Cymbarieae*] ..... ***10. Schwalbea***
4 Stem leaves (at least the lower) opposite.
7 Corolla salverform; [tribe *Buchnereae*].
8 Plant strict, unbranched unless damaged; flowers in a terminal spike; corolla purple; [native, sometimes weedy] ..... ***8. Buchnera***
8 Plant strongly branched; flowers solitary and axillary; corolla red or orange; [alien, in agricultural fields] ..... ***9. Striga***
7 Corolla various, but not salverform.
9 Calyx 4-lobed or essentially unlobed; corolla strongly bilabiate, the upper lip consisting of 2 petals almost wholly connate and strongly cucullate (hooded); corolla white or yellow; [tribe *Rhinantheae*].
10 Lower lip of corolla with raised yellow, densely pubescent palate; stem leaves entire (bracteal leaves in and near the inflorescence sometimes pectinately fringed; annual, 1-4 dm tall..... ***13. Melampyrum***
10 Lower lip of corolla without raised palate; stem leaves pinnately lobed, the lobes themselves crenate; perennial, 3-8 dm tall ..... ***12. Pedicularis***
9 Calyx 5-lobed; corolla 5-lobed, the lobes relatively similar in size and shape, spreading; corolla yellow, orange, red, or pink; [tribe *Gerardieae*].
11 Corolla pink; leaves linear and thread-like (except lanceolate in *A. auriculata*)..... ***1. Agalinis***
11 Corolla yellow or orange; leaves **either** lanceolate or broader, at least the basal pinnately or bipinnately lobed or toothed, **or** pinnately or bipinnately divided into linear segments.
12 Leaves pinnately or bipinnately divided into linear segments up to 2 mm wide; corolla rotate, the tube shorter than the lobes ..... ***2. Seymeria***
12 Leaves not lobed or divided, or the segments broader; corolla tubular, campanulate, or funnelform, the tube much longer than the lobes.
13 Corolla orange, tubular, the tube narrow and straight, > 5× as long as the diameter..... ***3. Macranthera***
13 Corolla yellow, campanualte or funnelform, the tube conical, < 4× as long as the diameter.
14 Anthers pubescent; lower leaves< 12 cm long..... ***4. Aureolaria***
14 Anthers glabrous; lower leaves 20-40 cm long..... ***5. Dasistoma***

1. Agalinis Rafinesque 1836 (Agalinis, Purple-foxglove)

A genus of about 40 species, hemiparasitic herbs, of tropical and warm temperate regions of America. References: Canne (1979); Hays (1998b); Pennell (1935)=P.

1 Perennial, from horizontal rootstalk bearing slender, scaly rhizomes; corollas 3-4 cm long; [of Carolina bays, cypress savannas, limesink ponds] ..... ***A. linifolia***
1 Annual, with 1-several fibrous roots from the stem base; corollas < 3 cm long (except sometimes *A. fasciculata* and *A. purpurea*).
2 Stem retrorse-hispid; leaves lanceolate to ovate, usually lobed at the base; [of mafic glades and woodlands]..... ***A. auriculata***
2 Stem ascending scabridulous or glabrous; leaves linear or filiform, entire.
3 Leaves reduced to scales < 2.5 mm long, plant thus appearing leafless ..... ***A. aphylla***
3 Leaves not scale-like, > 8 mm long.
4 Pedicels less than 1.5× as long as the calyx, mostly 1-5 mm long at anthesis, mostly < 8 mm long in fruit.
5 Plants fleshy; [of saline or brackish marshes and salt flats].
6 Pedicels usually longer than or equaling the leaflike bracts; corollas 15-20 mm long; anther cells 1.8-2.3 mm long, usually long-lanose; [of Princess Anne County, VA, southward]..... ***A. maritima*** *var.* ***grandiflora***
6 Pedicels usually less than or equaling the leaflike bracts; corollas 12-17 mm long; anther cells 1.3-1.8 mm long, glabrous or somewhat pubescent; [of the Delmarva Peninsula northward]..... ***A. maritima*** *var.* ***maritima***
5 Plants not fleshy; [not inhabiting saline habitats, though some species may be found in freshwater interdune swales].
7 Stems appearing copiously leafy because of the well-developed fascicles of axillary leaves; [inhabiting dry to moist, often ruderal, habitats] ..... ***A. fasciculata***
7 Stems not copiously leafy, the axillary fascicles absent or poorly developed; [inhabitating moist to wet natural habitats].
8 Corolla (10-) 15-20 mm long; calyx lobes from 0.4-1.9× as long as the calyx tube; pollen sacs 1.4-2.0 mm long ..... ***A. paupercula*** *var.* ***paupercula***
8 Corolla 18-38 mm long; calyx lobes 0.2-0.5× as long as the calyx tube; pollen-sacs 2.5-3.5 mm long.
9 Branches spreading or ascending; stems more-or-less scabridulous; corollas 18-38 mm long ..... ***A. purpurea***
9 Branches virgate; stems glabrous; corollas 20-25 mm long ..... ***A. virgata***
4 Pedicels > 2.5× as long as the calyx, mostly 5-20 mm long at anthesis, mostly > 10 mm long in fruit.
10 Living plants dull green, usually suffused with much purplish pigment; leaves > 20 mm long; dried plants dark, sometimes blackish; dried calyx deep purple, the veins obscure (difficult to see even at 10×).

11 Upper lip of the corolla arched forward over the stamens, greatly reducing the opening of the throat; corolla throat glabrous or glabrate within; [of the Piedmont and Mountains] ..... ***A. tenuifolia***
11 Upper lip of the corolla erect or reflexed, the throat open; corolla throat densely long-hairy within; [of the Coastal Plain].
12 Branches widely spreading or laxly ascending; pedicels > 4× as long as the leaflike bracts; anterior filaments 5-5.5 mm long; [of Berkeley and Beaufort counties, SC, southward] ..... ***A. laxa***
12 Branches ascending to somewhat spreading; pedicels < 3× as long as the leaflike bracts; anterior filaments 7-9 mm long; [widespread] ..... ***A. setacea***
10 Living plants light green or glaucescent, usually with no purple pigment; leaves < 15 (-20) mm (except *A. decemloba*, with leaves 15-25 mm long); dried plants not dark, but turning pale yellowish green; dried calyx pale yellowish green, the veins distinct and obvious without magnification.
13 Corolla throat within lacking 2 yellow lines; leaves widen distally to obtuse tips; stem and branches distinctly rough-scabridulous to the touch ..... ***A. obtusifolia***
13 Corolla throat with 2 prominent yellow lines; leaves taper to acute or acuminate tips; stem and branches not (or very slightly) scabridulous.
14 Corolla 10-15 mm long, its lobes emarginate or retuse; [of the Piedmont and Mountains, and rarely the upper Coastal Plain]. ..... ***A. decemloba***
14 Corolla 15-20 mm long, its lobes entire to slightly emarginate; [of the Coastal Plain, from e. NC southward] ..... ***A. tenella***

Agalinis aphylla (Nuttall) Rafinesque, Scale-leaf Agalinis. Cp (FL, GA, NC, SC): wet pine savannas; uncommon (rare in GA, NC, SC). September-October; October-November. Se. NC south to ne. FL and Panhandle FL, west to e. LA. [= RAB, GW, K, S, WH; = *Gerardia aphylla* Nuttall – P]

Agalinis auriculata (Michaux) S.F. Blake, Earleaf Foxglove. Pd (SC, VA), Cp (AL), PD (WV): glades, barrens, blackbelt prairies, and disturbed clearings over mafic rocks (such as diabase and gabbro) or calcareous rocks; rare. August-October; September-November. KY and OH west to MN, south to n. AL, wc. AL (Schotz 2009), AR, and TX; also rarely disjunct east of the Blue Ridge, in NJ, n. VA, and nc. SC. In Lewis County, KY (D. White, pers. comm.). Sometimes treated in the genus *Tomanthera*. [= C, K; = *Tomanthera auriculata* (Michaux) Rafinesque – G, P, S; = *Gerardia auriculata* Michaux – F]

Agalinis decemloba (Greene) Pennell. Pd (NC, SC, VA), Mt (GA, NC): dry clayey or sandy woodlands; rare. [= RAB, S, W; < *A. obtusifolia* – C, K; = *Gerardia decemloba* Greene – F, G, P]

Agalinis fasciculata (Elliott) Rafinesque. Cp (FL, GA, NC, SC, VA), Pd (GA, SC, VA): sandhills, pine savannas, disturbed sandy areas, roadsides; common (uncommon in VA). S. MD south to s. FL, west to e. TX, northward in the interior to s. IN, s. IL, sw. MO, AR, , e. NE, and nc. TX. [= RAB, C, S, W, WH; = *Gerardia fasciculata* Elliott – F, G; < *A. fasciculata* (Elliott) Rafinesque – GW, K; > *Gerardia fasciculata* ssp. *typica* – P; > *Gerardia fasciculata* ssp. *peninsularis* (Pennell) Pennell – P]

Agalinis laxa Pennell. Cp (FL, GA, SC): sandhills; rare. SC south to GA and c. peninsular FL. [= K, S, WH; < *A. divaricata* (Chapman) Pennell – GW; = *Gerardia laxa* (Pennell) Pennell – P]

Agalinis linifolia (Nuttall) Britton. Cp (DE, FL, GA, NC, SC): Coastal Plain depression ponds, cypress savannas, wet pine savannas; common (uncommon in GA, NC, and SC, rare in DE). August-September; September-October. Se. NC south to s. FL, west to e. LA; disjunct in e. DE (reports for MD are in error). [= RAB, C, GW, K, S; = *Gerardia linifolia* Nuttall – F, G, P]

Agalinis maritima (Rafinesque) Rafinesque *var.* ***grandiflora*** (Bentham) Shinners. Cp (FL, GA, NC, SC, VA): tidal marshes; uncommon (rare in VA). July; August. Se. VA south to s. FL, west to s. TX and Tamaulipas; West Indies; Yucatan. [= K, S; < *A. maritima* – RAB, C, GW, WH; = *Gerardia maritima* Rafinesque var. *grandiflora* Bentham – F; < *Gerardia maritima* – G; = *Gerardia maritima* ssp. *grandiflora* (Bentham) Pennell – P]

Agalinis maritima (Rafinesque) Rafinesque *var.* ***maritima***. Cp (DE, NC, VA): tidal marshes; uncommon (rare in DE). July; August. NS and s. ME south to se. VA and e. NC. [= K; < *A. maritima* – RAB, C, GW; = *Gerardia maritima* Rafinesque var. *maritima* – F; < *Gerardia maritima* – G; = *Gerardia maritima* ssp. *typica* – P]

Agalinis obtusifolia Rafinesque. Cp (DE, FL, GA, NC, SC, VA), Pd (GA, NC, VA), Mt (VA): pine savannas, wet pine flatwoods, sandhill seeps, disturbed areas; uncommon (rare in DE, rare in VA Mountains). September-October; October-November. DE south to s. FL, west to e. LA, in the interior north to KY and TN. [= RAB, GW, W; < *A. obtusifolia* – C, K, WH (also see *A. decemloba* and *A. tenella*); = *Gerardia obtusifolia* (Rafinesque) Pennell – F, G, P]

Agalinis paupercula (A. Gray) Britton *var.* ***paupercula***. Mt (VA): calcareous fens; rare. NS west to MB, south to NJ, PA, OH, IN, IL, and IA; disjunct in sw. VA (Washington County). [= K; < *A. purpurea* (Linnaeus) Pennell var. *parviflora* (Bentham) B. Boivin – C; = *Gerardia paupercula* (A. Gray) Britton var. *paupercula* – F; < *Gerardia purpurea* Linnaeus var. *parviflora* Bentham – G; = *Gerardia paupercula* var. *typica* – P] {not yet keyed}

Agalinis plukenetii (Elliott) Rafinesque. Cp (FL, GA), Pd (GA), Mt (SC): sandhills, other dry forests; uncommon. SC south to c. peninsular FL, west to wc. LA, and northward in the interior to extreme se. TN (Polk County) (Chester, Wofford, & Kral 1997). Scattered in GA (e.g., Baldwin and Laurens counties). [= K, S; = *Gerardia plukenetii* Elliott – P]

Agalinis purpurea (Linnaeus) Pennell. Cp (DE, FL, GA, NC, SC, VA), Pd (DE, GA, NC, SC, VA), Mt (GA, NC, SC, VA, WV): woodlands, roadsides, in a wide variety of open habitats; common (uncommon in WV, uncommon in VA Mountains). August-October; September-November. NS west to MN, south to s. FL and e. TX. [= RAB, K, S, W, WH; < *A. purpurea* var. *purpurea* – C; = *Gerardia purpurea* var. *purpurea* – G; = *Gerardia purpurea* Linnaeus – F, P; < *A. purpurea* – GW (also see *A. virgata*)]

Agalinis setacea (J.F. Gmelin) Rafinesque. Cp (DE, FL, GA, NC, SC, VA), Pd (GA, NC, SC, VA), Mt (GA, NC, SC, VA): sandhills, other dry forests and openings; common (rare in DE and FL, rare in VA Piedmont). September-October; October-November. NY (Long Island) south to ne. FL, c. peninsular FL, and AL. [= RAB, C, K, S, W, WH; > *Gerardia setacea* J.F. Gmelin – F, G, P; > *G. stenophylla* (Pennell) Pennell – P; > *A. stenophylla* Pennell]

Agalinis tenella Pennell. Cp (FL, GA, NC, SC, VA), Pd (SC): sandhills, other dry woodlands; uncommon (rare in NC and VA). S. NC south to n. FL, west to s. AL; disjunct in Amelia County, VA. [= RAB, S; < *A. obtusifolia* – K, WH; = *Gerardia tenella* (Pennell) Pennell – P]

Agalinis tenuifolia (Vahl) Rafinesque *var.* ***tenuifolia***. Mt (GA, NC, SC, VA, WV), Pd (DE, GA, NC, SC, VA), Cp (DE, GA, NC, SC, VA): wooded slopes, roadsides; common (uncommon in WV, rare in DE). August-October; September-November. ME, ON, MI, and MO, south to GA and LA. [= K, S; < *A. tenuifolia* – RAB, C, W; = *Gerardia tenuifolia* Vahl var. *tenuifolia* – F, G]

Agalinis virgata Rafinesque. Cp (GA, NC, SC): pine savannas; rare. September-October; October-November. NY south to GA. [= RAB, S; < *A. purpurea* var. *purpurea* – C; = *Gerardia racemulosa* Pennell – F, P; = *Gerardia purpurea* Linnaeus var. *racemulosa* (Pennell) Gleason – G; < *A. fasciculata* (Elliott) Rafinesque – K; < *A. purpurea* (Linnaeus) Pennell – GW]

Agalinis acuta Pennell, Sandplain Agalinis. Cp (MD): coastal sand plains; rare. MA south to Baltimore County, MD. [= C, K; = *Gerardia acuta* Pennell –F, G, P] {not yet keyed}

Agalinis divaricata (Chapman) Pennell, Pineland Agalinis. Cp (FL, GA): sandhills; common (rare in GA). GA (Decatur County) south to c. peninsular FL, west to MS (Sorrie & LeBlond 2008). [= K, S, WH; = *Gerardia divaricata* (Chapman) Pennell – P] {not yet keyed}

Agalinis filicaulis (Bentham) Pennell, Spindly Agalinis. Cp (FL, GA): wet pine savannas, prairies; rare. E. GA (Tattnall County) south to c. peninsular FL and Panhandle FL, west to w. LA. [= K, S, WH; = *Gerardia filicaulis* (Bentham) Chapman – P] {not yet keyed}

Agalinis filifolia (Nuttall) Rafinesque, Seminole Agalinis. Cp (FL, GA): dry longleaf pine savannas, scrub; uncommon (rare in GA). S. GA (east to Liberty County) south to s. FL, west to sw. AL (Baldwin County) (Sorrie & LeBlond 2008). [= K, S, WH; = *Gerardia filifolia* Nuttall – P] {not yet keyed}

Agalinis flexicaulis Hays. Cp (FL): wet pinelands; rare. Endemic to ne. FL (Bradford County, to be expected in adjacent counties). See Hays (2010) for detailed information. {not yet keyed}

Agalinis gattingeri (Small) Small ex Britton. Barrens, glades, outcrops, woodlands. ON, MN, and NE south to AL, MS, LA, and TX. In c. TN, east to e. TN (Rhea and Scott counties) (Chester, Wofford, & Kral 1997). Reported for NC (Kartesz 1999). {investigate} [= K, S; = *Gerardia gattingeri* Small – G, P]

Agalinis georgiana (C.L. Boynton) Pennell. Cp (FL, GA): mesic to wet pine savannas, bogs; rare. S. GA (Crisp, Dooly, Lowndes, Thomas, and Worth counties) south to w. Panhandle FL (Carter, Baker & Morris 2009). [= S, WH; < *A. fasciculata* – K; = *Gerardia georgiana* C.L. Boynton – P]

Agalinis harperi Pennell in Small. Cp (FL, GA, SC?): wet pinelands, interdune swales; uncommon (rare in GA). GA south to s. FL, west to w. LA. Glynn County, GA and east to McIntosh County, GA as *A. pinetorum*. See Hays (1998a) who has established the nomenclatural priority of *A. harperi*. Reported for SC (Kartesz 1999); {investigate}. [= WH; > *A. harperi* Pennell in Small – S; > *A. pinetorum* – S; = *A. pinetorum* Pennell – K; > *A. delicatula* Pennell; = *Gerardia harperi* (Pennell in Small) Pennell – P] {not yet keyed}

Agalinis heterophylla (Nuttall) Small ex Britton. GA west to s. MO, AR, e. OK, and e. TX. [= G, K]

Agalinis oligophylla Pennell. Sc. TN (Coffee and Warren counties) (as *A. pseudaphylla*) (Chester, Wofford, & Kral 1997), c. and s. AL, west through s. MS to w. LA. [= K, S; > *Gerardia pseudaphylla* (Pennell) Pennell – P; > *A. pseudaphylla* (Pennell) Shinners; > *A. pseudophylla* (Pennell) Shinners, an orthographic variant]

Agalinis pulchella Pennell. Cp (FL, GA): pine savannas and sandhills; rare. Reported for Coffee and Ware counties, GA. {Nomenclatural and typification problems} [= K, S, WH; = *Gerardia pulchella* Pennell – P] {not yet keyed; synonymy incomplete}

Agalinis skinneriana (A. Wood) Britton. Coffee County, TN (Chester, Wofford, & Kral 1997). [= K; = *Gerardia skinneriana* A. Wood – G, P] {not yet keyed; synonymy incomplete}

Agalinis tenuifolia (Vahl) Rafinesque *var.* ***leucanthera*** (Rafinesque) Pennell. Cp (FL, GA): savannas; rare (GA Special Concern). [= K, S; < *A. tenuifolia* – WH] {not yet keyed; synonymy incomplete}

Agalinis tenuifolia (Vahl) Rafinesque var. *macrophylla* (Bentham) Blake. [= K, S; = *Gerardia tenuifolia* Vahl ssp. *macrophylla* (Bentham) Pennell – P] {not yet keyed; synonymy incomplete}

Agalinis tenuifolia (Vahl) Rafinesque *var.* ***polyphylla*** (Small) Pennell. Pd (GA): granitic flatrocks; uncommon? Endemic to granite flatrocks in GA. [= K, S; = *Gerardia tenuifolia* Vahl ssp. *polyphylla* (Small) Pennell – P; = *Gerardia polyphylla* Small] {not yet keyed; synonymy incomplete}

2. Seymeria Pursh 1814 (Seymeria)

A genus of about 25 species, herbs, of s. North America (including Mexico). References: Pennell (1935)=P.

1 Corolla glabrous on its outer surface; leaf segments linear, < 0.5 mm wide; stem glabrous or puberulent; seeds wingless (though with ridges) ..... ***S. cassioides***

1 Corolla pubescent externally; leaf segments lanceolate, 1-2 mm wide; stem pubescent; seeds 3-4-winged ..... ***S. pectinata*** *ssp.* ***pectinata***

Seymeria cassioides (J.F. Gmelin) Blake, Senna Seymeria. Dry to moist pinelands, wet pine savannas, sandhills, other dry woodlands. August-October. Se. VA south to c. peninsular FL, west to LA; disjunct in nc. AL and se. TN (Chester, Wofford, & Kral 1997). [= RAB, C, F, G, GW, K, P, WH; = *Afzelia cassioides* J.F. Gmelin – S]

Seymeria pectinata Pursh *ssp.* ***pectinata***, Comb Seymeria. Dry pinelands, sandhills. July-October. Ssp. *pectinata* ranges from se. NC south to c. peninsular FL, west to s. MS, a Southeastern Coastal Plain endemic. Ssp. *peninsularis* (Pennell) Pennell ranges from n. peninsular FL south to s. FL. [= K; < *S. pectinata* – RAB, WH; = *S. pectinata* ssp. *typica* – P; = *Afzelia pectinata* (Pursh) Kuntze ssp. *pectinata* – S]

3. Macranthera Nuttall ex Bentham 1836 (Flameflower)

A monotypic genus, a hemiparasitic herb, of se. North America. References: Pennell (1935)=P.

Macranthera flammea (Bartram) Pennell, Flameflower, Hummingbird-flower. Pitcherplant bogs, bayheads. July-September. Nearly restricted to the East Gulf Coastal Plain (e. GA and FL Panhandle west to se. LA), but ranging east to the Atlantic Coastal Plain of e. GA (Bullock County), within a county of the SC border. [= GW, K, P, S, WH]

4. Aureolaria Rafinesque 1836 (Oak-leach, False-foxglove)

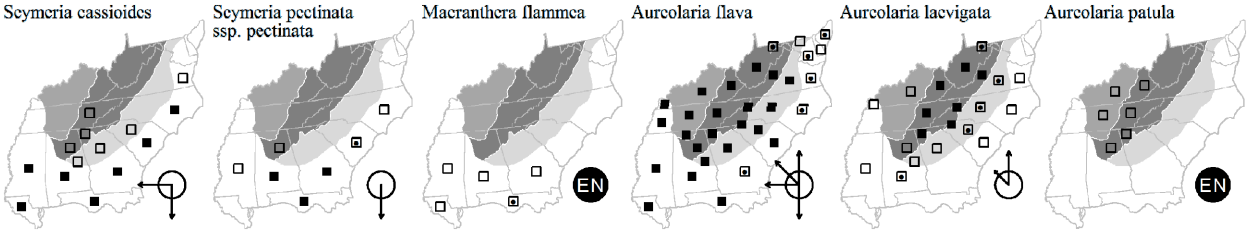
A genus of about 10 species, hemiparasitic herbs, of e. North America and Mexico. References: Pennell (1935)=P.

1 Plant pubescent (especially on the calyx, corolla, capsule, and lower stem) with glandular hairs; annual; seeds 0.8-1.0 mm long, not winged.
  2 Calyx tube hemispherical, glandular-hirsute to glandular-lanate on the outer surface; capsule ovoid; trichomes of the leaves usually glandular, at least in part; leaf lobes usually acute ..... ***A. pectinata***
  2 Calyx tube turbinate, glandular-puberulent on the outer surface; capsule ellipsoid; trichomes of the leaves usually nonglandular; leaf lobes usually obtuse ..... ***A. pedicularia***
1 Plant glabrous or pubescent with nonglandular hairs; perennial; seeds 1.3-2.7 mm long, winged.
  3 Capsule pubescent; inflorescence, pedicels, and/or calyx pubescent with nonglandular hairs; pedicels 1-3 mm at anthesis; flowering May-July ..... ***A. virginica***
  3 Capsule glabrous; inflorescence, pedicels, and calyx glabrous (or pubescent with nonglandular hairs in *Au. patula*); pedicels 1-25 mm long at anthesis; flowering August-September.
    4 Inflorescence, pedicels, and calyx pubescent (at least sparsely so); pedicels slender, ca. 0.5 m in diameter ..... ***A. patula***
    4 Inflorescence, pedicels and calyx glabrous; pedicels stout, ca. 1 mm in diameter.
      5 Lower leaves entire to serrate (or with only a few shallow lobes at the base of the leaf); pedicels 1-8 mm long at anthesis, straight; corolla 3.0-4.0 cm long; capsule 10-15 mm long; stem not glaucous ..... ***A. laevigata***
      5 Lower leaves pinnately lobed, the lobes themselves usually serrate, the sinuses extending over half of the distance to the midrib; pedicels 4-25 mm long at anthesis, upwardly curved; corolla 3.5-6 cm long; capsule 12-20 mm long; stem slightly to strongly glaucous ..... ***A. flava***

Aureolaria flava (Linnaeus) Farwell, Smooth Oak-leach. Oak forests and woodlands. August-September; September-October. ME west to MN, south to GA, c. peninsular FL, AL, and e. LA. The various named varieties or subspecies need additional study; the variation seems to be too clinal to be practically recognized taxonomically. [= RAB, W, WH; > *A. flava* var. *flava* – C, G, K; > *Gerardia flava* Linnaeus var. *flava* – F; > *Gerardia flava* var. *reticulata* (Rafinesque) Cory – F; > *A. flava* ssp. *typica* – P; >< *A. flava* ssp. *flava* – S; > *A. flava* ssp. *reticulata* (Rafinesque) Pennell – P, S; *A. flava* (Linnaeus) Farwell var. *macrantha* Pennell – C, G, = *Gerardia flava* Linnaeus var. *macrantha* (Pennell) Fernald – F; = *A. flava* ssp. *macrantha* Pennell – P; > *A. flava* ssp. *flava* – S]

Aureolaria laevigata (Rafinesque) Rafinesque, Appalachian Oak-leach. Oak forests and woodlands. August-September; September-October. PA west to s. OH, south to SC and GA, primarily a Central and Southern Appalachian endemic, but extending into adjacent provinces, and, rarely, even the Coastal Plain. [= RAB, C, G, K, P, S, W; = *Gerardia laevigata* Rafinesque – F]

Aureolaria patula (Chapman) Pennell, Cumberland Oak-leach. Rich alluvial forests. August-October; September-October. C. KY south through TN to nw. GA, and approaching w. NC and sw. VA. [= C, G, K, P, S]



Aureolaria pectinata (Nuttall) Pennell, Southern Oak-leach. Turkey oak sandhills, other dry oak forests and woodlands. May-September; September-October. NC south to s. FL, west to LA, inland north to AR and MO. Related to *A. pedicularia*, but much more southerly in distribution. [= RAB, K; = *A. pedicularia* (Linnaeus) Rafinesque var. *pectinata* (Nuttall) Gleason – C, G, WH; = *Gerardia pectinata* (Nuttall) Bentham – F; > *A. pectinata* ssp. *eurycarpa* (Pennell) Pennell – P, S; > *A. pectinata* ssp. *transcedens* (Pennell) Pennell – P, S; > *A. pectinata* ssp. *typica* – P; > *A. pectinata* ssp. *pectinata* – S; < *A. pedicularia* – W]

Aureolaria pedicularia (Linnaeus) Rafinesque, Annual Oak-leach. Oak forests and woodlands. September-October; November. ME west to NY and e. MN, south to nw. SC, ne. GA, e. TN, and n. IL. The various named varieties or subspecies need additional study; the variation seems to be too clinal to be practically recognized taxonomically. [= RAB, W; > *A. pedicularia* var. *pedicularia* – C, G, K; = *Gerardia pedicularia* Linnaeus var. *pedicularia* – F; > *A. pedicularia* ssp. *caesariensis* Pennell – S; > *A. pedicularia* ssp. *carolinensis* Pennell – P, S; > *A. pedicularia* (Linnaeus) Rafinesque var. *austromontana* Pennell – C, G, K; > *Gerardia pedicularia* Linnaeus var. *austromontana* (Pennell) Fernald – F; > *A. pedicularia* ssp. *austromontana* (Pennell) Pennell – P, S; > *A. pedicularia* (Linnaeus) Rafinesque var. *intercedens* – Pennell – C, G, K; > *Gerardia pedicularia* Linnaeus var. *intercedens* (Pennell) Fernald – F; > *A. pedicularia* ssp. *intercedens* (Pennell) Pennell – P]

Aureolaria virginica (Linnaeus) Pennell, Downy Oak-leach, Virginia Oak-leach. Oak forests and woodlands. May-July; August-September. MA west to MI, south to ne. FL, Panhandle FL, and AL. [= RAB, C, G, K, W, WH; = *Gerardia virginica* (Linnaeus) Britton, Sterns, & Poggenburg – F; > *A. virginica* – P, S; > *A. microcarpa* Pennell – P, S]

5. Dasistoma Rafinesque 1819 (Mullein Foxglove)

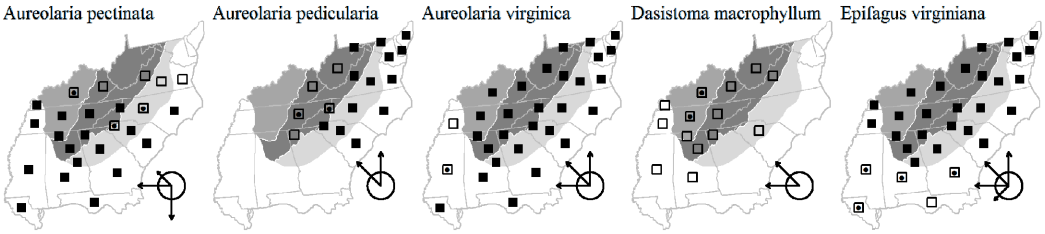
A monotypic genus, a hemiparasitic herb, endemic to se. North America. The genus is sometimes spelled '*Dasystoma*.' References: Pennell (1935)=P.

Dasistoma macrophyllum (Nuttall) Rafinesque, Mullein Foxglove. Xeric to dry-mesic woodlands and bluffs, riverbanks, over limestone or diabase. July-September. WV, OH, s. WI, IA, and NE, south to sw. VA (Lee County), nc. SC, nw. GA, c. AL, MS, LA, and nc. TX. First reported for VA by Wieboldt et al. (1998). [= *Dasistoma macrophylla* – RAB, C, G, K, P, S, orthographic variant; = *Seymeria macrophylla* Nuttall – F, GW, WV; = *Dasystoma macrophylla*, orthographic variant]

6. Epifagus Nuttall 1818 (Beechdrops)

A monotypic genus, an herb parasitic on the roots of *Fagus*, of e. North America. References: Thieret (1971)=Z.

Epifagus virginiana (Linnaeus) W. Barton, Beechdrops. Moist to rather dry forests under *Fagus grandifolia*. September-November. NS west to WI, south to ne. FL, Panhandle FL, and LA; disjunct in the mountains of e. Mexico (Tamaulipas). [= RAB, C, F, G, K, W, WH, WV, Z; = *Leptamnium virginianum* (Linnaeus) Rafinesque – S]



7. Orobanche Linnaeus 1753 (Cancer-root, Broomrape)

A genus of about 150 species, parasitic herbs, of mainly north temperate regions. References: Musselman (1982)=Z; Thieret (1971)=Y; Collins, Colwell, & Yatskievych 2009)=X; Manen et al. (2004).

1 Flowers solitary on a long pedicel (appearing as a scape, the true stem entirely underground or nearly so); [section *Gymnocaulis*] ..... ***O. uniflora***

1 Flowers several-many, sessile or subsessile in a dense spike.

2 Calyx 5-lobed, the lobes subequal, all well-developed; [section *Nothaphyllon*]

3 Corolla 14-20 mm long, slightly curved, the lobes 4-8 mm long and rounded-obtuse; inflorescence a dense raceme, the flowers in a dense and often irregular spiral; flowering April-August; [of uplands, usually parasitizing perennial composites such as *Artemisia*, *Heterotheca*, and *Grindelia*] ..... ***[O. ludoviciana]***

3 Corolla 15-22 mm long, strongly curved, the lobes 4-5 mm long and triangular-acute; inflorescence an open raceme, the flowers in a loose and regular spiral; flowering August-October; [of bottomlands, usually parasitizing annual composites such as *Ambrosia* and *Xanthium*] ..... ***O. riparia***

2 Calyx 2-4-lobed, rarely 5-lobed, but then the fifth lobe minute and much smaller than the other lobes; [section *Orobanche*].

4 Calyx divided to the base into 2 lateral halves, these usually 2-lobed, the 4 lobes long-attenuate or caudate..... ***O. minor***

4 Calyx tubular, with 4 (-5) lobes about the length of the calyx tube ..... ***O. ramosa***

Orobanche ludoviciana Nuttall, Prairie Broomrape. Pastures, upland areas, and glades, parasitic on perennial composites such as *Grindelia*, *Artemisia*, and *Heterotheca*. April-August. SK and BC south to MO, w. TX, AZ, and n. Mexico. [= X; < *O. ludoviciana* – F, G, Z; < *O. ludoviciana* var. *ludoviciana* – C; < *O. ludoviciana* ssp. *ludoviciana* – K] {excluded; not keyed or mapped}

* ***Orobanche minor*** J.E. Smith, Hellroot, Lesser Broomrape. Cultivated fields, parasitic on various hosts, especially *Trifolium*, *Nicotiana tabacum*, and *Solanum lycopersicum*; native of Eurasia. [= RAB, C, F, G, K, S, WH, WV, Z]

* ***Orobanche ramosa*** Linnaeus, Branching Broomrape. Disturbed areas; native of Asia. As discussed by Musselman (1984), the identity of the sole NC record (collected in 1884) is somewhat presumptive, and the precise location uncertain. An infestation of this serious weed was discovered in 2007 at a car wash in urban Norfolk, VA (Musselman & Bolin 2008). [= C, F, G, K]

Orobanche riparia L.T. Collins, Riparian Broomrape. Bottomlands, parasitic on annual composites such as *Ambrosia trifida*, *Xanthium strumarium*, and *Ambrosia artemisiifolia*. August-October. VA, s. WV, and DC (James, Potomac, Shenandoah, and New rivers); OH, IN, IL, MO, TN (Mississippi and Ohio rivers and their tributaries); NE and CO south to w. TX and NM. See Collins, Colwell, & Yatskievych (2009) for detailed discussion. [= X; < *O. ludoviciana* var. *ludoviciana* – C; < *O. ludoviciana* – F, G, WV, Z; < *O. ludoviciana* ssp. *ludoviciana* – K]

Orobanche uniflora Linnaeus, Cancer-root. Sandy streambanks and riverbanks, rich forests. April-May. Nearly throughout s. Canada and the United States. [= RAB, F, G, K, W, WH, Z; > *O. uniflora* var. *uniflora* – C; = *Thalesia uniflora* (Linnaeus) Britton – S]

8. Buchnera Linnaeus 1753 (Bluehearts)
(contributed by Bruce A. Sorrie)

A genus of about 100 species, hemiparasitic herbs, of tropical and warm temperate regions of the Old and New Worlds. The taxonomy of this genus is poorly understood. The plants are root hemi-parasites, apparently not particular about the host species. References: Sorrie & Weakley (in prep.)=Z; Pennell (1935)=P.

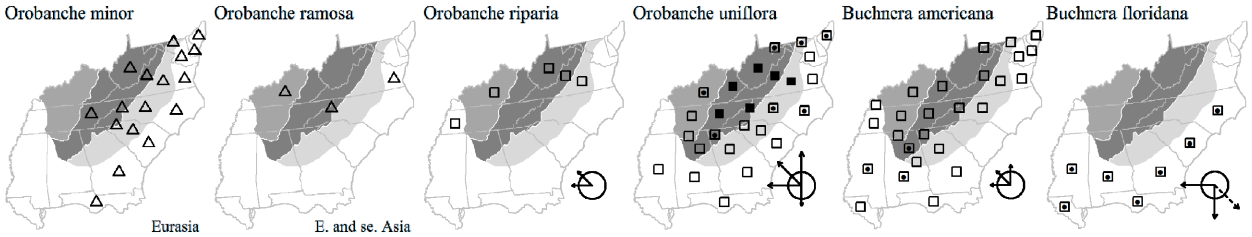
Identification notes: Lower leaves are broadest, mid and upper leaves narrowest, often markedly so; the key refers to lower leaves. Leaf teeth are usually few in number and vary in development, from crenate to 2-3 mm long and sharply pointed. The former condition is normal for *B. floridana*, the latter for *B. americana*. Calyx length is ca. 0.5 mm longer in fruit than in flower. The foliage turns black on drying.

1 Leaves lanceolate to narrowly ovate, tapering to a point; veins of lower stem leaves consisting of 3 major and 2 minor ones (narrow leaves may only have 3 total veins); leaf teeth usually well developed, rarely absent, usually 2-3 mm long; calyx (6.0-) 6.5-8.0 mm long; corolla lobes 5.0-7.0 mm long; [primarily of moderate to high pH soils in southern Great Plains, ranging to southern margin of the Great Lakes and eastward to the mid Atlantic seaboard, especially in mafic or calcareous glades and prairies, sometimes in more acid sites].....***B. americana***

1 Leaves narrowly oblanceolate to lanceolate, rounded at tip; veins of lower stem leaves consisting of 1 major and 2 minor ones (narrow leaves may only have 1 vein); leaf teeth usually crenate but may be absent, < 2 mm long; calyx (4.0-) 4.5-5.5 mm long; corolla lobes 4.0-5.0 mm long; [primarily of low pH soils on the southern Atlantic and Gulf Coastal Plain, sometimes in calcareous sites (especially outside of our area)].....***B. floridana***

Buchnera americana Linnaeus, Prairie Bluehearts, American Bluehearts, Plains Bluehearts. Dry (seasonally moist) rocky, gravelly, or clayey soil of limestone glades, glades over mafic rock (such as diabase, gabbro, etc.), wet meadows, sandy roadsides. July-September; August-October. NY and s. ON west to MI, IL, MO, and s. KS, south to c. NC, GA, Panhandle FL, and TX. In addition to the key characters given, *B. americana* is overall a larger and more robust plant than *B. floridana*, though both are quite variable in size, depending on the conditions in which they grow. *B. americana* has apparently declined very greatly in our area, probably owing to fire suppression in its habitats. [= RAB, C, F, G, GW, P, S, W, Z; < *B. americana* – K, WH (also see *B. floridana*)]

Buchnera floridana Gandoger, Savanna Bluehearts, Florida Bluehearts. Pine savannas, flatwoods, seepage bogs, sandy roadsides. April-October; May-November. Se. NC south to s. FL, west to TX, and in the West Indies. Previous attributions of *B. longifolia* Kunth (including *B. elongata* Small) to southeastern states (notably FL, AL, GA, and MS) are based on misidentifications of material which is actually *B. floridana*. [= RAB, GW, S, Z; >< *B. americana* – K; > *B. longifolia* Sw. – K, by misattribution; > *B. floridana* – S; > *B. breviflora* Pennell – S, by misattribution; > *B. elongata* Sw. – S; < *B. americana* – WH]



9. Striga Loureiro 1790 (Witchweed)

A genus of about 40 species, hemiparasitic herbs, of tropical to temperate regions of the Old World.

* ***Striga asiatica*** (Linnaeus) Kuntze, Witchweed. Cultivated fields, parasitic on the roots of corn and other grasses; native of the Old World. A serious weed, *Striga* has been the subject of eradication efforts and quarantine policies since its appearance in our area. [= K; = *S. lutea* Loureiro – RAB]

10. Schwalbea Linnaeus 1753 (Chaffseed)

The genus is monotypic, a hemiparasitic herb, of se. North America. References: Pennell (1935)=P.

Schwalbea americana Linnaeus, Chaffseed. Savannas, sandhill-pocosin ecotones (in the uphill portions), mesic loamy-soil slopes or swales in sandhill longleaf pine woodlands, fire-maintained interior woodlands and barrens. May-June; August. Formerly rather widespread in e. North America, primarily in the Coastal Plain, from e. MA, south to c. peninsular FL and west to TX, and disjunct in the Cumberland Mountains of KY and TN. The species is now limited to a few scattered sites in NJ, NC, SC, GA, FL, AL, and LA. It appears to require high fire frequency, especially during the growing season, perhaps related to its establishment ecology. The tiny seeds are hyaline-winged. [= RAB, C, F, G, GW, K, WH; > *S. americana* – P; > *S. australis* Pennell – P, S; > *S. americana* var. *australis* (Pennell) Reveal & C.R. Broome]

11. Castilleja Mutis ex Linnaeus f. 1782 (Indian Paintbrush)

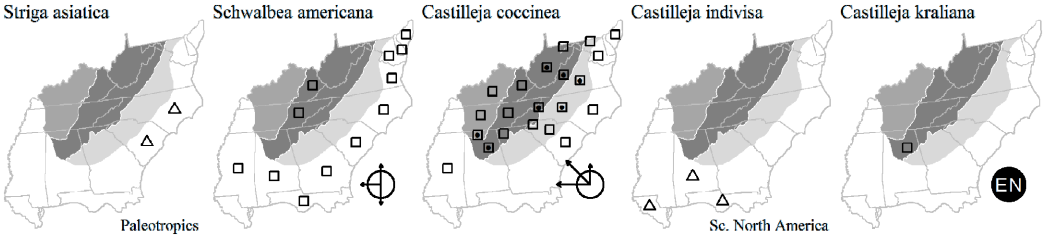
A genus of about 200 species, hemiparasitic herbs, primarily of w. North America, with a few species also in e. North America, Eurasia, Central America, and Andean South America. References: Pennell (1935)=P.

1 Inflorescence bracts mostly entire, yellow, < 2 cm long; [endemic to c. AL] ..... ***C. kraliana***
1 Inflorescence bracts either deeply lobed or entire, red (rarely yellow), mostly > 2 cm long; [collectively widespread in our area].
2 Lower corolla lip 2-3.5 mm long, thin, yellowish or orangish; inflorescence bracts deeply lobed; basal rosettes of leaves usually well-developed ..... ***C. coccinea***
2 Lower corolla lip <2 mm long, thickened, greenish; bracts simple; basal rostettes absent..... ***C. indivisa***

Castilleja coccinea (Linnaeus) Sprengel, Eastern Indian-paintbrush. Woodlands, fens, barrens, rock outcrops, meadows, wet pastures, grassy openings, usually over mafic rocks. April-May; May-June. ME, NY, and MN south to SC, n. GA, n. AL, c. MS, w. LA, and OK. [= RAB, C, F, G, GW, K, P, S, W]

* ***Castilleja indivisa*** Engelmann, Texas Indian-paintbrush. Dry, disturbed areas; introduced from sc. North America (AR and OK south to w. LA and TX). March-April. [= K, P, WH]

Castilleja kraliana J. Allison, Cahaba Paintbrush. Dolomitic Ketona glades. Endemic to dolomitic Ketona glades in Bibb County, c. AL (Allison & Stevens 2001).



12. Pedicularis Linnaeus 1753 (Wood-betony, Lousewort)

A genus of about 350 species, hemiparasitic herbs, of temperate regions of c. and e. Asia, Europe, w. North America, e. North America, and Andean South America. References: Pennell (1935)=P.

1 Inflorescence 1-4 dm tall; stem leaves alternate; stem pubescent, at least near the inflorescence; flowering April-May ..... ***P. canadensis***
1 Inflorescence 4-10 dm tall; stem leaves opposite; stem glabrous; flowering August-October..... ***P. lanceolata***

Pedicularis canadensis Linnaeus, Eastern Lousewort, Wood-betony. Moist to dry forests and woodlands, streambanks. April-May; May-July. ME, QC, and MB south to ne. FL, FL Panhandle, TX, and n. Mexico. Var. *dobbsii* Fernald, alleged to differ in having nearly solitary flowering stems and stoloniform basal offsets, needs additional study. [= RAB, C, G, GW, P, S, W, WH, WV; > *P. canadensis* var. *canadensis* – F; > *P. canadensis* var. *dobbsii* Fernald – F; > *P. canadensis* ssp. *canadensis* – K]

Pedicularis lanceolata Michaux, Swamp Lousewort. Springheads and swampy areas, over calcareous, mafic, or ultramafic rocks. August-October; September-October. MA and NY west to MN and ND, south to e. VA, w. NC, e. TN, ne. GA, w. TN, n. AR, and NE. [= RAB, C, F, G, GW, K, P, S, W, WV]

13. Melampyrum Linnaeus 1753 (Cow-wheat)

A genus of about 35 species, hemiparasitic herbs, of temperate regions of North America and Eurasia. References: Pennell (1935)=P.

1 Lowermost bracteal leaves entire or nearly so, or the uppermost with a few short basal teeth; leaves (2-) 10-30 mm wide, the widest leaves on a plant usually over 10 mm wide; plants usually simple or with 4 (rarely more) branches; internodes of the midstem usually 4-6 cm long ..... ***M. lineare*** *var.* ***latifolium***
1 Lowermost bracteal leaves generally with a few prominent sharp teeth or segments; leaves 2-10 mm wide; plants usually with numerous branches (often 10 or more); internodes of the midstem usually 1-3 cm long.
2 Teeth of the middle and upper bracts shorter than the width of the undivided portion of the bracts; leaves lanceolate, (2-) 5-10 mm wide; [widespread in our area] ..... ***M. lineare*** *var.* ***americanum***
2 Teeth of the middle and upper bracts commonly about as long as the width of the undivided portion of the bracts; leaves linear to lanceolate, 2-6 (-8) mm wide; [of the Coastal Plain] ..... ***M. lineare*** *var.* ***pectinatum***

Melampyrum lineare Desrousseaux *var.* ***americanum*** (Michaux) Beauverd, Common Cow-wheat. Dry soils. May-July; August-September. QC west to MN, south to VA, NC, and TN. Our three varieties are quite distinctive in morphology and have distinctive geographic ranges; they seem worthy of distinction from one another at the varietal level, at least. The fourth variety, var. *lineare*, is more northern, ranging from NL (Labrador) west to BC, south to New England, n. MI, and n. MN. It is similar to var. *latifolium* in its entire bracteal leaves, but overall is more like var. *americanum*, differing in the bracteal teeth and in its linear leaves, rarely over 5 mm wide. The distinction between var. *americanum* and var. *lineare* may not be worth making; if combined (as by K), the correct name is var. *lineare*. [= C, F, G; < *M. lineare* – RAB, W; < *M. lineare* var. *lineare* – K, WV; < *M. lineare* var. *typicum* – P; < *M. lineare* – S]

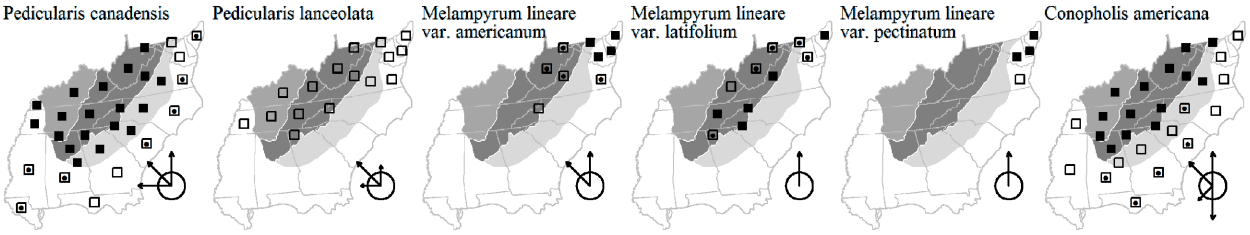
Melampyrum lineare Desrousseaux *var.* ***latifolium*** Barton, Appalachian Cow-wheat. Dry soils in ridgetop woodlands, in thin soils around rock outcrops. Late April-July; August-September. MA and NY south to n. GA, mostly in the Appalachians. [= C, F, G, K, P, WV; < *M. lineare* – RAB, W; = *M. latifolium* (Barton) Muhlenberg ex Britton - S]

Melampyrum lineare Desrousseaux *var.* ***pectinatum*** (Pennell) Fernald, Pine-barren Cow-wheat. Dry sandy areas. May-July; August-September. E. MA to se. VA, on the Coastal Plain. [= C, F, G, K, P; < *M. lineare* – RAB, W]

14. Conopholis Wallroth 1825 (Squawroot, Bearcorn)

A genus of 3 species, herbs parasitic on *Quercus*, of e. North America and sw. North America south to Central America. Rodrigues, Colwell, & Stefanović (2011) determined that a division of the genus into 3 species best reflects genetic differentiation, the other 2 being *C. alpina* Liebmann, ranging from AZ, NM, and TX south to s. Mexico, and *C. panamensis* Woodson of Costa Rica and Panama. References: Rodrigues, Colwell, & Stefanović (2011)=X; Haynes (1971)=Z; Thieret (1971)=Y.

Conopholis americana (Linnaeus) Wallroth, Squawroot, Bearcorn. Rich, moist forests, under *Quercus* species. March-June. NS west to WI and south to c. peninsular FL, AL, and TNl; disjunct in e. Mexico (Chiapas, Oaxaca, and Puebla). Haynes (1971) discusses the nature of the parasitism. *Conopholis* apparently germinates near an oak root, forms a parasitic connection to the root, resulting in the formation of a gall consisting of both *Quercus* and *Conopholis* tissue. The gall can be up to 25 cm in diameter, and lasts for many years, repeatedly sending up flowering shoots. It is believed that the gall exists underground for some years prior to first flowering. [= RAB, C, F, G, K, S, W, WH, WV, X, Y, Z]



377. LENTIBULARIACEAE Richard 1808 (Bladderwort Family) [in LAMIALES]

A family of 3 genera and about 270-320 species, insectivorous herbs, cosmopolitan. References: Fischer et al. in Kadereit (2004).

1 Leaves ovate or elliptic, in a basal rosette; carnivory via the viscid-slimy upper leave surfaces; flowers solitary on bractless peduncles ..... ***Pinguicula***
1 Leaves or leaf segments linear, borne along a subterranean or submersed stem; carnivory via specialized bladder-like traps; flowers in (1-) many-flowered racemes, each flower pedicel subtended by a bract ..... ***Utricularia***

Pinguicula Linnaeus 1753 (Butterwort)

A genus of about 46-80 species, herbs, of America, Mediterranean Europe, and circumboreal America and Eurasia. References: Schnell (2002b)=Z; Godfrey & Stripling (1961); Wood & Godfrey (1957); Schnell (1980a); Fischer et al. in Kadereit (2004). Key based in part on GW.

1 Expanded corolla < 1.5 cm across; palate not exserted from the throat of the corolla; rosettes usually 2-4 cm in diameter; flowers usually white to pale violet (rarely medium violet); seeds 0.4 mm long ..... ***P. pumila***
1 Expanded corolla > 1.8 cm across; palate markedly exserted from the throat of the corolla; rosettes usually 5-10 (-15) cm across; corolla yellow, violet, or white; seeds (0.4-) 0.5-0.8 mm long.
  2 Corolla yellow ..... ***P. lutea***
  2 Corolla lavender-blue or white.
    3 Hairs on the lower portion of the scape elongated, pointed, multicellular, nonglandular, transitioning upward to 1-celled glandular hairs; expanded portion of corolla markedly "veiny" (darker along the veins); [of se. NC southward to s. peninsular FL and e. Panhandle FL] ..... ***P. caerulea***
    3 Hairs throughout scape glandular; expanded portion of corolla not "veiny;" [collectively of sw. GA and FL Panhandle westward to s. MS].
      4 Fresh leaves dull red or reddish green; corolla lobes ca. 2× as long than broad, the lobes notched almost ½ their length.... ***P. planifolia***
      4 Fresh leaves bright yellow-green; corolla lobes ca. 1× as long than broad, the lobes notched about 1/4 their length
        5 Corolla tube violet, with darker violet veins; hairs of the inner corolla tube white ..... ***P. ionantha***
        5 Corolla tube yellow, with reddish-brown veins; hairs of the inner corolla tube yellow ..... ***P. primuliflora***

Pinguicula caerulea Walter, Blue Butterwort. Pine savannas and wet pine flatwoods, mostly in the outer Coastal Plain, rarely extending inland to seepages and sandhill-pocosin ecotones in the fall-line Sandhills of NC and SC. April-May. Se. NC

(Carteret and Johnston counties) south to s. peninsular FL, west to e. Panhandle FL. Schnell (1980a) discusses populations with white corollas. [= RAB, GW, K, S, WH, Z; *Pinguicula elatior* Michaux]

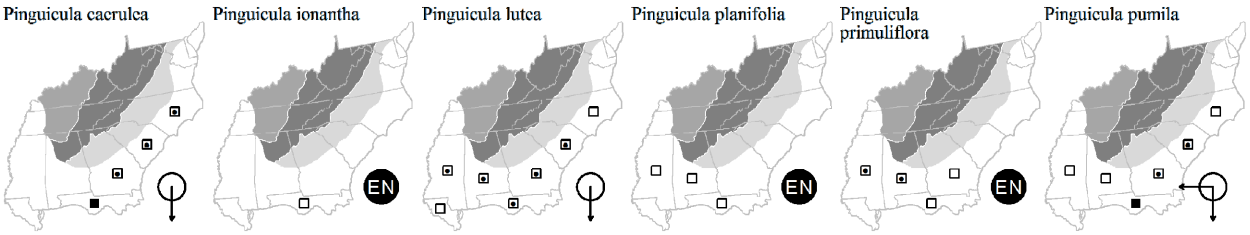
Pinguicula ionantha Godfrey, Panhandle Butterwort. Pond margins, bogs, flatwoods. Endemic to FL Panhandle. [= GW, K, WH, Z]

Pinguicula lutea Walter, Yellow Butterwort. Pine savannas and wet pine flatwoods, mostly in the outer Coastal Plain, rarely extending inland to seepages and sandhill-pocosin ecotones in the fall-line Sandhills of SC. Late March-May. Se. NC (Pender and New Hanover counties) south to s. FL, west to e. LA. [= RAB, GW, K, S, WH, Z]

Pinguicula planifolia Chapman, Chapman's Butterwort. Pond margins, bogs, flatwoods. S. AL, Panhandle of FL, and s. MS. [= GW, K, S, WH, Z]

Pinguicula primuliflora Wood & Godfrey, Clearwater Butterwort. Clearwater streams and seeps. Sw. GA, s. AL, Panhandle FL, and s. MS. [= GW, K, WH, Z]

Pinguicula pumila Michaux, Small Butterwort. Pine savannas and wet pine flatwoods. April-May. Se. NC (Carteret and Pender counties) south to s. FL, west to se. TX; and in the Bahamas. [= RAB, GW, K, S, WH, Z]



Utricularia Linnaeus 1753 (Bladderwort)

Utricularia, as monographed by Taylor (1989), consists of 214 species in 35 sections, with a nearly cosmopolitan distribution. In our area, 14 or 15 species in 5 sections are known to occur. References: Taylor (1989)=Z; Schnell (2002b)=Y; Müller & Borsch (2005); Fischer et al. in Kadereit (2004). Key based in part on Z and GW.

1 Flowers white or cream-white, 1-3 mm long; inflorescence peduncles very reduced, the pedicels appearing to arise directly from the stolons; traps 0.3-0.8 mm long; plants floating unattached in water (sometimes deposited land by dropping water, but then the principal branch systems stranded on the soil surface); capsules ca. 1 mm long, fusiform, indehiscent, with 1 seed; seeds essentially smooth, unornamented; leaves absent; [section *Utricularia*] ..... ***U. olivacea***

1 Flowers yellow, pink, or purple (sometimes fading whitish), (2-) 5-20 mm long; inflorescence peduncles well-developed, the inflorescence clearly a raceme; traps 0.2-5.0 mm long (< 0.7 mm long only in the terrestrial species (see key lead 2); plants attached (with principal branch systems within the soil), or floating unattached in water (sometimes deposited on land by dropping water, but then the principal branch systems stranded on the soil surface); capsules 1-8 mm long, globose, subglobose, or ovoid, with many seeds; seeds reticulate, papillose, echinate, multi-angled, or winged (rarely more-or-less smooth); leaves present (sometimes absent in the terrestrial species).

2 Plants attached (with principal branch systems within the soil); leaves absent or simple, linear, grass-like aerial leaves; bladders 0.2-1.1 mm long, most or all on a plant usually < 1.0 mm long; seeds reticulate-alveolate (also angled in *U. resupinata*), 0.20-0.25 mm long.

3 Flowers pink; inflorescence 1 (-2)-flowered; bract at base of the pedicel tubular, attached circumferentially around the stem; aerial leaves (when present) terete, septate; [very rare in our area]; [section *Lecticula*] ..... ***U. resupinata***

3 Flowers yellow (sometimes fading whitish); inflorescence (1-) 2-15-flowered; bract at base of the pedicel peltate or ovate, attached on one side of the stem; aerial leaves (when present) flattened, not septate; [collectively common in our area].

4 Bracts subtending the pedicels peltate (attached near their middles), unattached at either end; pair of bracteoles absent; spur of the corolla oriented forward, more-or-less appressed to the lower lip; aerial leaves (when present) with subacute to obtuse apex; [section *Setiscapella*] ..... ***U. subulata***

4 Bracts subtending the pedicels ovate (attached at their bases), free only at their upper end; pair of bracteoles associated with each bract present, linear to lanceolate; spur of the corolla oriented downward or backward, at approximately a right angle to the lower lip; aerial leaves (when present) with acute apex; [section *Stomoisia*].

5 Corolla 1.5-2.0 cm long; spur 8-12 mm long; raceme usually short, the (1-) 2-6 flowers crowded together, all of them chasmogamous ..... ***U. cornuta***

5 Corolla 0.25-1.5 cm long; spur 5-7 (-9) mm long; raceme usually elongate, the (1-) 2-15 flowers well-spaced, often the lower (sometimes all) cleistogamous and much smaller than the chasmogamous flowers ..... ***U. juncea***

2 Plants floating unattached in water (sometimes deposited on land by dropping water, but then the principal branch systems stranded on the soil surface); leaves present and dissected into linear segments; bladders 0.7-5.0 mm long, most or all on a plant > 1.0 mm long; seeds papillose, reticulate, ridged, angled, or winged, 0.5-2.0 mm long.

6 Flowers purple; leaves divided into verticillate segments with terminal traps; [section *Vesiculina*] ..... ***U. purpurea***

6 Flowers yellow; leaves divided into alternate segments with lateral traps; [section *Utricularia*].

7 Peduncle with whorl of inflated leaf-like organs (floats).

8 Floats 4-7, not fused basally to one another, fusiform, tapering gradually to base and apex from a widest point near the middle; leaves with the 2 primary divisions unequal; bracts of the scape longer than broad, entire; flowers (6-) 9-14 (-17) per scape; apex of corolla spur bifid ..... ***U. inflata***

8 Floats (5-) 6-8 (-10), fused basally to one another, cylindrical, more-or-less parallel-sided through most of their length, tapering abruptly to base and apex; leaves with the 2 primary divisions equal; bracts of the scape broader than long, the apex slightly to strongly 3-lobed; flowers (1-) 3-4 (-7) per scape; apex of corolla spur usually entire (rarely bifid) ..... ***U. radiata***

7 Peduncle without whorl of inflated leaf-like organs (floats).

9 Main axes distinctly flattened in cross-section, up to 10 mm wide ..... ***U. foliosa***

9 Main axes round in cross-section.
10 Lower lip of corolla 3-lobed; seeds disk-shaped, not angular or winged; inflorescences of 2 types, the chasmogamous on erect peduncles 5-25 cm long bearing 2-8 flowers, the cleistogamous without a peduncle, the solitary pedicels borne directly on the stolons, 0.5-2 cm long, deflexed..... ***U. geminiscapa***
10 Lower lip of corolla entire or slightly irregular, not 3-lobed; seeds angular or winged; inflorescences of 1 type (erect, chasmogamous).
11 Upper corolla lip smaller than the lower, entire; capsule circumscissilely dehiscent; seeds 0.7-1.0 mm long, 4-6-angled; corolla without stipitate glands on its external surface.
12 Leaves of one kind only, divided into numerous capillary segments bearing lateral traps; bracts scarcely auriculate; plant distinctly aquatic, floating in water and only rarely stranded; [of the Coastal Plain] ..... ***U. macrorhiza***
12 Leaves of 2 or 3 kinds, some divided into capillary or narrowly linear segments and bearing few or no traps, others divided into fewer capillary segments and bearing more-or-less numerous traps; bracts distinctly auriculate; plants typically in boggy situations, in shallow water or frequently stranded; [**either** of the Mountains at high elevations **or** of various physiographic provinces northward].
13 Broadest leaf segments with 9-20 lateral setae (use 10× magnification); spur of corolla cylindrical, distinctly longer than wide, the apex distinctly curved forward..... ***[U. intermedia]***
13 Broadest leaf segments lacking lateral setae; spur of corolla shortly saccate to broadly conical, wider than long, the apex not curved forward ..... ***U. minor***
11 Upper corolla lip larger than the lower, obscurely 3-lobed; capsule laterally 2-valved or indehiscent; seeds 0.8-2.5 mm long, lenticular, with an irregular, lobed, or continuous wing; corolla (or at least the spur) with a few to many short stipitate glands (sometimes patchily distributed).
14 Vegetative shoots uniform, all bearing rather sparsely divided leaf segments bearing traps, seeds 0.8-1.1 mm long, with a continuous, circumferential wing, slightly to irregularly lobed.
15 Lower corolla lip 8-10 mm long, about equaling or slightly shorter than the conical, 5-9 mm long spur; leaves usually forked twice..... ***U. biflora***
15 Lower corolla lip 5-6 mm long, exceeding the blunt, 3.5-4.5 mm long spur; leaves usually forked once ..... ***U. gibba***
14 Vegetative shoots of 2 kinds, some bearing leafy segments and few or no traps, others bearing reduced segments and more-or-less numerous traps; seeds 1.0-2.5 mm long, with an irregularly deeply lobed or partial wing.
16 Plant anchored in mud up to 100 cm below water surface; green leafy shoots up to 40 cm long and 5 cm wide; peduncle flexuous, to 100 cm long, only the uppermost ca. 10 cm emergent ..... ***U. floridana***
16 Plant in shallow water or stranded; green leafy shoots usually not > 10 cm long and 2 cm wide; peduncle erect, straight, to 30 cm long, the uppermost 10-25 cm emergent..... ***U. striata***

Utricularia biflora Lamarck, Longspur Creeping Bladderwort. Ponds, lakes, and diches. June-October. This species may not be distinct from *U. gibba* (which see for discussion). E. MA south to FL, west to TX and OK, primarily on the Coastal Plain; also apparently widespread in the New World and Old World tropics. [= RAB, C, F, G, GW, W; = *U. pumila* Walter – S, apparently misapplied; < *U. gibba* – K, WH, Y, Z]

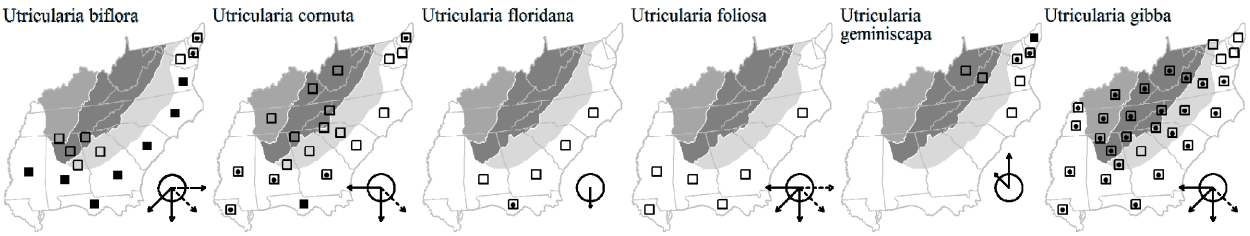
Utricularia cornuta Michaux, Horned Bladderwort. Shores of limesink ponds (dolines), bogs, mountain bogs. May-September. NL (Newfoundland) and QC west to n. ON, AB, and MN, south to s. FL and e. TX; also in the Bahamas and Cuba. Taylor (1989) states that where sympatric with *U. juncea*, *U. cornuta* flowers much earlier. [= RAB, C, F, G, GW, K, W, WH, WV, Y, Z; = *Stomoisia cornuta* (Michaux) Rafinesque – S]

Utricularia floridana Nash, Florida Bladderwort. In deep water of natural Carolina bay lakes, other natural lakes, and limesink ponds (dolines). July-August. Se. NC south to c. peninsular FL, west to Panhandle FL and sw. GA. [= GW, K, S, WH, Y, Z]

Utricularia foliosa Linnaeus, Flatstem Bladderwort. In deep water of natural lakes and ponds. Se. NC south to s. FL, west to TX (Brown & Marcus 1998); West Indies, South America, Africa. This species is reported for NC by Taylor (1989). See GW for a detailed description of this species. [= GW, K, S, WH, Y, Z]

Utricularia geminiscapa Benjamin, Two-flowered Bladderwort, Hidden-fruited Bladderwort. Beaver ponds, mucky seepages. NL (Newfoundland) and QC west to n. MI and n. WI, south to PA and sc. NC. [= C, F, G, K, W, WV, Y, Z]

Utricularia gibba Linnaeus, Shortspur Creeping Bladderwort. Ponds, lakes, and diches. May-September. QC west to WI, south to FL and LA; also apparently widespread in the West Indies and Central America and apparently the Old World tropics. Taylor (1989) includes *U. biflora* in *U. gibba*. Other authors have expressed doubts about the distinction, including RAB ("doubtfully distinct"). Taylor suggests that "further research is clearly indicated, but to be at all meaningful, it must be conducted on a worldwide basis." I have here, for the moment, retained the 2 traditionally recognized species, though intermediates will be encountered. [= RAB, C, F, G, S, W, WV; < *U. gibba* – K, Y, Z (also see *U. biflora*)]



Utricularia inflata Walter, Swollen Bladderwort, Inflated Bladderwort. Ponds, lakes, ditches. May-November. NJ south to s. FL, west to e. TX; disjunct in WA (probably introduced). Also disjunct in an artificial pond in Henderson County, NC (Carl Sandburg Home National Historic Site). [= C, G, GW, K, S, WH, Y, Z; = *U. inflata* var. *inflata* – RAB, F]

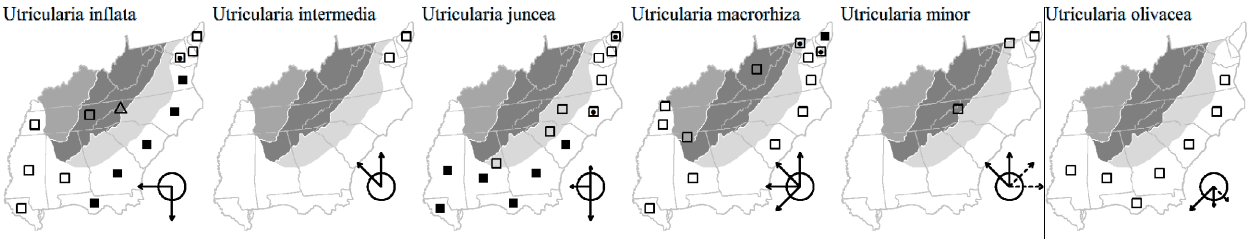
Utricularia intermedia Hayne, Northern Bladderwort. {habitats} South to se. PA (Rhoads & Klein 1993), DE (?), and MD (Kartesz 1999). The report from sc. GA (Jones & Coile 1988) is in error. [= C, F, G, K, Y, Z]

Utricularia juncea M. Vahl, Southern Bladderwort. Shores of limesink ponds (dolines), borrow pits, wet sands. July-September. NY (Long Island) and NJ south to s. FL, west to e. TX and se. AR; also in the West Indies, Central America and South America. [= RAB, C, F, G, GW, K, WH, Y, Z; > *Stomoisia juncea* (M. Vahl) Barnhart – S; > *Stomoisia virgatula* Barnhart – S]

Utricularia macrorhiza Le Conte, Greater Bladderwort. Pools and ponds. May-September. NL (Newfoundland) west to AK, south to NC, SC, TX, CA, and Mexico; also in e. Asia. See Taylor (1989) for a discussion of the differences between this species and *U. vulgaris* of Europe and w. Asia, with which it has often been combined or associated as a variety. [= K, S, Y, Z; < *U. vulgaris* Linnaeus – RAB, C, F, G, WV, misapplied to American plants]

Utricularia minor Linnaeus, Lesser Bladderwort, Small Bladderwort. Fens and bogs, in the Southern Blue Ridge at about 1400 meters elevation. Circumboreal, south in North America to NJ, DE, PA, IN, IL, IA, NE, CO, UT, NV, and CA; disjunct in w. NC. [= C, F, G, K, W, Y, Z]

Utricularia olivacea Wright ex Grisebach, Dwarf Bladderwort, Minute Bladderwort. In floating mats (often algal) in water of limesink ponds (dolines), artificial lakes or beaver ponds. September-October. NJ south to FL, west to s. AL and s. MS (Sorrie & Leonard 1999), in the Coastal Plain; also in the West Indies (Cuba), Central America, and South America. [= RAB, GW, K, WH, Y, Z; = *Biovularia olivacea* (Wright ex Grisebach) Kam. – S]



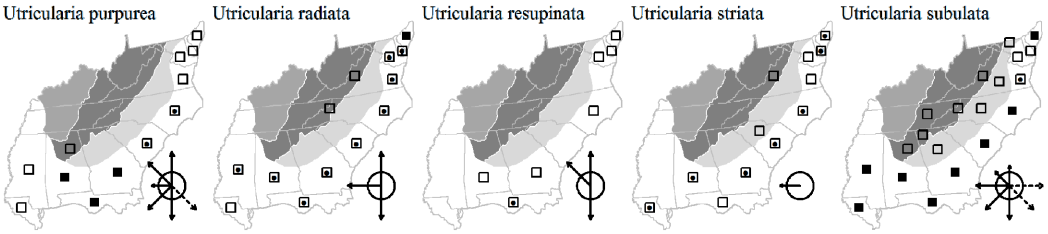
Utricularia purpurea Walter, Purple Bladderwort. In water of ponds, ditches, other slow-moving water. May-September. NS and QC west to MN, south to NY, n. IN, s. MI, and WI, and on the Coastal Plain south to s. FL, west to se. TX; also in Mexico, the West Indies, and Central America. [= RAB, C, F, G, GW, K, WH, Y, Z; = *Vesiculina purpurea* (Walter) Rafinesque – S]

Utricularia radiata Small, Floating Bladderwort, Small Swollen Bladderwort. Ponds, depression ponds, lakes, and ditches. May-November. NS south to s. FL, west to TX; disjunct in w. VA, w. TN, nw. IN; reports of this species in Cuba and South America are apparently in error. [= C, G, GW, K, S, W, WH, Y, Z; = *U. inflata* var. *minor* Chapman – RAB, F]

Utricularia resupinata B.D. Greene ex Bigelow, Northeastern Bladderwort, Resupinate Bladderwort. Wet pine flatwoods, pond margins, shores of natural lakes. NS west to nw. WI, south (irregular and scattered in part) to FL and sw. GA; also in the Bahamas (Sorrie & LeBlond 1997). Although "the curious gap in the North American range" [NC, SC, and VA] (Taylor 1989) is no longer strictly a gap, *U. resupinata* does appear to have a strangely bimodal range, with a center of distribution in ne. United States and se. Canada and a second extending from se. United States south into the West Indies and Central America. [= C, F, G, GW, K, WH, Y, Z; = *Lecticula resupinata* (B.D. Greene) Barnhart – S]

Utricularia striata Le Conte ex Torrey, Fibrous Bladderwort. Ponds, lakes, and ditches. May-November. Se. MA south to n. FL, west to e. TX and e. OK. [= K, WH, Y, Z; = *U. fibrosa* Walter – RAB, C, F, G, GW, S, of uncertain application and likely misapplied]

Utricularia subulata Linnaeus, Slender Bladderwort, Zigzag Bladderwort. Moist sands or peats of various kinds of acidic wetlands, including wet pine savannas and flatwoods, shores of limesink ponds (dolines), borrow pits, ditches. March-July (-later). In North America primarily in the Coastal Plain, from NS and e. MA south to s. FL, west to TX, north in the interior to TN and AR; also in the West Indies, Central America, South America, Africa, and Asia. Taylor (1989) terms this "the most widespread of *Utricularia* species." [= RAB, C, F, G, GW, K, W, WH, Y, Z; > *Setiscapella subulata* (Linnaeus) Barnhart – S; > *Setiscapella cleistogama* (A. Gray) Barnhart – S]



378. ACANTHACEAE Durande 1762 (Acanthus Family) [in LAMIALES]

A family of about 230 genera and about 3450 species, herbs, shrubs, vines, and trees, largely tropical. References: Wasshausen (1998); Long (1970); McDade & Moody (1999).

1 Plant a tree, with opposite leathery leaves; [of FL, s. MS, s. LA southward] ..... ***Avicennia***
1 Plant an herb, with various leaf arrangements.
2 Leaves in a basal rosette (sometimes with smaller leaves on a scape).

3 Leaves glabrate, to 22 cm long and 8 cm wide; corolla 0.8-1.3 cm long; capsule 8-10 mm long; stamens 2; [of moist to wet swamps] ..... ***Elytraria***
3 Leaves pubescent, to 10 cm long and 3 cm wide; corolla 1.8-4 cm long; capsule 9-18 mm long; stamens 4; [of dry upland pinelands].
4 Leaves 2-10 cm long, 1-3 cm wide; corolla 3-4 cm long; calyx lobes 15-30 mm long; capsule 12-18 mm long ..... ***Ruellia ciliosa***
4 Leaves 1.5-2.5 cm long, 0.7-0.8 cm wide; corolla ca. 2 cm long; calyx lobes 6-9 mm long; capsule ca. 10 mm long..... ***Stenandrium***
2 Leaves cauline.
5 Fertile stamens 4; corolla not distinctly 2-lipped, the corolla lobes of nearly equal size (except distinctly 2-lipped in *Hygrophila*).
6 Corolla distinctly 2-lipped ..... ***Hygrophila***
6 Corolla not distinctly 2-lipped, the corolla lobes of nearly equal size.
7 Plant an herbaceous vine; leaves cordate-hastate at the base; flowers yellow to orange, usually with a dark purple "eye" ..... ***Thunbergia***
7 Plant an herb; leaves cuneate to rounded at the base; flowers white to various shades of blue or pink.
8 Calyx lobes linear-aristate; anther sacs awned or pointed at the base ..... ***Dyschoriste***
8 Calyx lobes lanceolate or linear; anther sacs blunt ..... ***Ruellia***
5 Fertile stamens 2; corolla distinctly 2-lipped (except salverform in *Pseuderanthemum* and with with 4 nearly equal lobes in *Yeatesia*).
9 Corolla salverform, 5-lobed..... ***Pseuderanthemum***
9 Corolla distinctly 2-lipped or 4-lobed.
10 Bracts and bractlets inconspicuous, 2-5 mm long, linear or triangular; stem subterete or obscurely 4-angled ..... ***Justicia***
10 Bracts and/or bractlets subtending the flowers conspicuous, 5-15 mm long, obovate; stem terete or 6-angled.
11 Stem six-angled in cross-section; corolla conspicuously 2-lipped ..... ***Dicliptera***
11 Stem terete in cross-section; corolla 4-lobed, the lobes nearly equal ..... ***Yeatesia***

Andrographis Wallich (False Water-willow)

A genus of about 20 species of tropical Asia.

* *Andrographis echioides* (Linnaeus) Nees, native of India, is reported for chrome ore piles near Newport News, VA, by Reed (1961); it is likely not established in our area. [= K] {not keyed; not mapped; rejected as a component of our flora}

Avicennia Linnaeus (Black Mangrove)

A genus of 4-7 species, tropical. Of variable family placement, having been variously placed in the Acanthaceae, Verbenaceae, or Avicenniaceae.

Avicennia germinans (Linnaeus) Linnaeus, Black Mangrove. Brackish and salt marshes and swamps. Scattered on the Gulf Coast in FL peninsula (Dixie county southward on the west coast, St. Johns County southwards on the east coast), Panhandle FL (Franklin and Taylor counties), s. MS, s. LA, and se. TX, southwards into the West Indies and Tropical America. [= GW, K, WH; = *A. nitida* Jacquin – S]

Dicliptera Antoine Laurent de Jussieu (Dicliptera, Foldwing)

A genus of about 150 species, largely tropical, but extending into warm temperate regions. References: Wasshausen (1998)=Y; Long (1970)=Z.

1 Corolla tan to purplish-pink, 15-20 mm long, the tube straight or nearly so ..... ***D. brachiata***
1 Corolla scarlet red, 20-25 mm long, the tube curved..... ***D. sexangularis***

Dicliptera brachiata (Pursh) Sprengel, Dicliptera, Branched Foldwing. Bottomland forests. August-October. Se. VA south to c. peninsular FL, west to TX, and north in the interior to c. TN, s. IN, s. IL, MO, and se. KS. [= RAB, C, F, GW, K, WH, Y; = *Diapedium brachiatum* (Pursh) Kuntze – S; > *Dicliptera brachiata* var. *brachiata* – Z]

Dicliptera sexangularis (Linnaeus) de Jussieu, Six-angle Foldwing. Disturbed areas, hammocks. [= K, WH, Y; = *Diapedium assurgens* (Linnaeus) Kuntze – S; > *Dicliptera assurgens* (Linnaeus) de Jussieu var. *vahliana* (Nees) M. Gómez – Z]

Dyschoriste Nees (Twinflower, Snakeherb, Dyschoriste)

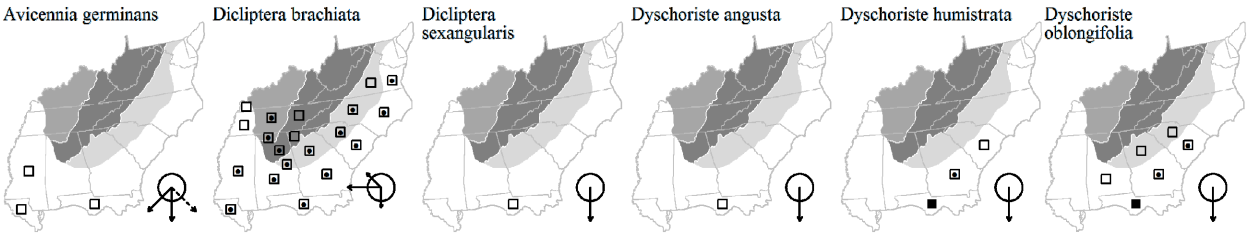
A genus of about 65 species, of tropical and warm temperate regions. References: Wasshausen (1998)=Y; Long (1970)=Z.

1 Corolla 25-27 mm long (including the 5-10 mm lobes); capsule 10-14 mm long; [of pinelands] ..... ***D. oblongifolia***
1 Corolla 10-15 mm long (including the 3-5 mm lobes); capsule 7-10 mm long
2 Leaves linear to linear-elliptic; [of moist pinelands]..... ***D. angusta***
2 Leaves elliptic to elliptic-ovate; [of floodplain forests] ..... ***D. humistrata***

Dyschoriste angusta (A. Gray) Small, Pineland Twinflower. Moist pinelands. N. FL south to s. peninsular FL. Reported for FL Panhandle (Wakulla County) by Kunzer et al. (2009). [= K, S, WH] {add GW, Y, Z to synonymy; improve key}

Dyschoriste humistrata (Michaux) Kuntze, Swamp Twinflower, Swamp Dyschoriste. Bottomland forests, especially on soils over limestone. April-May. SC to c. peninsular FL, west to e. Panhandle FL. [= RAB, GW, K, S, WH, Y, Z]

Dyschoriste oblongifolia (Michaux) Kuntze, Blue Twinflower, Pineland Dyschoriste. Pine savannas, flatwoods, and sandhills. April-May. SC to s. FL, west to se. AL and e. Panhandle FL. The basis of Small's (1933) attribution of this species to VA is unknown. [= RAB, K, S, WH, Y; > *Dyschoriste oblongifolia* var. *oblongifolia* – Z]



Elytraria Michaux (Elytraria)

A genus of about 17 species, of tropical and warm temperate regions of the Western and Eastern Hemispheres. The placement of this genus in the Acanthaceae is uncertain (McDade & Moody 1999, McDade et al. 2000). References: Long (1970)=Z; Ward (2004d)=Y.

Elytraria caroliniensis (J.F. Gmelin) Persoon *var.* ***caroliniensis***, Carolina Elytraria. Swamp forests over coquina limestone ("marl"). June-August. Var. *caroliniensis* ranges from se. SC south to c. peninsular FL, west to Panhandle FL and sw. GA. Var. *angustifolia* (Fernald) Blake is restricted to s. FL. Ward (2004d) also recognizes *E. caroliniensis* var. *vahliana* (Nees in A.P. de Candolle) D.B. Ward, in ne. and Panhandle FL, south to c. peninsular FL. [= K, Z; < *E. caroliniensis* – RAB, WH; = *E. carolinensis* var. *carolinensis* – GW, misspelling; = *Tubiflora carolinensis* J.F. Gmelin – S, misspelling; > *E. carolinensis* var. *carolinensis* – Y; > *E. caroliniensis* var. *vahliana* (Nees in A.P. de Candolle) D.B. Ward – Y]

Hygrophila R. Brown

A genus of about 25 species, of tropical regions. References: Wasshausen (1998)=Y; Les & Wunderlin (1981)=Z. Key based on Y.

1 Leaf blades 5-12 cm long; calyx segments ca. 5 mm long, glabrous; flowers borne in axillary clusters ..... ***H. lacustris***
1 Leaf blades 1-3.5 cm long; calyx segments ca. 2 mm long, pubescent; flowers borne in terminal and axillary spikes ..... ***H. polysperma***

Hygrophila lacustris (Schlectendahl & Chamisso) Nees, Gulf Swampweed. Shallow water of swamps and shores. Sw. GA south to c. FL Peninsula, west to e. TX; West Indies. [= GW, K, S, Y, Z; = *Hygrophila costata* Nees et al. – WH; = *Ruellia lacustris* Schlectendahl & Chamisso]

* ***Hygrophila polysperma*** (Roxburgh) T. Anderson, East Indian Swampweed. Lakes, rivers, canals; established in AL and FL, doubtfully established in VA, native of the East Indies. Grown for the aquarium trade, and sporadically introduced to bodies of water, apparently well-established in FL (Les & Wunderlin 1981). [= GW (footnote), K, WH, Y, Z]

Justicia Linnaeus (Water-willow)

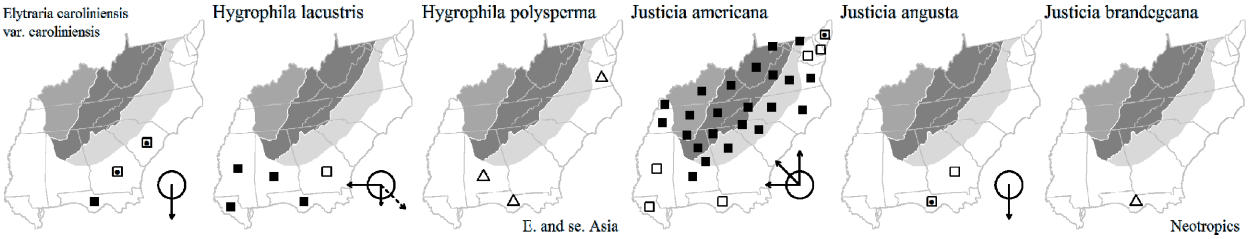
A genus of about 600 species, herbs and shrubs of the tropics and warm temperate North America. References: Wasshausen (1998)=Y; Long (1970)=Z. Key based in part on Y.

1 Bracts of the inflorescence foliaceous and overlapping ..... ***J. brandegeana***
1 Bracts of the inflorescence small, neither foliaceous nor overlapping.
  2 Spike densely flowered; seeds verrucose; primary leaves averaging 6-8× as long as wide; [of the Piedmont, Mountains, and Coastal Plain]. ..... ***J. americana***
  2 Spike loosely flowered; seeds smooth or minutely muricate (with very fine, sharp projections); primary leaves **either** ca. 2-6× as long as wide **or** > 8× as long as wide; [of the Coastal Plain].
    3 Corolla purple, 18-30 mm long; leaves averaging > 8× as long as wide; cystoliths parallel to the midvein of the leaf; [of s. GA south into FL].
      4 Upper leaf blades 4-7 cm long, not channeled, tough but not fleshy; calyx segments 5-7 mm long, < 1 mm wide ..... ***J. angusta***
      4 Upper leaf blades 8-13.5 cm long, channeled, fleshy; calyx segments 11-15 mm long, ca. 1 mm wide..... ***J. crassifolia***
    3 Corolla pale lavender to white, 8-13 mm long; leaves averaging 2-6× as long as wide; cystoliths parallel to the secondary veins of the leaf; [of the Coastal Plain throughout our area].
      5 Spikes lax, the flowers usually borne singly, secund; seeds smooth; leaves averaging ca. 5× as long as wide ..... ***J. ovata*** *var.* ***lanceolata***
      5 Spikes somewhat congested, the flowers borne in opposite pairs; seeds minutely muricate (with very fine, sharp projections); leaves averaging ca. 3× as long as wide ..... ***J. ovata*** *var.* ***ovata***

Justicia americana (Linnaeus) Vahl, American Water-willow. River and stream beds, in shallow water, often rooted in rocky shallows. June-October. W. QC west to MI and NE, south to sw. GA, Panhandle FL, and s. TX. [= RAB, C, GW, K, W, WH, WV, Y, Z; > *J. americana* var. *americana* – F, G; > *J. americana* var. *subcoriacea* Fernald – F, G; > *J. mortuifluminis* Fernald – F; = *Dianthera americana* Linnaeus – S]

Justicia angusta (Chapman) Small, Pineland Water-willow, Narrowleaf Water-willow. Pond-cypress depressions, roadside ditches, savannas. Se. GA (Camden and Charlton counties) (Sorrie 1998b; Carter, Baker, & Morris 2009) south to s. FL. [= K, WH, Y; < *J. ovata* – GW; < *J. crassifolia* (Chapman) Chapman ex Small – S; = *J. ovata* (Walter) Lindau var. *angusta* (Chapman) R.W. Long – Z]

Justicia brandegeana Wasshausen, Shrimp-plant. Disturbed areas; native of Mexico. January-December. [= K2, WH]



Justicia crassifolia (Chapman) Chapman ex Small. Flatwoods, cypress ponds. S. GA to the FL Panhandle. [= GW, K, WH, Y; < *J. crassifolia* – S]

Justicia ovata (Walter) Lindau *var.* ***lanceolata*** (Chapman) R.W. Long. Swamps, marshes. May. Se. GA west to TX, north in the Mississippi Embayment to s. IL, s. IN, w. KY. Needs additional study; may warrant specific status. [= K, WH, Y, Z; < *J. ovata* – GW; = *J. lanceolata* (Chapman) Small – S]

Justicia ovata (Walter) Lindau *var.* ***ovata***, Coastal Plain Water-willow, Loose-flower Water-willow. Swamps, marshes. May-July. S. VA south to c. peninsular FL, Panhandle FL, and se. AL. [= C, K, WH, Y, Z; < *J. ovata* – RAB, F, GW; *? J. humilis* Michaux var. *humilis* – G; = *J. ovata* (Walter) Lindau – S]

Pseuderanthemum Radlk.

A genus of about 60 species, mostly shrubs, of tropical regions.

* ***Pseuderanthemum variabile*** (R. Brown) Radlkofer, Night-and-Afternoon. Disturbed areas, also in potted plants and greenhouses; native of the Old World. Reported as a greenhouse weed from SC (Nelson & Kelly 1997), but not included as a regular member of the flora of SC because "it is unlikely that it could persist anywhere in South Carolina outside a greenhouse environment" (Nelson & Kelly 1997). [= K, Y; ? *Ps. fasciculatum* (Oerst.) Leonard – WH]

Ruellia Linnaeus (Wild-petunia)

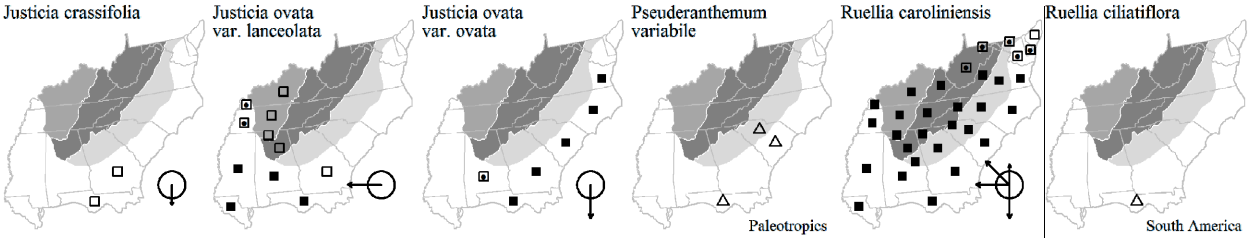
A genus of about ca. 300 species, of the tropics and temperate North America (E. Tripp, pers. comm., 2009). References: Ward (2007c)=X; Wasshausen (1998)=Y; Long (1970)=Z; Ezcurra & Daniel (2007)=Q; Fernald (1945)=V.

1 Principal leaves linear-lanceolate, > 10× as long as wide (8-27 cm long, 0.7-2 cm wide); [alien, cultivated and naturalized] ..... ***R. simplex***
1 Principal leaves elliptic, ovate or broadly lanceolate, 2-5 × as long as wide (2-16 cm long, 0.5-7 cm broad); [native].
  2 Calyx lobes narrowly linear-lanceolate, flattened to the tip, 1-4 mm wide ..... ***R. strepens***
  2 Calyx lobes linear, filiform or setaceous at least apically, < 1.2 mm wide at their widest point (usually the base), hairlike at the tip.
    3 Corolla 6-10 cm long, opening at night and withering by mid-morning, white to pale lavender; calyx lobes 2.5-4.5 cm long; [of Coastal Plain seepage bogs and wet pine flatwoods] ..... ***R. noctiflora***
    3 Corolla 3-7 cm long, opening during the day, lavender to lavender-blue (rarely white in *R. humilis*); calyx lobes 1-3 cm long; [of various habitats].
      4 Flowers borne on peduncles 0.2-7 cm long, from the axils of lower and median nodes, not from the terminal node or terminal cluster.
        5 Stem divergently branched (rarely simple); calyx glabrous or glabrate, with many partially imbedded cystoliths; calyx lobes 0.5-1 mm wide, tapering from the base to a very slender tip; [of dry to wet pine woodlands of the Coastal Plain] ..... ***R. pinetorum***
        5 Stem simple (rarely with a few ascending branches); calyx pubescent, without cystoliths; calyx lobes 0.7-1.2 mm wide, widest near the middle and tapering to the apex; [of dry woodlands, forests, and glades of the Piedmont and Mountains] ..... ***R. purshiana***
      4 Flowers sessile or subsessile, in the axils of median and upper nodes, and usually also from the terminal node or cluster.
        6 Leaves sessile or subsessile; flower-bearing nodes usually 4-8; stem typically branched at base; stigma lobe 1 ..... ***R. humilis***
        6 Leaves petioled; flower-bearing nodes usually 1-3; stem typically simple below (unless damaged), sometimes branched upward; stigma lobes (1-) 2.
          7 Plant with all leaves caulescent; leaves ovate, lanceolate, elliptic, or oblong; [widespread in our area] ..... ***R. caroliniensis***
          7 Plant with a rosette of purplish basal leaves, flat on the ground; leaves spatulate to obovate; [restricted to dry pinelands in the Coastal Plain] ..... ***R. ciliosa*** *var.* ***ciliosa***

Ruellia caroliniensis (J.F. Gmelin) Steudel, Carolina Wild-petunia, Common Wild-petunia. Dry to moist forests and woodlands. (May-) June-September. NJ, s. OH, s. IN, s. IL, and OK, south to s. FL and e. TX. [= RAB, C, G, WH, X; > *R.*

caroliniensis var. *caroliniensis* – F; > *R. caroliniensis* var. *typica* – V; > *R. caroliniensis* var. *cheloniformis* Fernald – F, V; > *R. caroliniensis* var. *dentata* (Nees) Fernald – F, V, WV; > *R. caroliniensis* var. *membranacea* Fernald – F, V, WV; > *R. caroliniensis* var. *nanella* Fernald – F, V; > *R. caroliniensis* var. *salicina* Fernald – F, V; > *R. caroliniensis* var. *semicalva* Fernald – F, V; = *R. caroliniensis* ssp. *caroliniensis* var. *caroliniensis* – K, Y, Z; ? *R. parviflora* (Nees) Britton – S; < *R. caroliniensis* – W (also see *R. ciliosa*)]

* ***Ruellia ciliatiflora*** Hooker, Hairyflower Wild-petunia. Disturbed areas; native of South America. [= K2, WH] {not yet keyed; add to synonymy}



Ruellia ciliosa Pursh *var.* ***ciliosa***, Sandhills Wild-petunia. Sandhills, particularly in loamy, submesic swales. May-September. Sc. NC south to c. peninsular FL, west to se. LA. Although treated as only subspecifically distinct from *R. caroliniensis* by many recent authors, there seem ample differences in morphology, distribution, and habitat to warrant specific distinction. Var. *cinerascens* Fernald of the FL Panhandle needs additional assessment. [< *R. ciliosa* – RAB, S, WH, X; = *R. caroliniensis* (J.F. Gmelin) Steudel ssp. *ciliosa* (Pursh) R.W. Long var. *cinerascens* (Fernald) Kartesz & Gandhi – K; = *R. caroliniensis* ssp. *ciliosa* var. *ciliosa* – Y, Z; < *R. caroliniensis* – W; > *R. ciliosa* var. *cinerascens* Fernald – V; > *R. ciliosa* var. *typica* – V]

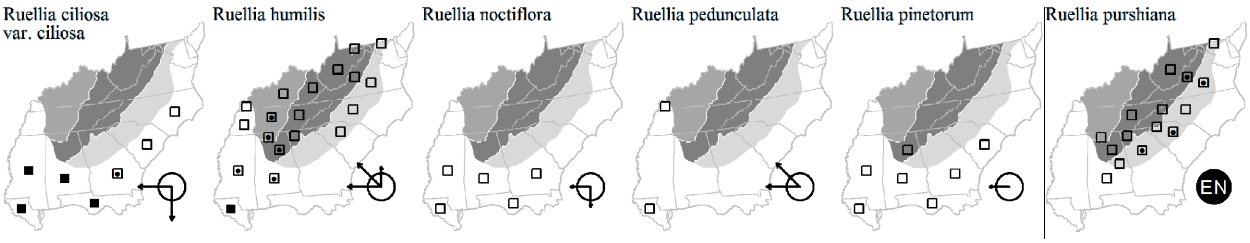
Ruellia humilis Nuttall, Low Wild-petunia, Hairy Wild-petunia. Calcareous or mafic glades and woodlands. May-September. S. PA west to se. MN and e. NE, south to c. NC, c. AL, s. MS, s. LA, and c. and s. TX. Piedmont plants of NC are uniformly white-flowered. [= RAB, K, W, WV, Y, Z; > *R. humilis* var. *calvescens* Fernald – C, F, G, V; > *R. humilis* var. *frondosa* Fernald – F, G, V; > *R. humilis* var. *humilis* – C, F, G; > *R. humilis* var. *typica* – V; > *R. humilis* var. *longiflora* A. Gray – V; > *R. humilis* var. *frondosa* Fernald – V; > *R. humilis* var. *expansa* Fernald – F]

Ruellia noctiflora (Nees) A. Gray, Night-flowering Wild-petunia. Wet pinelands and savannas. (May-) June-July (-August). E. GA (in counties immediately adjacent to SC) south to ne. FL; Panhandle FL west to se. LA. [= GW, K, S, WH,X, Y, Z]

Ruellia pedunculata Torrey ex A. Gray, Stalked Wild-petunia. Dry woodlands and forests. IL and MO south to w. LA and e. TX, apparently not in our area. [= F; < *R. pedunculata* – C, G; = *R. pedunculata* ssp. *pedunculata* – K, Y, Z] {not yet keyed}

Ruellia pinetorum Fernald, Pineland Wild-petunia. Dry to wet pinelands. May-September. SC south to Panhandle FL, west to e. TX. Although treated as only subspecifically distinct from *R. pedunculata* by many recent authors, there seem ample differences in morphology, distribution, and habitat to warrant specific distinction. First reported for GA by Sorrie (1998b). [= RAB, F, X; = *R. pedunculata* Torrey ex A. Gray ssp. *pinetorum* (Fernald) R.W. Long – K, WH, Y, Z]

Ruellia purshiana Fernald, Pursh's Wild-petunia. Dry woodlands and forests, especially over mafic or calcareous rocks. May-(June). MD south to c. GA and c. AL, in and adjacent to the Appalachians. [= RAB, F, K, W, WV, Y, Z; < *R. pedunculata* Torrey ex A. Gray – C, G]



* ***Ruellia simplex*** C. Wright in Sauvalle, Mexican Bluebell. Commonly cultivated, especially in maritime situations along the south Atlantic and Gulf coasts, disturbed areas; native of e. Mexico. May-September. [= Q; = *R. brittoniana* Leonard – RAB, GW, X, Z = *R. coerulea* Morong – Y; = *R. tweediana* Grisebach – WH; = *R. caerulea* – K, orthographic variant; = *R. malacosperma* Greenman – S]

Ruellia strepens Linnaeus, Limestone Wild-petunia. Calcareous forests. May-September. NJ west to OH and IA, south to se. and sc. NC, e. SC, AL, and TX. [= RAB, C, F, G, K, S, W, WV, Y, Z]

Stenandrium Nees

A genus of about 25 species, of tropical to warm temperate New World. References: Wasshausen (1998)=Y; Long (1970)=Z.

Stenandrium dulce (Cavanilles) Nees *var.* ***dulce***, Sweet Shaggytuft. Pine savannas. GA to FL. Var. *dulce* ranges from GA south to FL; var. *floridanum* A. Gray is restricted to s. peninsular FL. [= K, Y; < *Gerardia floridana* (A. Gray) Small – S; < *S. dulce* – WH; < *S. dulce* var. *floridanum* A. Gray – Z]

Thunbergia Retzius (Clock-vine)

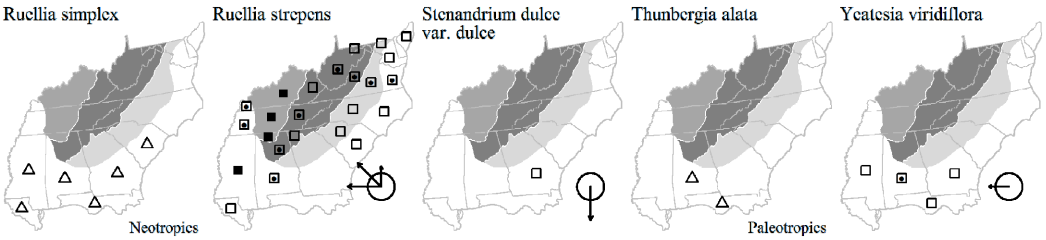
A genus of 100-200 species, of the Old World tropics. References: Wasshausen (1998)=Y; Long (1970)=Z.

* ***Thunbergia alata*** Bojer ex Sims, Black-eyed-Susan Vine. Disturbed areas; native of Africa. [= K, S, WH, Y, Z]

Yeatesia Small (Bractspike)

A genus of 3-4 species, of warm temperate to tropical areas, se. United States to ne. Mexico. References: Wasshausen (1998)=Y; Long (1970)=Z.

Yeatesia viridiflora (Nees) Small, Yellow bract-spike. Rich bottomlands. Sw. GA (Jones & Coile 1988) and Panhandle FL west to TX (Kartesz 1999). See Sorrie & LeBlond (2008) for additional distributional information. [= K, S, WH, Y; = *Dicliptera viridiflora* (Nees) R.W. Long – Z; *Dicliptera halei* Riddell]



379. BIGNONIACEAE A.L. de Jussieu 1789 (Bignonia Family) [in LAMIALES]

A family of about 110 genera and 800 species, trees, shrubs, and lianas, mainly tropical and especially of South America. The monophyly of the Bignoniaceae (excluding *Paulownia*) was confirmed by Spangler & Olmstead (1999). References: Manning (2000)=Z; Spangler & Olmstead (1999); Fischer, Theisen, & Lohmann in Kubitzki (2004).

1 Leaves simple, cordate; plant a tree; corolla white (marked internally with other colors); [tribe *Tecomeae*]..... ***1. Catalpa***
1 Leaves pinnately compound; plant a vine; corolla reddish or yellowish.
  2 Leaves 7-15-foliolate, with a leaflet in the terminal position; [tribe *Tecomeae*]..... ***2. Campsis***
  2 Leaves 2-foliolate, with a 3-branched tendril in the terminal position; [tribe *Bignonieae*].
    3 Tendrils not hooked, claw-like..... ***3. Bignonia***
    3 Tendrils hooked, claw-like..... ***4. Macfadyena***

1. Catalpa Scopoli 1777 (Catalpa)

A genus of about 10 species, trees, of e. North America (2 species), e. Asia (4 species), and the West Indies (4 species). References: Manning (2000)=Z; Paclt (1952)=Y; Li (2008); Fischer, Theisen, & Lohmann in Kubitzki (2004).

1 Flowers creamy yellow, striped inside with deeper yellow and spotted with dark violet; leaves usually lobed; seeds elliptical, 2.5-3 mm long, 8-10 mm wide..... ***C. ovata***
1 Flowers white or pale rose, striped inside with yellow and spotted with purple; leaves rarely lobed; seeds elongate, 4-10 mm long, 20-35 mm wide.
  2 Corolla 2-4 cm wide, the lower corolla lobe densely spotted with purple, entire; pod 6-10 mm thick, each valve 9-15 mm wide when flattened; seeds with 2 elongated wings, each wing narrowing to an acutish end, the hairs at the end appressed to one another in 2 planes, thus forming a pointed tail; fresh foliage with a fetid odor..... ***C. bignonioides***
  2 Corolla 4-6 cm wide, the lower corolla lobe sparsely spotted with purple, notched; pod 10-15 mm thick, each valve 13-18 mm wide when flattened; seeds with 2 elongated wings, each wing narrowing only slightly to a rounded or oblique end, the hairs at the end appressed to one another only in one plane, thus forming a flattish fringe; fresh foliage essentially odorless ..... ***C. speciosa***

Catalpa bignonioides Walter, Southern Catalpa. Bottomlands and streambanks (as a native), escaped or persistent after cultivation. June; October. S. GA, ne. FL, n. peninsular FL, and Panhandle FL west to s. MS (or LA?), on the Coastal Plain, early naturalized in a more widespread area, and now extending north to CT and MI. [= RAB, C, F, G, GW, K, W, WH, Z; = *C. catalpa* (Linnaeus) Karsten – S]

* ***Catalpa ovata*** G. Don, Chinese Catalpa. Suburban woodlands; native of China. Introduced in WV, MD, DC, PA, and other northeastern states (Manning 2000; Kartesz 1999), and beginning to be considered invasive. [= C, F, G, K, Z; > *C. ovata* var. *ovata* – Y; > *C. ovata* var. *flavescens* Bean – Y]

Catalpa speciosa (Warder) Warder ex Engelmann, Northern Catalpa. Bottomlands and river banks (as a native), also escaped or persistent after cultivation, and sometimes thoroughly naturalized. May-June; July-August. Native in the upper Mississippi River Embayment of s. IN and s. IL, south to w. TN and e. AR; early naturalized in a more widespread area. [= RAB, C, F, G, K, S, W, Z]

2. Campsis Loureiro 1790 (Trumpet-creeper)

The only other species in the genus is the e. Asian *C. grandiflora* (Thunberg) K. Schumann. Wen & Jansen (1995) estimated the age since divergence to be 24.4 million years, based on molecular divergence. References: Manning (2000)=Z; Wen & Jansen (1995); Fischer, Theisen, & Lohmann in Kubitzki (2004).

Campsis radicans (Linnaeus) Seemann ex Bureau, Trumpet-creeper. Bottomland forests, swamp forests, fencerows, old fields, forests, thickets, disturbed areas. June-July; September-October. NJ west to IA, south to s. FL and c. TX. In the pre-Columbian landscape this plant was primarily limited to swamps and bottomlands; it has done well as a weedy colonizer of abandoned farmland, fencerows, and thickets (where particularly conspicuous on fenceposts and old tobacco barns). In swamps of the Coastal Plain it is a common liana, often with its foliage in the canopy 30-40 m above the ground, and with stems to 15 cm in diameter. Even when the foliage cannot be seen, *Campsis* is immediately recognizable by its shreddy tan or yellow bark (unlike any of our other high-climbing vines). [= RAB, C, F, G, GW, K, W, WH, Z; = *Bignonia radicans* Linnaeus – S]

3. Bignonia Linnaeus 1753 (Cross-vine)

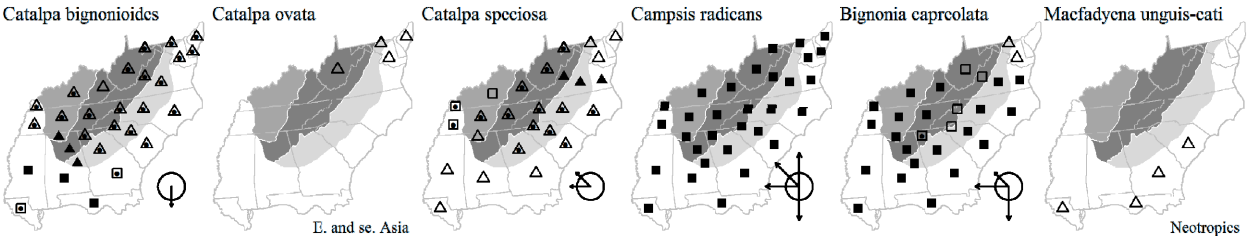
A monotypic genus, a woody vine, of Southeastern North America. References: Manning (2000)=Z; Fischer, Theisen, & Lohmann in Kubitzki (2004).

Bignonia capreolata Linnaeus, Cross-vine. Swamp forests, bottomlands, forests, woodlands. April-May; July-August. MD west to s. OH and s. MO, south to c. peninsular FL and e. TX. This species is absent from most of the Mountains in our area (also scarce in the Piedmont of Virginia and upper Piedmont of NC), reappearing at lower elevations on the west side of the Blue Ridge. Though primarily a species of swamp and bottomland forests, *Bignonia* often occurs as well in mesic or even dry forests, where it generally remains stunted (most individuals with only a few leaves) and does not flower or fruit. [= C, F, GW, K, W, WH, Z; = *Anisostichus capreolata* (Linnaeus) Bureau – RAB, G; = *Anisostichus crucigera* (Linnaeus) Bureau – S]

4. Macfadyena Alphonse de Candolle 1845 (Claw-vine)

A genus of 3-4 species, woody vines, of Mexico and the West Indies south through Central America to northern South America. References: Manning (2000)=Z; Fischer, Theisen, & Lohmann in Kubitzki (2004).

* ***Macfadyena unguis-cati*** (Linnaeus) A.H. Gentry, Claw-vine, Cat's-claw-vine. Cultivated and naturalized; native of tropical America. This vine is introduced and naturalized in s. and e. GA (Jones & Coile 1988) and is locally commonly naturalized in Charleston. [= K, WH, Z; = *Bignonia unguis-cati* Linnaeus]



382. VERBENACEAE J. St.-Hilaire 1805 (Verbena Family) [in LAMIALES]

As recently reworked, a family of about 34-41 genera and 950-1200 species, trees, shrubs, vines, and herbs, widespread in tropical, subtropical, and warm temperate regions of the Old World and New World. References: Atkins in Kadereit (2004). [also see *LAMIACEAE* and *PHRYMACEAE*]

1 Shrubs; fruits fleshy; [tribe *Lantaneae*] ..... ***Lantana***
1 Herbs; fruits dry.
  2 Mericarps 2; corolla 4-lobed, evidently zygomorphic (bilabiate); [tribe *Lantaneae*] ..... ***Phyla***
  2 Mericarps 4; corolla 5-lobed, actinomorphic or only weakly irregular; [tribe *Verbeneae*].
    3 Mericarps not separating at maturity; [sandy woodlands of the Coastal Plain] ..... ***Stylodon***
    3 Mericarps separating at maturity; [collectively widespread].
      4 Styles > 6 mm long; calyx 8-10 mm long, longer than the fruit; corolla salverform ..... ***Glandularia***
      4 Styles < 3 mm long; calyx 2-4 mm long, often shorter than the fruit; corolla funnelform ..... ***Verbena***

Aloysia Palau 1784 (Bee-brush)

A genus of about 30 species, shrubs, of tropical and subtropical America. References: Atkins in Kadereit (2004).

* *Aloysia triphylla* (L'Héritier) Britton, Lemon Bee-brush, is allegedly introduced in Iredell County, in the Piedmont of NC (Moldenke 1980); the documentation is unknown and the record rejected. [= K] {not keyed; not mapped}

Glandularia J.F. Gmelin 1796 (Vervain)

A genus of about 100 species, herbs, of s. North America, Central America, and South America. References: Umber (1979)=Z; Atkins in Kadereit (2004).

1 Leaves finely dissected, the divisions 1 mm or less wide, the margins strongly revolute.
  2 Bracts as long as or longer than the calyx; leaf segments 1-4 mm wide ..... ***G. bipinnatifida*** *var.* ***bipinnatifida***
  2 Bracts much shorter than the calyx; leaf segments 0.5-1.5 mm wide ..... ***G. pulchella***
1 Leaves coarsely dissected or lobed, the divisions > 1 mm wide, the margins slightly or not at all revolute.
  3 Calyx lobes > 3 mm long ..... ***G. canadensis***
  3 Calyx lobes < 3 mm long ..... ***G. ×hybrida***

Glandularia bipinnatifida (Nuttall) Nuttall *var.* ***bipinnatifida***, Dakota Vervain. Cp (GA), Mt (GA): dry prairies on clay soils; rare. KY, MO, SD, and CO south to c. GA, AL, AZ and s. Mexico; elsewhere in e. North America as waifs. [= K; = *Verbena bipinnatifida* Nuttall – C] {synonymy incomplete}

Glandularia canadensis (Linnaeus) Nuttall, Rose Vervain, Rose Verbena, Creeping Vervain. Cp (GA, NC, SC, VA), Pd (GA, NC, SC), Mt* (WV*): roadsides, sandhills, other dry (especially sandy) soils; uncommon. March-May. PA, IL, and CO, south to FL and TX, and introduced elsewhere. [= K, S, Z; = *Verbena canadensis* Linnaeus – RAB, C, F, G]

* ***Glandularia ×hybrida*** (Grönland & Rümpler) Nesom & Pruski, Garden Vervain. Cp (SC): cultivated in gardens; uncommonly cultivated, rarely escaped or persistent. March-July. Nesom & Pruski (1992) have provided the transfer to *Glandularia* of this common garden plant. [= *Verbena ×hybrida* Grönland & Rümpler – RAB, G, K; = *Verbena hybrida* – C]

* ***Glandularia pulchella*** (Sweet) Troncoso, Moss Vervain, South American Vervain. Cp (GA, NC, SC), Pd (GA, SC): pastures, roadsides, other disturbed areas; common, native of South America. March-November. [= K, Z; = *Verbena tenuisecta* Briquet – RAB, C; = *G. tenuisecta* (Briquet) Small – S]

Lantana Linnaeus 1753 (Lantana)

A genus of about 150 species, shrubs and subshrubs, of tropical and subtropical America and Africa. References: Sanders (1987)=Z; Sanders (2006)=Y; Atkins in Kadereit (2004).

1 Heads with an involucre; flowers pink or purple ..... ***L. montevidensis***
1 Heads with bracts, but not an involucre; flowers orange, yellow, or multicolored.
  2 Stems lacking prickles ..... ***L. depressa*** *var.* ***floridana***
  2 Stems with scattered retrorse prickles.
    3 Calyx lobes acute, as long as or longer than the calyx tube ..... ***L. camara***
    3 Calyx lobes obtuse, shorter than the calyx tube ..... ***L. urticoides***

* ***Lantana camara*** Linnaeus, Common Lantana, Hedgeflower. Cp (FL, GA, NC, SC): disturbed areas, especially near the coast; rare, native of the West Indies. [= RAB, K, S, Z]

Lantana depressa Small *var.* ***floridana*** (Moldenke) R. Sanders, Florida Lantana. Cp (FL, SC*?): edges of brackish marshes, dunes; rare, the SC occurrence apparently introduced from FL. Native from ne. FL south to se. FL. [= K, Z; < *L. ovatifolia* Britton – RAB, S, misapplied; < *L. depressa* Small – S]

* ***Lantana montevidensis*** (Sprengel) Briquet, Trailing Shrub-verbena, Polecat-geranium. Cp (FL, GA): disturbed areas; rare, native of South America. Scattered locations in s. and e. GA (Jones & Coile 1988). [= K; = *L. sellowiana* Link & Otto – S]

* ***Lantana urticoides*** Hayek, West Indian Lantana. Cp (NC, SC): disturbed and brackish areas; rare, native of West Indies. May-December. [= K; < *L. horrida* Kunth – RAB, misapplied]

Phyla Loureiro 1790 (Frogfruit)

A genus of about 11-15 species, herbs, of tropical, subtropical, and warm temperate regions of the Old and New Worlds. References: Atkins in Kadereit (2004).

1 Leaves 2-6 cm long, lanceolate, widest at or below the middle, acute at the tip; leaf teeth (5-) 7-11 per leaf side ..... ***P. lanceolata***
1 Leaves 1-4 cm long, obovate, widest above the middle, obtuse to rounded at the tip; leaf teeth (3-) 5 (-7) per leaf side ..... ***P. nodiflora***

Phyla lanceolata (Michaux) Greene, Marsh Frogfruit, Northern Frogfruit. Cp (DE, FL, GA, NC, SC, VA), Pd (VA), Mt (VA, WV): brackish marshes, other marshes, ditches; common (rare in DE, FL, GA, and WV). June-November. ON west to SD, south to Panhandle FL, AL, MS, LA, CA, and n. Mexico; primarily in the outer Coastal Plain in the Carolinas, but extending inland in VA. [= C, G, GW, K, S, W, WH; = *Lippia lanceolata* Michaux – RAB, WV; > *L. lanceolata* var. *lanceolata* – F; > *Lippia lanceolata* var. *recognita* Fernald & Griscom – F]

Phyla nodiflora (Linnaeus) Greene, Creeping Frogfruit, Capeweed, Turkey-tangle, Matgrass. Cp (FL, GA, NC, SC, VA): sandy soils of roadsides, lawns, ditches, disturbed areas; common (rare in VA). May-November. Pantropical, in North America from se. VA south to s. FL and west to CA, north in the interior to AR, se. MO, and southward into the tropics. This species is very weedy, and is a familiar component of road margins and lawns in the southeastern Coastal Plain. [= C, G, GW, K, S, WH; = *Lippia nodiflora* (Linnaeus) Michaux – RAB, F]

Verbena Linnaeus 1753 (Verbena, Vervain)

A genus of about 70 species, herbs, of tropical, subtropical, and warm temperate regions of the New World and (rarely) Old World. Infrageneric taxonomy follows Neson (2010b). References: Nesom (2010b)=X; Nesom (2010c)=V; Nesom (2010d)=U; Barber (1982)=Z; O'Leary, Múlgara, & Morrone (2007)=Y; Atkins in Kadereit (2004). Key based in part on V. [also see *Glandularia* and *Stylodon*]

1 Spikes short and stout, the flowers or fruits overlapping and completely obscuring all of the rachis (except in *V. montevidensis*, the fruits spaced towards the base of the spike).
- 2 Plant procumbent or decumbent; leaves pinnately lobed or dissected; [section *Verbena*, series *Bracteatae*] ... ***V. bracteata***
- 2 Plant erect; leaves coarsely serrate.
  - 3 Leaves basally attenuate to short-petiolate.
    - 4 Central spikes sessile to subsessile, spikes compact, 3-5 mm wide, fruits remaining densely overlapping at maturity; [section *Verbenaca*, series *Pachystachyae*] ... ***V. brasiliensis***
    - 4 Central spikes pedunculate, spikes loose, 2-3 mm wide, with fruits becoming remote at least in the proximal portion at maturity' section *Verbenaca*, series *Litorales*] ... ***[V. montevidensis]***
  - 3 Leaves basally clasping to subclasping; [section *Verbenaca*, series *Pachystachyae*].
    - 5 Corolla tube > 10 mm long ... ***V. rigida***
    - 5 Corolla tube 2.5-6 (-7) mm long.
      - 6 Corolla tube 4-6 (-7) mm, 1.5-2 mm longer than the calyx; distal stems, peduncles, and calyces stipitate-glandular; spikes 8-30 mm in fruit; floral bracts 2.1-2.8 mm; nutlets 1.5-1.9 mm; basal and midstem leaves oblong-lanceolate to oblong-oblanceolate ... ***V. bonariensis***
      - 6 Corolla tube 2.5-4 mm, 0-0.5 mm longer than the calyx; stems, peduncles, and calyces eglandular; spikes 6-55 mm in fruit; floral bracts 3-4 mm; nutlets 1-1.2 (-1.4) mm; basal and midstem leaves ovate to ovate-lanceolate, oblong-elliptic, or obovate ... ***V. incompta***

1 Spikes elongate, the flowers or fruits well-spaced and not obscuring the rachis.
- 7 Leaves mostly lobed or dissected.
  - 8 Plants much branched at base, stems decumbent to ascending; leaves 1-5 cm long; [section *Verbena*, series *Tricesimae*] ... ***[V. canescens]***
  - 8 Plants little branched, stems erect; leaves 3-12 cm long.
    - 9 Bractlets about as long as the calyx; [AL westward]; [section *Verbena*, series *Candelabrae*] ... ***[V. xutha]***
    - 9 Bractlets about ½ as ong as the calyx; [collectively widespread].
      - 10 Basal and lower cauline leaves persistent, relatively thick, large and spatulate, margins revolute, cauline leaves quickly reduced in size distally and becoming linear-entire; rachis and calyces eglandular; [section *Verbena*, series *Haleae*] ... ***V. halei***
      - 10 Basal leaves usually deciduous, relatively thin, margins not revolute, cauline leaves relatively even-sized upwards or largest near midstem; rachis and calyces stipitate-glandular, sometimes sparsely so; [section *Verbena*, series *Verbena*] ... ***V. officinalis***
- 7 Leaves not lobed or dissected, or some of the leaves lower on the stem 3-lobed.
  - 11 Stem leaves sessile or subsessile, cuneate to base.
    - 12 Leaves linear to narrowly oblancolate, < 1.5 cm wide, > 6× as long as wide; [section *Verbena*, series *Simplices*] ... ***V. simplex***
    - 12 Leaves ovate, 2-4 cm wide, < 4× as long as wide
      - 13 Mericarps tightly adhering in fruit, appearing as one; calyx lobes curved inward in fruit; corolla pink to pinkish lavender; [section *Verbena*, series *Connaticarpae*] ... ***V. carnea***
      - 13 Mericarps separate in fruit; calyx lobes erect to divergent in fruit; corolla blue to violet; [section *Verbena*, series *Candelabrae*] ... ***V. stricta***
  - 11 Stem leaves with well-developed petioles.
    - 14 Flowers and fruits distinctly overlapping in the upper part of the spikes; [section *Verbena*, series *Candelabrae*] ... ***V. hastata***
    - 14 Flowers and fruits well-spaced throughout the inflorescence; [section *Verbena*, series *Leptostachyae*].
      - 15 Upper leaf surfaces densely scabrous or hispidulous to hispid or hispid-hirsute; calyx lobes triangular, connivent; corollas mostly pinkish to bluish, lavender, or purple; nutlet outer surfaces deeply ridged and grooved, often with prominent cross-ridges, commisural faces consistently densely silver-white minutely papillate-bullate; fibrous-rooted ... ***V. scabra***
      - 15 Upper leaf surfaces hirsutulous to hirsute or strigose-hirsute; calyx lobes deltate-subulate, not connivent or subconnivent; corollas white, rarely pinkish; nutlet outer surfaces smooth to longitudinally ridged, sometimes with cross-ridges distally, commisural faces smooth or rarely with slight development of minutely bullate ornamentation; taprooted ... ***V. urticifolia***

* ***Verbena bonariensis*** Linnaeus. Cp (GA, NC, SC): roadsides, disturbed areas, old fields; common, native of South America. May-October. [= V, X; < *V. bonariensis* – RAB, C, G, GW, S, WH (also see *V. incompta*) ; = *V. bonariensis* var. *conglomerata* Briquet – K]

* ***Verbena bracteata*** Lagasca & Rodriguez, Prostrate Vervain, Big-bracted Vervain. Cp (FL, GA, NC, SC, VA), Pd (GA, NC), Mt (NC, WV): disturbed areas, waste areas near wool-combing mills; rare. June-October. The original distribution uncertain, now distributed from ME west to BC, south to FL and Mexico, but apparently native of mw. and w. North America. [= RAB, C, F, G, K, WH, WV, X, Z; = *V. bracteosa* Michaux – S]

* ***Verbena brasiliensis*** da Conceição Vellozo, Brazilian Vervain. Cp (FL, GA, NC, SC, VA), Pd (GA, NC, SC, VA), Mt (GA, NC): roadsides, disturbed areas, old fields; common (uncommon in Piedmont), native of South America. May-October. [= RAB, C, F, G, GW, K, S, WH, V, X; = *V. litoralis* Kunth var. *brevibracteata* (Kuntze) N. O'Leary – Y]

Verbena carnea Medikus, Carolina-vervain. Cp (FL, GA, NC, SC, VA?): sandy woodlands, sandhills; uncommon. April-July. E. NC (se. VA?) south to c. peninsular FL, west to e. TX. Sometimes placed in a monotypic genus, *Stylodon* Rafinesque, but apparently evolved from within *Verbena*. See discussion in Nesom (2010b, 2010e). [= RAB, F; = *Stylodon carneus* (Medikus) Moldenke – K; = *Stylodon carolinensis* (Walter) Small – S; = *Stylodon carneum* – WH, orthographic variant; = *Verbena caroliniana* Michaux]

Verbena halei Small, Texas Vervain. Cp (FL, GA, NC*, SC*): dry hammocks, roadsides, pastures; common (rare in NC and SC, where presumably introduced). April-June. C. GA south to c. peninsular FL, TX, AZ, and Mexico; scattered as an introduction further north, as in NC and SC. [= RAB, K, S, X; = *V. officinalis* ssp. *halei* (Small) S.C. Barber – WH, Z]

Verbena hastata Linnaeus, Common Vervain, Blue Vervain, Simpler's-joy. Cp (DE, NC, VA), Pd (DE, NC, VA), Mt (NC, VA, WV): marshes, bogs, low fields; common (rare in NC). June-October. NS west to BC, south to NC, n. AL, AR, OK, n. TX, NM, AZ, CA; scattered occurrences further south appear to be introductions. The hybrid with *V. urticifolia*, *Verbena* ×*engelmannii* Moldenke, is known from our area. [= RAB, C, F, G, GW, S, W, WV, X, Z; > *V. hastata* var. *hastata* – K; > *V. hastata* var. *scabra* Moldenke – K]

* ***Verbena incompta*** P.W. Michael. Cp (FL, GA, NC, SC, VA), Pd (GA, NC, SC), Mt (NC): roadsides, disturbed areas, old fields; common, native of South America. May-October. [= V, X; < *V. bonariensis* Linnaeus – RAB, C, F, G, GW, K, S, WH; = *V. litoralis* Kunth var. *brevibracteata* (Kuntze) N. O'Leary – Y= *V. bonariensis* var. *bonariensis* – K, Y]

* ***Verbena officinalis*** Linnaeus, European Vervain, Juno's Tears, Herb-of-the-cross. Cp (DE, FL, GA, NC, SC, VA), Mt (NC, VA), Pd (DE, VA): disturbed areas; common (rare in FL, GA, NC, SC, and VA), native of Europe. June-October. The enigmatic *V. riparia* is represented by a few collections, and the taxonomic status of the taxon is unclear; it probably represents an unusual form of *V. officinalis*. [= X; > *V. officinalis* – RAB, C, F, G, S; > *V. riparia* Rafinesque ex Small & Heller – RAB, C. F, G, K, S, W; > *V. officinalis* var. *officinalis* – K, WH; > *V. officinalis* var. *prostrata* Grenier & Godron – K; = *V. officinalis* ssp. *officinalis* – Z]

* ***Verbena rigida*** Sprengel. Cp (FL, GA, NC, SC, VA), Pd (GA): roadsides, disturbed areas; common (uncommon in NC, rare in VA), native of South America. Late March-July. [= K, S, WH, X, Y]

Verbena scabra Vahl, Rough Vervain, Harsh Vervain. Cp (FL, GA, NC, SC, VA), Pd (GA, VA), Mt (VA, WV*): brackish marshes, shell deposits, other wet habitats; common (uncommon in NC, rare in VA and WV). May-October. VA and WV south to s. FL, west to TX and CA, south into tropical America; mainly coastal in our area but with scattered inland records (probably adventive). [= RAB, C, F, G, GW, K, S, U, WH, WV, X]

Verbena simplex Lehmann, Narrowleaf Vervain. Pd (DE, GA, NC, SC, VA), Mt (GA, VA, WV), Cp (DE, FL, VA): glades, woodlands, forests, and roadsides, over mafic or calcareous rocks; common (uncommon in WV). May-September. NH west to MN and NE, south to Panhandle FL (Jackson County) and TX. [= RAB, C, F, G, K, W, WH, X, Z; ? *V. angustifolia* Michaux – S]

* ***Verbena stricta*** Ventenat, Hoary Vervain. Cp* (DE*, NC*, VA*), Pd (DE*, GA), Mt* (WV*): pastures and roadsides; uncommon (rare in GA, NC, and VA), native of c. United States. June-September. Perhaps native as far east as prairie-like sites in TN, AL, and (?) GA. [= RAB, C, F, G, K, S, W, WV, X, Z]

Verbena urticifolia Linnaeus, White Vervain, Velvetleaf Vervain. Cp (NC, SC, VA), Pd (NC, SC, VA), Mt (NC, SC, VA, WV): {habitats}; common. May-November. NB west to SK, south to Panhandle FL and TX. Two varieties have been distinguished by many authors (see synonymy), but the characters used are poorly correlated and the distributional ranges largely overlapping. The hybrid with *V. hastata*, *Verbena* ×*engelmannii* Moldenke, is known from our area. [= RAB, GW, W, X, U, Z; > *V. urticifolia* var. *leiocarpa* Perry & Fernald – C, F, G, K, WV; > *V. urticifolia* var. *urticifolia* – C, F, G, K, WV; = *V. urticaefolia* – S, orthographic variant]

* *Verbena canescens* Kunth, Gray Vervain. Cp (AL): disturbed areas; rare, native of TX. Reported for s. AL. [= K, X]
* *Verbena montevidensis* Sprengel. Cp (AL, LA): disturbed areas; rare. June-July (-September). [= K, V, X]
Verbena xutha Lehmann, Gulf Vervain. Cp (AL, LA, MS): {habitat}; rare. AL west to TX. [= K, S, X]

384. MARTYNIACEAE Stapf 1895 (Martynia Family) [in LAMIALES]

A family of 5 genera and about 16 species, herbs, tropical and subtropical. Bretting & Nilsson (1988) present evidence for maintaining the Martyniaceae as distinct from the Pedaliaceae. References: Ihlenfeldt in Kadereit (2004).

Proboscidea Schmidel 1763 (Unicorn-plant)

A genus of about 9 species, herbs, of warm temperate to subtropical America. References: Thieret (1977)=Y; Bretting & Nilsson (1988)=Z; Ihlenfeldt in Kadereit (2004).

* ***Proboscidea louisianica*** (Miller) Thellung, Unicorn-plant, Devil's-claw, Cow Catcher. Disturbed areas; native of the Great Plains. The curious fruits are unmistakable. [= RAB, F, GW, WV, Y; = *P. louisiana* – C, G, orthographic variant; = *Martynia louisiana* Miller – S; > *P. louisianica* ssp. *louisianica* – K, Z]

389. AQUIFOLIACEAE Bartling 1830 (Holly Family) [in AQUIFOLIALES]

A monogeneric family of about 500 species, nearly cosmopolitan.

Ilex Linnaeus 1753 (Holly, Winterberry, Gallberry)

A genus of 400-500 species, mostly trees and shrubs, cosmopolitan and widespread in tropical and temperate areas, especially Asia and America. The genus *Nemopanthus* is clearly best subsumed into *Ilex*. References: Godfrey (1988)=Y; Krakow (1989)=Z; Powell et al. (2000)=X; Wunderlin & Poppleton (1977).

Identification notes: Some of our species can be superficially similar to various shrubs and trees of the Rosaceae, in their alternate toothed leaves borne on spur shoots.

1 Leaves coriaceous, evergreen.
- 2 Leaves with a well-developed apical spine (and usually also marginal spines) 2-6 mm long.
  - 3 Flowers in 1-few-flowered axillary cymes, on growth of the same year; [native trees of a wide variety of habitats]
    - 4 Leaves dark green above, 1.5-5.0 cm long, 1.0-2.5 cm wide; [of FL]..... ***I. opaca*** *var.* ***arenicola***
    - 4 Leaves somewhat yellowish green above, 3-12 cm long, 2.0-5.5 cm wide; [widespread in our area] ..... ***I. opaca*** *var.* ***opaca***
  - 3 Flowers in axillary clusters, on branches of the previous year; [alien shrub, rarely naturalized, especially in suburban areas] .... ***I. cornuta***
- 2 Leaves with margins either entire, crenate, serrate, or with marginal spinose prickles < 1 mm long (the apex sometimes mucronate, but not stiff and spinose).
  - 5 Leaves crenate from base to apex, 0.5-4.5 cm long; calyx and corolla 4-lobed.
    - 6 Fruits black; [alien shrub, rarely naturalized, especially in suburban areas] ..... ***I. crenata***
    - 6 Fruits red or yellow; [native shrub of the Coastal Plain, sometimes planted and naturalized elsewhere] ..... ***I. vomitoria***
  - 5 Leaves entire, crenate (if so, only beyond the midpoint), serrate, or with marginal spinose prickles, 2-10 cm long; calyx and corolla 4-lobed or 5-9-lobed; fruits red, yellow, or black.
    - 7 Fruits black; calyx and corolla 5-9-lobed; leaves crenate near the tip or with a few marginal spinose prickles, or entire, with dark punctate dots beneath.
      - 8 Leaves 1.5-3× as long as wide, with a few, irregularly spaced, marginal spinose prickles (or commonly entire), generally about 2-3 cm wide ..... ***I. coriacea***
      - 8 Leaves 3-4× as long as wide, crenate in the apical 1/2 to 1/3 (or rarely entire), generally about 1 cm wide (almost never > 2 cm wide) ..... ***I. glabra***
    - 7 Fruits red or yellow; calyx and corolla 4-lobed; leaves entire (or with spinose serrations), lacking dark punctate dots beneath.
      - 9 Leaves oblanceolate, oblong, or elliptic, 3-12 cm long, (8-) 15-40 mm wide, 2-4× as long as wide; petioles (3-) 5-15 mm long; leaf apex acute, obtuse, or rounded; branchlets strongly ascending, most of them forming an angle of < 45 degrees to the branch..... ..... ***I. cassine***
      - 9 Leaves lanceolate to narrowly oblong, 2-4 cm long, 3-8 mm wide, 3-7× as long as wide; petioles 1-3 (-5) mm long; leaf apex acute to acuminate; branchlets ascending to spreading, most of them forming angles greater than 45 degrees to the branch, and often at right angles ..... ***I. myrtifolia***

1 Leaves membranous, deciduous.
- 10 Leaves entire, or nearly so; [of moist to wet sites, from WV northward] ..... ***I. mucronata***
- 10 Leaves toothed; [collectively widespread in our area].
  - 11 Leaves oblanceolate or obovate, broadest above the middle, 8-30 (-45) mm wide, narrowly cuneate basally, mostly 2-3× as long as wide.
    - 12 Pedicels of fruits and pistillate flowers 2-6 mm long; pedicels of staminate flowers (2-) 4-8 (-16) mm long; leaves mostly gray green, often revolute, especially toward the base; pubescence of the lower leaf surface tomentose, primarily on or near the midrib; leaf margins rarely ciliate.
      - 13 Leaves 2-4.8 cm long, 0.6-1.5 cm wide; fruits 4-5 mm in diameter; sepals usually ciliate; [plant apparently endemic to the Suwanee River drainage of sc. GA and e. Panhandle FL] ..... ***I. decidua*** *var.* ***curtissii***
      - 13 Leaves 4.5-8.5 (-10) cm long, 1.5-3 cm wide; fruits (4-) 5-8 (-9) mm in diameter; sepals not ciliate; [plant widespread in our area, in the Coastal Plain, Piedmont, and rarely Mountains of our area]..... ***I. decidua*** *var.* ***decidua***
    - 12 Pedicels of fruits and pistillate flowers (5.5-) 10-30 mm long; pedicels of staminate flowers (10-) 15-25 mm long; leaves rarely revolute; pubescence of the lower leaf surface strigose, distributed on the surface; leaf margins often ciliate.
      - 14 Upper leaf surface with trichomes throughout; sepals ciliate; leaf blades entire to shallowly crenate ..... ***I. cuthbertii***
      - 14 Upper leaf surface glabrous, or with trichomes confined to the veins or their vicinity; sepals eciliate; leaf blades crenate to distinctly serrate ..... ***I. longipes***
  - 11 Leaves elliptic or ovate, broadest near the middle, (10-) 20-55 mm wide, rounded to broadly cuneate basally, mostly 1-2.5× as long as wide.
    - 15 Veins on undersurface of leaf blades reticulate, defining areoles; fruit surface dull; fruiting pedicels 6-14 mm long (averaging about 10 mm); [of blackwater floodplains and clay-based Carolina bays of the Coastal Plain]..... ***I. amelanchier***
    - 15 Veins on undersurface of leaf blades obscure, not defining areoles; fruit surface shiny; fruiting pedicels either (8-) 10-30 mm long or 2-9 mm long (averaging either < 6 mm or > 15 mm long); [collectively of various habitats, widespread in our area].
      - 16 Fruiting pedicels (8-) 10-30 mm long; fruit (7-) 8-12 mm in diameter, bright cherry-red; [of bogs and very moist forests of the Mountains]..... ***I. collina***
      - 16 Fruiting pedicels 2-9 mm long; fruit 5-9 (-12) mm in diameter, red to orange; [collectively of various habitats, widespread in our area].
        - 17 Nutlets (5-) 6-8 per fruit, smooth on the (curved) back; staminate flower clusters on peduncles 2-6 mm long; pistillate flowers with entire corolla lobes; flowers mostly in axils of leaves on normal shoots.
          - 18 Sepals glabrous (in flower or fruit), acute; leaves lighter green, slightly if at all rugose ..... ***I. laevigata***
          - 18 Sepals ciliate (in flower or fruit), obtuse; leaves darker green, often moderately rugose..... ***I. verticillata***

17 Nutlets 4-5 per fruit, with striate ridges on the (curved) back; staminate flower clusters sessile or very short-peduncled (0-2 mm long); pistillate flowers with ciliate corolla lobes; flowers mostly in axils of leaves on lateral short-shoots.
19 Leaves 2-9 (-10.5) cm long, elliptic to broadly ovate, often nearly round, the apex abruptly to gradually acuminate, the marginal teeth usually inconspicuous; petioles of mature leaves usually < 1 cm long; fruits 5-9 mm in diameter; plant a shrub to 6 m tall; [of the Coastal Plain, Piedmont, and Mountains] ..... ***I. ambigua***
19 Leaves 6-16 cm long (the largest, at least, > 8 cm long), narrowly to broadly ovate, the apex long acuminate to attenuate, the marginal teeth rather coarse; petioles of mature leaves usually > 1 cm long; fruits 9-12 mm in diameter; plant shrub or small tree to 10 m tall; [of the Mountains and upper Piedmont]..... ***I. montana***

Auxiliary Key to Deciduous *Ilex* of Moist to Wet Habitats of the Mountains

[Note: trichotomous lead]

1 Fruits bright cherry-red, broader than long, (7-) 8-12 mm in diameter, borne on stalks 9-20 mm long, primarily in the axils of leaves on spur shoots; bark of 2-3 year old twigs usually light tan; calyx (persistent on fruit) 4 (-5) lobed; nutlets 4 (-5) per fruit, with bony white longitudinal striations on the back, the furrows between the striations very shallow if developed at all; petiole with a deeply U- to V-shaped channel on its upper side (made by the decurrent leaf edges), with dark ascending trichomes in the channel; leaves variable, but mostly 3-6 cm wide and about 1.5× as long as wide, usually abruptly short-acuminate; [plant of bogs, seepages, streambanks, and (rarely) moist forests, mostly at high elevations] ..... ***I. collina***
1 Fruits duller red, longer than broad, 5-8 mm in diameter, borne on stalks 1-6 mm long, primarily in the axils of leaves on spur shoots; bark of 2-3 year old twigs usually brown, gray, or purplish; calyx (persistent on fruit) 4-6 lobed; nutlets 4-6 per fruit, with longitudinal ridges, the furrows between the ridges about as deep as the distance between the ridges; petiole with U-shaped channel on its upper side, with white appressed trichomes in the channel; leaves variable, but mostly 3-7 cm wide and about 2× as long, usually long-acuminate; [plant of moist forests and (rarely) bog edges] ..... ***I. montana***
1 Fruits duller red, longer than broad, 5-7 mm in diameter, borne on stalks 1-6 mm long, primarily in the axils of leaves on normal shoots with elongate internodes; bark of 2-3 year old twigs usually brown, gray, or purplish; calyx (persistent on fruit) (4-) 5-6 lobed; nutlets (4-) 5-6 per fruit, smooth and unmarked on the back; petiole nearly terete in cross-section (or very shallowly channeled on the upper surface); leaves variable, but mostly 2-3.5 (-5) cm wide and about 2× as long, usually merely acute; [plant of bogs and other wetlands] ..... ***I. verticillata***

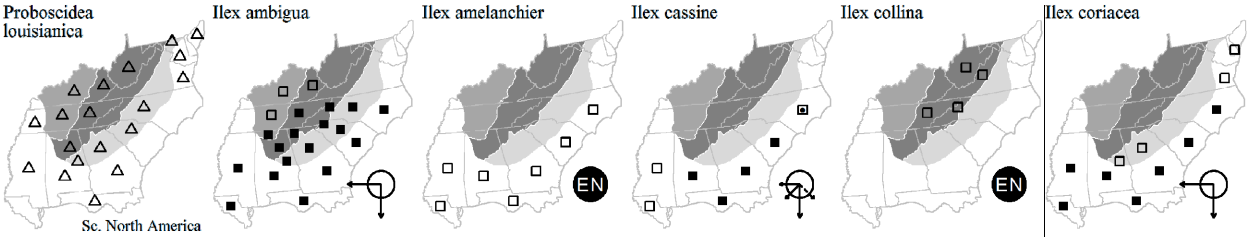
Ilex ambigua (Michaux) Torrey, Carolina Holly. Sandy upland forests, dry slope forests, rarely in pocosin ecotones in the fall-line sandhills region. April-June; August-September. Ne. NC, se. TN, n. AR, and se. OK south to c. peninsular FL, s. MS, and se. TX; disjunct in the Sierra Madre Oriental and Chiapas, Mexico. The various taxa that have been distinguished in this complex may have some merit, though a detailed study by Krakow (1989) did not show a clear basis for their recognition. *I. buswellii* Small, strictly of xeric habitats of the Coastal Plain from se. NC southward, has the larger leaves 2-3.5 (-4) cm long and 0.7-1.7 (-2.5) cm wide. *I. ambigua* (*sensu stricto*) is distributed in the Coastal Plain, Piedmont and low Mountains, and has leaves 3-9 (-10.5) cm long and 1.7-6 cm wide. *I. beadlei* of the low Mountains and Piedmont has leaves 7-9 (-10.5) cm long and 2-6 cm wide. [= K, Z; = *I. ambigua* var. *ambigua* – RAB, W, Y; > *I. montana* var. *mollis* (A. Gray) Britton – C, F; > *I. montana* var. *beadlei* (W.W. Ashe) Fernald – G; > *I. ambigua* – S; > *I. beadlei* W.W. Ashe – S; > *I. buswellii* Small – S; > *I. ambigua* (Michaux) Torrey var. *monticola* (A. Gray) Wunderlin & Poppleton – Y, misapplied; > *I. beadlei* var. *laevis* W.W. Ashe; > *I. caroliniana* Trelease ex Small; > *I. mollis* A. Gray]

Ilex amelanchier M.A.Curtis ex Chapman, Sarvis Holly. Banks of blackwater creeks and rivers, clay-based Carolina bays. April-May; October-November. A Southeastern Coastal Plain endemic: se. NC south to the FL Panhandle and west to se. LA (reports from se. VA appear to be based on confusion of material). The fruits are sometimes persistent until the following spring; the species is perhaps most conspicuous in the winter, when the dull red fruits can be easily seen. [= RAB, C, F, G, GW, K, S, Y, Z]

Ilex cassine Linnaeus, Dahoon, Cassena. Blackwater stream swamps, pocosins, nearly always in very acid peaty or sandy sites. May-June; October-November. Primarily a Southeastern Coastal Plain endemic: se. NC south to s. FL and west to se. TX; also in Cuba and Mexico. *I. cassine* is variable in leaf shape, sometimes approaching *I. myrtifolia*. Some populations in our area show intergradation with or poor differentiation from *I. myrtifolia*, lending some credibility to their treatment as varieties. [= GW, S, Y; = *I. cassine* var. *cassine* – RAB; > *I. cassine* var. *cassine* – K]

Ilex collina Alexander, Long-stalked Holly, Cherry Holly. In peats of bogs and seepages, on banks of cold, high elevation streams (less commonly on moist, rocky slopes in northern hardwood forests or mixed spruce-hardwood forests) at moderate to high elevations (1100-1800m). May-June; (August-) September-October. A Southern Appalachian endemic: e. and c. WV, sw. VA, w. NC, and e. TN (Sevier County) (Boetsch & Nielsen 2003). The affinities of this species are with *Ilex montana* and *I. verticillata*, not with *Ilex* (*Nemopanthus*) *mucronata* (Baas 1984). See Clark (1974) and Boetsch & Nielsen (2003) for additional information about this species. *I. collina* often occurs with or in close proximity to the similar *I. montana* and *I. verticillata*; the long fruiting pedicels will separate fruiting plants readily. [= K, WV; = *Nemopanthus collinus* (Alexander) R.C. Clark – C, W; < *I. longipes* – F, G]

Ilex coriacea (Pursh) Chapman, Big Gallberry, Sweet Gallberry. Pocosins, more restricted to wet, peaty sites than *I. glabra*. April-May; September-October. A Southeastern Coastal Plain endemic: se. VA south to c. peninsular FL and west to e. TX. [= RAB, C, F, G, GW, K, S, Y]



* ***Ilex cornuta*** Lindley, Chinese Holly, Burford Holly. Escaped into forests in suburban areas; native of China. Escaped from suburban plantings in AL, NC, and KY (Clark et al. 2005). [= K]

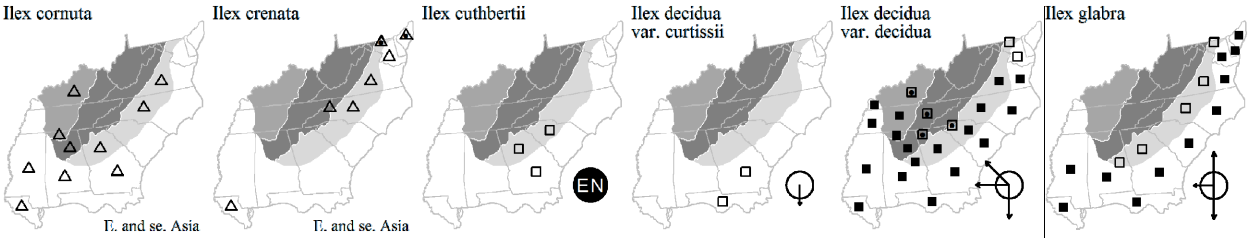
* ***Ilex crenata*** Thunberg, Japanese Holly. Planted as a landscaping shrub, escaped into forests in suburban areas; native of Japan. First reported for NC by Pittillo & Brown (1988). [= K]

Ilex cuthbertii Small, Cuthbert Holly. Upland circumneutral woodlands and forestse. Endemic to an area along the Fall Line in SC and adjacent GA (Krakow 1989). Perhaps best treated as a variety of *I. longipes*, but the combination has not yet been made. [= K; >< *I. cuthbertii* – S (as to type, not as to range); = *I. longipes* var. *cuthbertii* (Small) G.A. Krakow, in prep. – Z]

Ilex decidua Walter *var.* ***curtissii*** Fernald, Suwanee Possum-haw, Curtiss's Holly. Floodplains and moist forests in the Suwanee River drainage. Mid-March-mid-April; September-October. Apparently endemic to the Suwannee River drainage of s. GA and n. FL. [= Z; < *I. decidua* – GW, K, Y; = *I. curtissii* (Fernald) Small – S]

Ilex decidua Walter *var.* ***decidua***, Possum-haw. Floodplain forests, less commonly on mesic (or even dry), upland slopes. March-May; September-October. MD south to Panhandle FL, west to TX on the Coastal Plain, extending also to adjacent provinces (the Piedmont and rarely Mountains in our area), and extending north in the interior to c. TN, w. KY, s. IL, c. MO, se. KS, and e. OK; also disjunct (as a variety) in the Sierra Madre Oriental of e. Mexico. The Mexican material was recognized by Krakow (1989) at the varietal level, but has not been formally named; it is known from a single collection from Nuevo León, Mexico. [= Z; < *I. decidua* var. *decidua* – RAB; < *I. decidua* – C, F, G, GW, K; > *I. decidua* var. *decidua* – Y (also including *I. cuthbertii*)]

Ilex glabra (Linnaeus) A. Gray, Little Gallberry, Inkberry. Savannas, pine flatwoods, pocosin margins, swamps, primarily in wetlands, but extending upslope even into sandhills. May-June; September-November. NS and ME south to FL, west to TX. [= RAB, C, F, G, GW, K, S, Y]



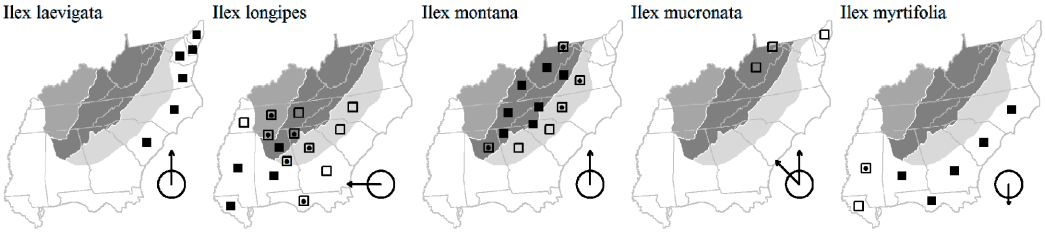
Ilex laevigata (Pursh) A. Gray, Smooth Winterberry. Pocosins, other wet, acidic sites, such as in small blackwater stream swamps. April-May; September-October. ME and NY south to SC, mostly near the coast. [= RAB, C, F, G, GW, K, S]

Ilex longipes Chapman ex Trelease, Georgia Holly, Chapman's Holly. Upland forests. April-May; September-October. Sc. NC, sc. TN (Chester, Wofford, & Kral 1997), and wc. AR south to Panhandle FL, s. MS, and se. TX. [= GW, K, S; = *I. decidua* var. *longipes* (Chapman ex Trelease) Ahles – RAB, Y; < *I. longipes* – F, G (apparently also including *I. collina*); = *I. longipes* var. *longipes* – Z]

Ilex montana Torrey & A. Gray ex A. Gray, Mountain Holly. Mesic forests, rarely bogs or bog edges. April-June; August-September. W. MA and w. NY south to n. GA and n. AL, essentially an Appalachian endemic. The range of this species is sometimes stated or shown as broader, extending into the Coastal Plain in our area, and as far south as n. FL, LA, and e. TX, but these reports are based on misidentifications, primarily of the "*beadlei*" component of *I. ambigua*. [= K, WV, Z; = *I. ambigua* var. *montana* (Torrey & A. Gray ex A. Gray) Ahles – RAB; = *I. montana* var. *montana* – C, F, G; = *I. monticola* A. Gray – S; = *I. ambigua* var. *monticola* (A. Gray) Wunderlin & Poppleton – W]

Ilex mucronata (Linnaeus) M. Powell, V. Savolainen, & S. Andrews, Nemopanthus. Bogs and moist, high-elevation forests. NL (Newfoundland) west to ON and MN, south to MD, WV, OH, IN, and IL (and allegedly in VA, according to Fernald 1950). It can be separated vegetatively from other hollies in the mountain regions of w. VA (*I. montana*, *I. collina*, *I. opaca*, and *I. verticillata*) by its smaller, narrower, entire (or nearly so) leaves, 2-5 (-6) cm long, 1-2.5 cm wide. Debate about the distinctiveness of *Nemopanthus* from *Ilex* have now been unequivocally answered, with *Nemopanthus* to be included in *Ilex* (Powell et al. 2000; Manen, Boulter, & Naciri-Graven 2002). [= X; = *Nemopanthus mucronatus* (Linnaeus) Trelease – C, F, G, K, WV]

Ilex myrtifolia Walter, Myrtle Holly. Limesink (doline) ponds, wet savannas. May-June; October-November. A Southeastern Coastal Plain endemic: se. NC south to n. peninsular FL and west to e. LA. See *I. cassine* for comments about these two taxa. [= GW, K, S, Y; = *I. cassine* var. *myrtifolia* (Walter) Sargent – RAB]

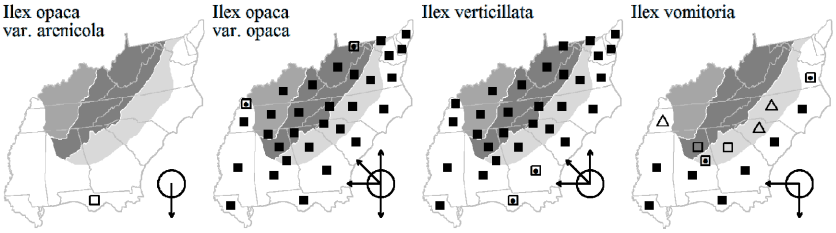


Ilex opaca Aiton *var.* ***arenicola*** (Ashe) Ashe, Scrub Holly. Xeric sands of sand pine scrub. Baker and Clay counties (ne. FL) south to c. peninsular FL. [= K; = *I. cumulicola* Small – S; = *I. arenicola* Ashe]

Ilex opaca Aiton var. ***opaca***, American Holly, Christmas Holly. In a wide variety of forests, ranging from xeric to wetland. April-June; September-October. MA (? NS and ME), IL, MO, and OK south to s. peninsular FL and TX. This is our only species of *Ilex* that becomes a medium to large tree. [= GW, K, Y; < *I. opaca* – RAB, C, F, G, W, WV; = *I. opaca* – S]

Ilex verticillata (Linnaeus) A. Gray, Winterberry. Bogs, pocosins, swampy forests. April-June; September-November. NL (Newfoundland) west to MN, south to FL and TX. [= RAB, GW, K, S, W, WV, Y; > *I. verticillata* var. *padifolia* (Willdenow) Torrey & A. Gray ex S. Watson – C, F, G; > *I. verticillata* var. *verticillata* – C, F, G]

Ilex vomitoria Aiton, Yaupon. Maritime forests, other dry sandy forests. March-May; October-November. Widespread in the Southeastern United States, primarily on the Coastal Plain, from e. VA (from Northampton County south) south to c. peninsular FL and west to se. TX. *I. vomitoria* from the Deep South often has much smaller leaves than plants in our area. In NC and VA, yaupon is nearly restricted to maritime habitats, on the barrier islands and in a narrow band on the mainland, in forests with substantial maritime influence. *I. vomitoria* is increasingly popular as an ornamental shrub, and is persistent or establishing in suburban woodlands. [= RAB, C, F, G, GW, K, S, Y]



391. CAMPANULACEAE A.L. de Jussieu 1789 (Bellflower Family) [in ASTERALES]

A family of about 80-82 genera and 2000-2400 species, mostly herbs, cosmopolitan. There is controversy about the circumscription of the family, specifically whether subfamily Lobelioideae should be recognized at the family level. References: Rosatti (1986)=Z; Eddie et al. (2003); Shulkina, Gaskin, & Eddie (2003); Lammers in Kadereit & Jeffrey (2007). [also see *SPHENOCLEACEAE*]

1 Corollas bilaterally symmetrical (zygomorphic); carpels 2; [subfamily *Lobelioideae*].....***1. Lobelia***
1 Corollas radially symmetrical (actinomorphic); carpels (2-) 3-5; [subfamily *Campanuloideae*].
  2 Capsule dehiscent laterally (the pores nearly apical in some *Campanula*); flowers in spikes, racemes, or panicles; [mostly native species of various habitats (some of them weedy)].
    3 Inflorescence spicate, the flowers sessile, mostly in the axils of well-developed leaves; corollas rotate and style straight.....***5. Triodanis***
    3 Inflorescence racemose or paniculate, the flowers pedicelled, sometimes axillary to well-developed leaves; corollas campanulate, funnelform, or rotate, with a straight or curved style .....***6. Campanula***
  2 Capsule dehiscent apically; flowers solitary or in very diffuse panicles (*Platycodon, Wahlenbergia*), or in compact involucrate umbels (*Jasione*); [aliens, generally in weedy or disturbed situations].
    4 Flowers and fruits borne in an involucrate umbel ..... ***4. Jasione***
    4 Flowers and fruits solitary or in a diffuse inflorescence.
      5 Flowers large, 1 to few, solitary or nearly so; leaves large, ovate to elliptic; [Platycodonoid clade].....***2. Platycodon***
      5 Flowers small, several to many, borne in a diffuse inflorescence; leaves small, linear to narrowly elliptic; {Wahlenbergioid clade] .....
      6 .....***3. Wahlenbergia***

1. Lobelia Linnaeus 1753 (Lobelia)
(contributed by A.S. Weakley and B.A. Sorrie)

A genus of over 400 secies, herbs, shrubs, trees, cosmopolitan. References: Rosatti (1986)=Z; McVaugh (1936)=Y; Thompson & Lammers (1997); Lammers in Kadereit & Jeffrey (2007). Key based in part on Y, GW, C, and F.

Identification notes: Vegetative *Lobelia* can be recognized by their milky sap, and the alternate leaves with obscure, whitish, callus-tipped, and often irregular or divergent teeth.

1 Corolla bright red (faded in dried specimens) or very rarely white, 30-45 mm long; filament-tube 19-33 mm long.....***L. cardinalis***

1 Corolla blue, purple, or white, 10-33 mm long; filament-tube 2-15 mm long.
2 Larger leaves in a basal rosette, **either** linear to linear-oblanceolate or orbicular, with a well-developed petiole; [plants generally of wetlands, often growing in shallow water, more rarely in dry or seasonally dry habitats].
3 Rosette leaf blades orbicular, broadly rounded at the base and the apex; stems trailing, rooting at nodes, mat-forming; [of FL]..... ***L. feayana***
3 Rosette leaf blades linear to linear-oblanceolate; stems erect.
4 Calyx segments with small auricles at the base; pedicels with very small bracteoles at the base; filament tube (6-) 7-9 (-11) mm long; corolla tube not fenestrate (lacking lateral slits); larger leaves 10-30 cm long; plants (5-) 8-10 (-15) dm tall ..... ***L. floridana***
4 Calyx segments not auriculate; pedicels lacking bracteoles; filament tube 3-4.5 mm long; corolla tube fenestrate (with lateral slits); larger leaves 5-12 cm long; plants (4-) 5-6 (-13) dm tall ..... ***L. paludosa***
2 Larger leaves cauline; [collectively of a range of habitats].
5 Flowers relatively large, the corolla (including the hypanthium) 18-33 mm long, fenestrate (with a slit or window on each side of the tube near the base).
6 Calyx with prominent leafy auricles; pedicels with bracteoles near the middle.
7 Stems, leaves, hypanthium, and calyx glabrous (or with very few hairs); leaves usually < 1.5 cm wide; flowers 6-20; [WI, MB, ND, and WY, south to MS, LA, and TX] ..... ***L. siphilitica*** *var.* ***ludoviciana***
7 Stems, leaves, hypanthium, and calyx hirsute; leaves usually 2-6 cm wide; flowers usually > 20; [ME, ON, and MN, south to GA, AL, MS, AR] ..... ***L. siphilitica*** *var.* ***siphilitica***
6 Calyx not auriculate; pedicels with bracteoles near the base (or sometimes near the middle in *L. puberula*).
8 Stems and leaves evidently short-pubescent throughout.
9 Stem densely short-hirsute; calyx lobes long-hirsute or villous, the lobes undulate-margined or crisped, 3-5 mm wide at base, and with large and broadly rounded basal auricles; lower and mid stem leaves ascending to appressed, the callous teeth oscure; [of the Coastal Plain and Piedmont] ..... ***L. puberula*** *var.* ***puberula***
9 Stem minutely puberulent; calyx lobes glabrous to sparsely short-pubescent, the lobes usually entire, 1.2-2 mm wide at the base, with or without prominent auricles; lower and mid stem leaves spreading to strongly ascending, the callous teeth prominent.
10 Leaves somewhat to strongly ascending, often short-pilose beneath; sinuses of calyx with prominent auricles; [mainly of sc. United States, east to AL] ..... ***L. puberula*** *var.* ***mineolana***
10 Leaves spreading to somewhat ascending, glabrous or scabrous beneath; sinuses of calyx with small auricles; [Appalachian and south into the Gulf Coastal Plain] ..... ***L. puberula*** *var.* ***simulans***
8 Stems and leaves glabrous or glabrescent, sometimes sparsely hairy near the base of the plant.
11 Calyx lobes prominently glandular-toothed (not all lobes will be toothed; check several flowers) (ignore leafy bract at base of calyx).
12 Corolla pubescent on outside; calyx tube with pustular-based translucent hairs, calyx lobes 4.5-8 mm long; leaves linear to lanceolate and < 3 cm; [flowering March-May] ..... ***L. brevifolia***
12 Corolla glabrous/glabrate on outside; calyx tube glabrous or hairy as above, calyx lobes 4-12 mm long; leaves linear to elliptical and > 3 cm (usually 4-15 cm); [flowering September-November].
13 Corolla lip glabrous basally; calyx tube glabrous, calyx lobes 6-12 mm long ..... ***L. georgiana***
13 Corolla lip densely pubescent basally; calyx tube with pustular-based translucent hairs or not, calyx lobes 4-7 mm long ..... ***L. glandulosa***
11 Calyx lobes smooth, without prominent glandular teeth (ignore leafy bract at base of calyx).
14 Leaves elliptic to lanceolate; calyx lobes 6-12 mm long; [of river shores and banks, small stream swamps, floodplains].
15 Flowers loosely arranged; anther tube 2.5-3.5 mm; [of Mountains and Piedmont, rarely lower Piedmont] ..... ***L. amoena***
15 Flowers densely arranged; anther tube 4 mm long; [of Coastal Plain and lower Piedmont] ..... ***L. elongata***
14 Leaves linear, occasionally lanceolate; calyx lobes 4-7 (-8) mm long; [of wet savannas and flatwoods, pitcher-plant bogs, seepage slopes, streamheads].
16 Corolla lip densely pubescent basally, corolla tube relatively densely pubescent within; corolla 19-27(-29) mm long; [of middle and outer Coastal Plain, mostly in wet savannas, flatwoods, pitcher-plant bogs] ..... ***L. glandulosa***
16 Corolla lip glabrous basally, corolla tube glabrate within; corolla 17-23 mm long; [endemic of NC-SC Sandhills region, mostly in wet streamheads and adjacent seepage slopes] ..... ***L. species 1***
5 Flowers relatively small, the corolla (including the hypanthium) 7-22 mm long, not fenestrate (thus lacking a slit or window on each side of the tube near the base) (except sometimes *L. flaccidifolia*).
17 Plants creeping, rooting at the nodes, mat-forming; flowers solitary, axillary in the axils of leaves ..... ***L. chinensis***
17 Plants erect or recling, not rooting at nodes nor mat-forming; flowers several-many in bracteate terminal racemes.
18 Stem leaves very narrow, the largest on a plant 1-5 mm wide.
19 Pedicels lacking bracteoles (but with subtending bracts); stem leaves subulate-filiform, < 0.5 mm wide; plant perennial from rhizomes, the stem often spongy-thickened toward the base ..... ***L. boykinii***
19 Pedicels bearing bracteoles near the base or middle (and also with subtending bracts); stem leaves linear to lanceolate, flat, 1-4 mm wide; stems not spongy-thickened.
20 Bracteoles borne near the middle of the pedicel; [of northern wetlands, south to WV and PA] ..... ***L. kalmii***
20 Bracteoles borne at the base of the pedicel; [collectively widespread in our area].
21 Lower lip of corolla pubescent inside at the base; corolla blue, lacking a white eye ..... ***L. canbyi***
21 Lower lip of the corolla glabrous; corolla blue, with a white eye ..... ***L. nuttallii***
18 Stem leaves broader, the largest on a plant > 10 mm wide.
22 Bracteoles borne near the middle of the pedicel ..... ***L. flaccidifolia***
22 Bracteoles borne at the base of the pedicel.
23 Stems long-hirsute, at least on the lower part of the stem; plant usually repeatedly branched (unless depauperate); hypanthium obovoid, almost as long as the corolla; hypanthium strongly inflated in fruit and including the capsule ..... ***L. inflata***

23 Stems lacking hirsute hairs, either densely puberulent (at least below) or glabrous to glabrescent (with a few chaffy hairs on the lower stem); plant unbranched or with a few upright branches; hypanthium obconic, shorter than the corolla; hypanthium slightly inflated in fruit.
24 Stem glabrous to glabrescent (with a few chaffy hairs on the lower stem); leaf bases (all) clasping to rounded; flowers 10-15 mm long.
25 Calyx segments prominently ciliate-margined; basal auricles of the calyx segments prominent and declined, obscuring the corolla tube; plants to 9 dm tall..... ***L. appendiculata***
25 Calyx segments glabrous (rarely minutely ciliate); basal auricles of the calyx segments small, not declined and obscuring the corolla tube; plants to 5.5 dm tall..... ***L. gattingeri***
24 Stem densely puberulent , at least at the base; leaf bases petiolate to sessile (and then decurrent); flowers 7-12 mm long.
26 Leaves chiefly basal, the stem leaves < 5 and much smaller than the basal; [of s. PA south to SC, west to LA, especially on the Piedmont]..... ***L. spicata*** *var.* ***scaposa***
26 Leaves mainly on the stem, basal leaves absent or if present no larger than the stem leaves; [collectively widespread].
27 Calyx lobes with long, slender auricles, these often as long as the hypanthium; [of WV south]..... ***L. spicata*** *var.* ***leptostachys***
27 Calyx lobes lacking auricles or with these much shorter than the hypanthium.
28 Flowers 7-9 mm long, deep purplish-blue; anthers white; [south to NJ, DE, MD, WV, s. IN, and IL]..... ***L. spicata*** *var.* ***campanulata***
28 Flowers 9-12 mm long, light blue to white; anthers pale bluish-gray; [south to GA]..... ***L. spicata*** *var.* ***spicata***

Lobelia amoena Michaux, Southern Lobelia. Marshes, streambanks, seeps, floodplain forests. Late July-October. W. NC and e. TN south through w. SC to c. GA and ec. AL; disjunct in FL Panhandle and Coastal Plain of GA and SC. Reported for VA by Kartesz (1999), supposedly on the basis of McVaugh (1936), but McVaugh does not record *L. amoena* for VA and no specimens have been seen from there. [= RAB, C, GW, S, Y; = *L. amoena* var. *amoena* – K, WH; < *L. amoena* – W]

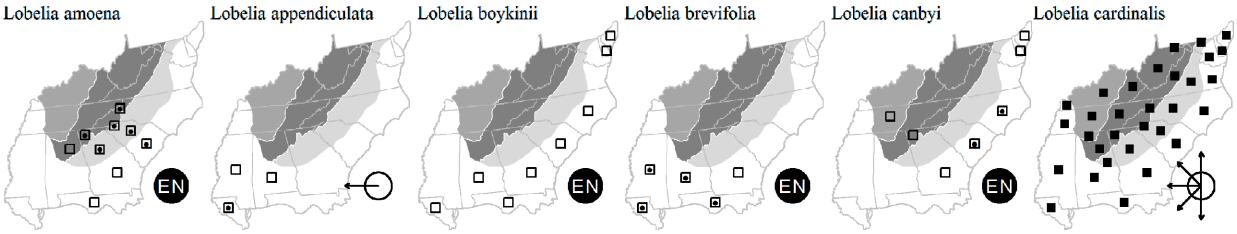
Lobelia appendiculata Alphonse de Candolle. Pinelands, prairies, roadsides, usually in mesic or dry soils. AR and se. KS south to LA and TX; disjunct east of the Mississippi in c. AL, MS, and e. LA. [= GW, S, Y; = *Lobelia appendiculata* Alphonse de Candolle var. *appendiculata* – K]

Lobelia boykinii Torrey & A. Gray ex Alphonse de Candolle, Boykin's Lobelia. Cypress ponds and depression meadows. May-July (-August). NJ and DE (formerly) south to w. Panhandle FL, s. AL, and s. MS (Sorrie & Leonard 1999). [= RAB, C, F, G, GW, K, S, WH, Y]

Lobelia brevifolia Nuttall ex Alphonse de Candolle, Shortleaf Lobelia. Savannas, flatwoods, and bogs. July-November. Endemic to the East Gulf Coastal Plain of c. and w. Panhandle FL, west through s. AL and s. MS to e. LA (Florida Parishes). [= GW, K, S, WH, Y]

Lobelia canbyi A. Gray, Canby's Lobelia. Depression ponds, Carolina bays, pine savannas. July-November. NJ to GA in the Coastal Plain; disjunct in Coffee County (and three other counties), TN, and in Bartow County, GA, with other Coastal Plain plants. [= RAB, C, F, G, GW, K, S, Y]

Lobelia cardinalis Linnaeus, Cardinal Flower. Streambanks, riverbanks, marshes, swamp forests. July-October. NB, QC, ON, MN, CO, UT, and s. CA south to c. peninsular FL, TX, and south through Mexico and Central America to Colombia. See Thompson & Lammers (1997). [= RAB, F, G, K, S, W, WH, WV, Y; > *L. cardinalis* var. *cardinalis* – C; > L. *cardinalis* ssp. *cardinalis* – GW; > *L. cardinalis* ssp. *cardinalis* var. *cardinalis*]



* ***Lobelia chinensis*** Loureiro, Chinese Lobelia, Creeping Lobelia. Tidal river banks. July-September. Reported for s. NJ and adjacent PA (Rhoads & Block 2007; Kartesz 2010). [= K2]

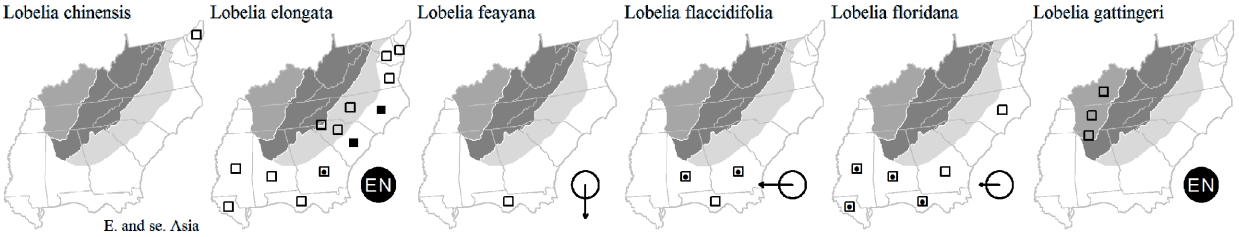
Lobelia elongata Small. River and stream margins, floodplain forests, marshes, bogs, pine savannas. August-October. Primarily a Southeastern Coastal Plain endemic from DE to se. GA, rarely inland onto the lower Piedmont of NC and SC. [= C, F, G, GW, K, S, Y; < *L. elongata* – RAB]

Lobelia feayana A. Gray, Bay Lobelia, Feay's Lobelia. Open, moist areas. Ne. FL (Duval County) and e. Panhandle FL (Madsion and Taylor counties) south to s. FL. [= GW, K, S, WH, Y]

Lobelia flaccidifolia Small. Depression ponds, swampy woods along rivers and streams. June-September. E. GA south into Panhandle FL, west to sw. AL (and presumably s. MS); disjunct in sw. LA and e. TX. [= GW, K, S, WH; > *L. halei* Small – Y]

Lobelia floridana Chapman, Florida Lobelia. Wet pine savannas and flatwoods, depression ponds. S. GA (Jones & Coile 1988) and Panhandle FL west to LA; disjunct in se. NC? McVaugh (1936) reports this species for Wilmington, New Hanover County, NC, based on a collection by MacFarlane in 1909 (PENN). This record seems unlikely and needs confirmation; mislabeling is a possibility. [= GW, K, S, WH, Y]

Lobelia gattingeri A. Gray, Gattinger's Lobelia. Calcareous glades. Endemic to sc. KY south through c. TN to n. AL. [= GW, S, Y; = *Lobelia appendiculata* Alphonse de Candolle var. *gattingeri* (A. Gray) McVaugh – K]



Lobelia georgiana McVaugh. Swamps, floodplain forests, wet places. August-October. E. VA to Panhandle FL, inland to w. NC and e. TN. Very close to *L. elongata* and inhabiting apparently the same habitats; additional taxonomic work is desirable. See McVaugh (1940) for an explanation of the need to replace the name *L. glandulifera* with *L. georgiana*. [= C, F, G, GW; < *L. elongata* – RAB; = *L. amoena* Michaux var. *glandulifera* A. Gray – K, WH; = *L. glandulifera* (A. Gray) Small – S, Y; < *L. amoena* – W]

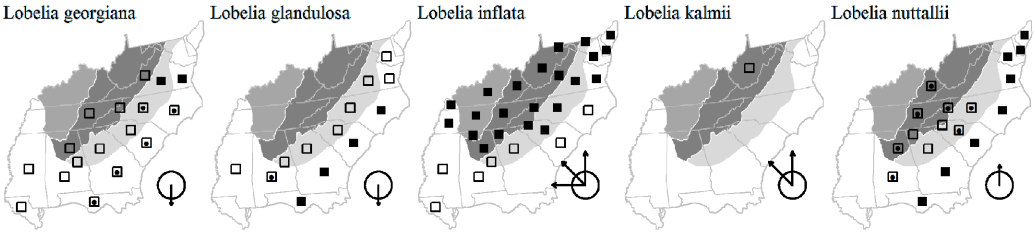
Lobelia glandulosa Walter. Seepage slopes, pitcher-plant bogs, streamhead margins, pine savannas, flatwoods, margins of beaver ponds. September-October. E. NC (or se. VA) to s. FL, west to s. AL. Prior reports from the Piedmont are erroneous, most referring to *L. elongata* and *L. georgiana*. [= RAB, C, F, G, GW, K, S, W, WH, Y]

Lobelia homophylla E. Wimmer. Just south of our area in FL (St Johns County) (Wunderlin & Hansen 2003). [= GW, K, S, WH, Y] {neither keyed nor mapped}

Lobelia inflata Linnaeus, Indian-tobacco. Fields, meadows, gardens, open woodlands, disturbed areas. July-November. PE west to MN, south to GA, AL, se. MS, e. LA, s. AR, and se. OK. [= RAB, C, F, G, GW, K, S, W, Y; > *L. inflata* var. *inflata* – WV; > *L. inflata* var. *simplex* (Rafinesque) Millspaugh – WV]

Lobelia kalmii Linnaeus, Kalm's Lobelia. Calcareous swamps. July-September. NL (Newfoundland) and BC, south to PA, e. WV, OH, IL, and MN. [= C, F, G, K, Y]

Lobelia nuttallii J.A. Schultes, Nuttall's Lobelia. Flatwoods, bogs, savannas. May-November. NY (Long Island) south to FL Panhandle on the Coastal Plain; less commonly disjunct inland to w. NC, w. SC, KY, and TN. [= RAB, C, F, G, GW, K, S, W, WH, Y]



Lobelia paludosa Nuttall, White Lobelia. Flatwoods, savannas, ditches, dune swales. March-May. Se. GA (Jones & Coile 1988) and FL Panhandle south to s. FL. [= F, GW, K, S, WH, Y]

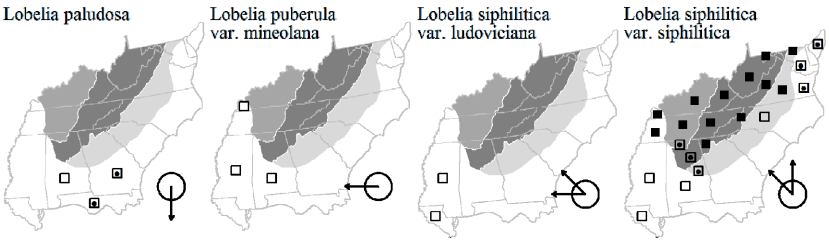
Lobelia puberula Michaux *var.* ***mineolana*** F. Wimmer, Western Downy Lobelia. Forests, openings. W. KY, s. MO, and e. OK, south to s. AL, MS, LA, and e. TX. [= K; < *L. puberula* – C, G, GW, S; = *L. puberula* "form d" – Y]

Lobelia puberula Michaux *var.* ***puberula***, Coastal Plain Downy Lobelia. Cp (DE, FL, GA, NC, SC, VA), Pd (GA, NC, SC, VA): forests, openings, fields; common. Late July-October. NJ and PA south to c. peninsular FL, primarily on the Coastal Plain and Piedmont. [= F, K; < *L. puberula* – RAB, C, G, GW, S, W, WH, Y]

Lobelia puberula Michaux *var.* ***simulans*** Fernald, Appalachian Downy Lobelia. Mt (GA, NC, SC, VA, WV), Pd (GA), Cp (GA): {habitats}; {abundance}, common in WV. Late July-October. Sw. VA, s. WV, and IL south to n. FL, AL, MS, and LA. [= F, K; < *L. puberula* – RAB, C, G, GW, S, W; = *L. puberula* "form a" – Y]

Lobelia siphilitica Linnaeus *var.* ***ludoviciana*** A. DC., Western Great Blue Lobelia. Bottomlands, moist forests, ditches, wet meadows, streambanks. Late July-October. WI, MB, ND, and WY, south to MS, LA, and TX. [=C, F, G, GW, K, Y; < *L. siphilitica* – RAB, S]

Lobelia siphilitica Linnaeus *var.* ***siphilitica***, Eastern Great Blue Lobelia. Bottomlands, moist forests, ditches, wet meadows, streambanks. Late July-October. ME, ON, and MN, south to GA, AL, MS, AR. [= C, F, G, GW, K, Y; < *L. siphilitica* – RAB, S, W]



Lobelia species 1, Batson's Lobelia. Wet streamheads and seepage slopes. Endemic to the Sandhills Region of NC and SC. Under study by A. Bert Pittman. [= "*L. batsonii*" in prep.]

Lobelia spicata Lamarck *var.* ***campanulata*** McVaugh. {habitats}. S. ME west to MN, south to NJ, DE, MD, WV, s. IN, and IL. [= F, G, K, WV, Y; < *L. spicata* var. *spicata* – C; < *L. spicata* – W]

Lobelia spicata Lamarck *var.* ***leptostachys*** (Alphonse de Candolle) Mackenzie & Bush. Meadows, woodlands, disturbed areas. Late May-August. WV west to IL and KS, south to GA, AL, MS, and AR. [= C, F, G, K, WV, Y; < *L. spicata* – RAB, GW, W; = *L. leptostachys* Alphonse de Candolle – S]

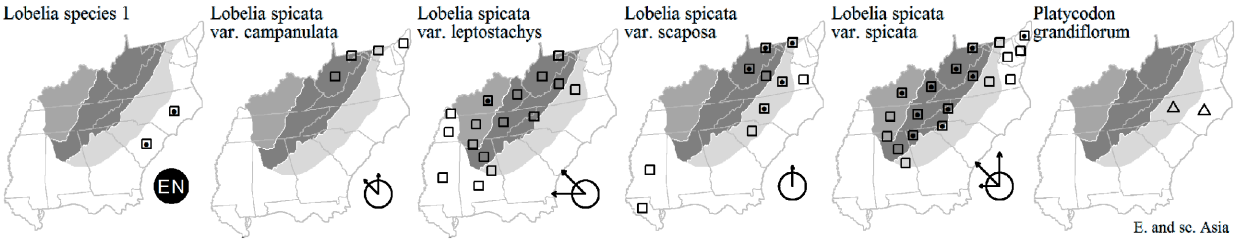
Lobelia spicata Lamarck *var.* ***scaposa*** McVaugh. Meadows, woodlands, disturbed areas. Late May-August. S. PA south to SC, west to LA. [= C, F, G, K, WV, Y; < *L. spicata* – RAB, GW, S, W]

Lobelia spicata Lamarck *var.* ***spicata***. Meadows, woodlands, disturbed areas. Late May-August. ME and NB west to ND, south to PA and AR, and in the mountains to n. GA. [= F, G, K, WV; < *L. spicata* var. *spicata* – C; < *L. spicata* – RAB, GW, W; > *L. spicata* – S; > *L. bracteata* Small – S; = *L. spicata* var. *originalis* – Y]

2. Platycodon Alphonse de Candolle 1830 (Japanese Bellflower, Balloonflower)

A monotypic genus, an herb, of ne. Asia. References: Rosatti (1986)=Z; Lammers in Kadereit & Jeffrey (2007).

* ***Platycodon grandiflorum*** (Jacquin) Alphonse de Candolle, Japanese Bellflower, Balloonflower. Ditches, disturbed areas, spread from horticultural cultivation; native of e. Asia. [= RAB, K, Z]



3. Wahlenbergia Schrader ex Roth 1821 (Wahlenbergia)

A genus of ca. 260 species, annual and perennial herbs, and shrubs, of southern South America, southern Africa, e. Asia, and Oceania. References: Rosatti (1986)=Z; Lammers in Kadereit & Jeffrey (2007).

1 Hypanthium narrowly obconic to nearly cylindric, 3.5-4.5 mm long at anthesis, lengthening to as much as 12 mm in fruit; fruit opening by 2 terminal pores; perennial ..... ***W. linarioides***
1 Hypanthium ellipsoid or ovoid, 1.5-3 mm long at anthesis, lengthening to as much as 7.5 mm in fruit; fruit opening by 3 terminal pores; annual ..... ***W. marginata***

* ***Wahlenbergia linarioides*** (Lamarck) Alphonse de Candolle. Disturbed areas; native of s. South America. [= K] {add Z synonymy}

* ***Wahlenbergia marginata*** (Thunberg) Alphonse de Candolle. Sandy soils along roadsides and in fields; native of e. Asia and Oceania. February-December. Apparently only recently introduced in se. United States, the earliest recorded date 1937 in Alachua County, FL (Rosatti 1986), but now quite common on sandy roadsides. [= RAB, K, Z]

4. Jasione Linnaeus 1753 (Sheep's-bit)

A genus of 16 species, herbs, European and Mediterranean. References: Rosatti (1986)=Z; Lammers in Kadereit & Jeffrey (2007).

* ***Jasione montana*** Linnaeus, Sheep's-bit. Disturbed areas in sandy soils; native of Europe. June-September. [= C, F, G, K; > *J. montana* var. *montana* – Z]

5. Triodanis Rafinesque 1838 (Venus's Looking-glass)

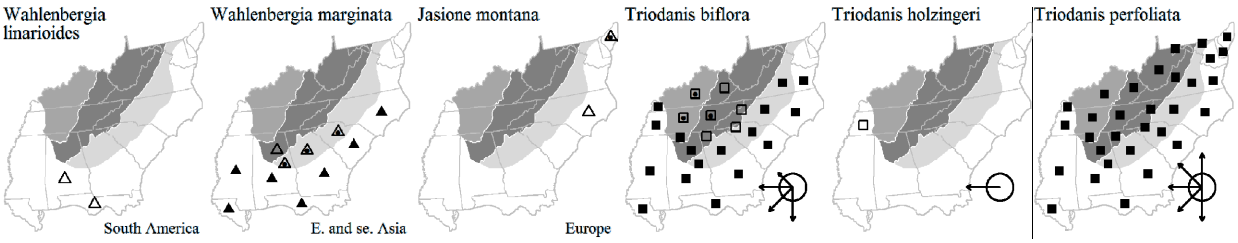
A genus of 6-8 species, annual herbs, of America. References: McVaugh (1945)=Z; McVaugh (1948); Lammers in Kadereit & Jeffrey (2007). Key based on Z.

1 Openings of the capsule linear, 0.2-0.4 mm wide; seeds minutely tuberculate in longitudinal lines; [sw. TN westward] ..... ***T. holzingeri***
1 Openings of the capsule broadly elliptic, oval, or rounded, 0.5-1.5 mm wide; seeds either muriculate over the entire surface or nearly to quite smooth; [collectively more widespread].
  2 Pores at or very near the apex of the capsule; seeds smooth and highly polished; open (chasmogamous) corolla usually 1 (the terminal), the others usually closed (cleistogamous) ..... ***T. biflora***
  2 Pores well below the apex of the capsule (usually 1-1.5 mm below), usually about midway between apex and base; seeds muriculate or smooth and lustrous; open (chasmogamous) corollas usually several ..... ***T. perfoliata***

Triodanis biflora (Ruiz & Pavón) Greene. Roadsides, gardens, glades, disturbed areas. April-June. E. VA, KY, KS, AZ, and OR, south c. peninsular FL and Mexico; South America. [= C, K, WH, Z; = *Specularia biflora* (Ruiz & Pavón) Fischer & C.A. Meyer – RAB, F, G; = *T. perfoliata* var. *biflora* (Ruiz & Pavón) Bradley – W]

Triodanis holzingeri McVaugh. {habitats} MO west to CO, south to sw. TN, AR, TX, and NM. [= K, Z; = *Specularia holzingeri* (McVaugh) Fernald – F]

Triodanis perfoliata (Linnaeus) Nieuwland. Roadsides, gardens, glades, dry forests, disturbed areas. April-June. ME and BC south to c. peninsular FL and Mexico; West Indies; Ecuador. [= C, K, Z, WH; = *Specularia perfoliata* (Linnaeus) Alphonse de Candolle – RAB, F, G, WV; = *T. perfoliata* var. *perfoliata* – W]



6. Campanula Linnaeus 1753 (Bellflower)

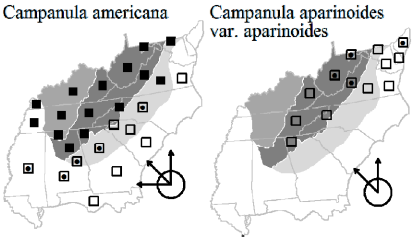
A genus of about 300-425 species, herbs (rarely shrubby), north temperate, most diverse in s. Europe. The appropriate circumscription remains uncertain and controversial, and related genera are sometimes combined into a broadly circumscribed *Campanula*, or alternately, several segregates recognized (*Campanula*, *Rapunculus*, *Campanulastrum*, etc.). A broad circumscription is adopted here, based on considerations discussed in Roquet et al. (2008). Park et al. (2006) propose splitting Campanula into a number of segregates, a suggestion which also has some merits; if followed, most or all of our species would likely be placed in the genus *Rapunculus*. References: Roquet et al. (2008); Park et al. (2006); Rosatti (1986)=Z; Shetler & Morin (1986); Shetler (1982)=Y; Shulkina, Gaskin, & Eddie (2003); Lammers in Kadereit & Jeffrey (2007).

1 Corolla rotate
  2 Stem erect; leaf obviously serrate or crenate; [of FL and northward, of uplands] ..... ***C. americana***
  2 Stem sprawling; leaf entire or with obscure teeth; [of FL wetlands] ..... ***C. floridana***
1 Corolla campanulate.
  3 Stems weak and slender, reclining, 3-angled.
    4 Corolla 4-10 mm long; pedicels divergent, the bractless portion 0.4-4 cm long; corolla white to very pale blue ..... ***C. aparinoides*** *var.* ***aparinoides***
    4 Corolla 5-13 mm long; pedicels ascending, the bractless portion 1-8 cm long; corolla pale blue ..... ***[C. aparinoides*** *var.* ***grandiflora]***
  3 Stems more robust, erect, terete or nearly so.
    5 Flowers on long pedicels (generally longer than 40 mm long), the inflorescence a diffuse panicle; [native species of rock outcrops or rocky woodlands].
      6 Corolla 6-8 mm long; leaves lanceolate, averaging about 1 cm wide, generally with prominent, often somewhat divergent teeth..... ***C. divaricata***
      6 Corolla 12-20 mm long; leaves (of the stem) linear, averaging < 5 mm wide, generally lacking teeth (or the teeth minute and obscure) ..... ***C. rotundifolia***
    5 Flowers mostly on short pedicels (the upper < 5 mm long), the inflorescence a raceme; [alien species usually of disturbed areas].
      7 Capsules with pores in the apical half ..... ***C. persicifolia***
      7 Capsules with pores at or near the base ..... ***C. rapunculoides***

Campanula americana Linnaeus, Tall Bellflower. Moist to fairly dry forests, especially over mafic or calcareous rocks. Late June-September; August-October. NY, ON, MN, and SD, south to Panhandle FL, LA, and OK. Shetler & Morin (1986) stated that "Small's view [segregating *Campanula americana* into the monotypic genus *Campanulastrum*] appears to have increasing justification from palynological, cytological, and now seed evidence." Also recently supported as a genus by Shulkina, Gaskin, & Eddie (2003), but combined into *Campanula* by Lammers in Kadereit & Jeffrey (2007) and Roquet et al. (2008). [= RAB, C, F, G, W, WH, Z; = ***Campanulastrum americanum*** (Linnaeus) Small – K, S; *Rapunculus*]

Campanula aparinoides Pursh *var.* ***aparinoides***, Marsh Bellflower. Bogs, marshes, wet meadows, seepage slopes over mafic or calcareous rocks. Late June-August; August-September. Widespread in ne. North America, south to nc. GA (Jones & Coile 1988), KY, MO, and NE. [= C, G; < *C. aparinoides* – RAB, K, W, Z; = *C. aparinoides* – F, S]

Campanula aparinoides var. *grandiflora* Holzinger ranges south to PA. It should be sought in our area. It has been variously treated as a species, variety, geographic phase, or form; its taxonomic status is uncertain. [= C, G; < *C. aparinoides* – K; = *C. uliginosa* Rydberg – F] {not mapped}

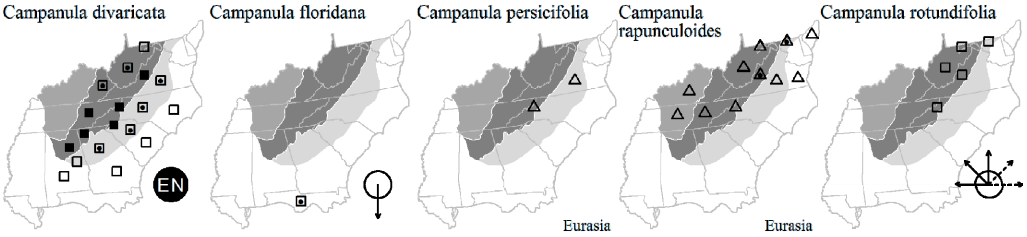


Campanula divaricata Michaux, Southern Harebell, Appalachian Bellflower. Rock outcrops, cliffs, rocky summits, talus, up to at least 1850m. July-October; September-December. A broad endemic of the Southern and Central Appalachians: MD and KY south to AL and GA. [= RAB, C, F, G, K, W, Z; = *C. flexuosa* Michaux – S; *Rapunculus*]

Campanula floridana S. Watson ex A. Gray, Florida Bellflower. Cypress ponds, depressions marshes, wet prairies. March-May. Ne. FL and Panhandle FL south to s. peninsular FL. [= GW, K, WH; = *Rotantha floridana* (S. Watson ex A. Gray) Small – S]

* ***Campanula persicifolia*** Linnaeus, Peachleaf Bellflower. Naturalized from gardens; native of Eurasia. This species was reported by Small (1933) as "escaping from gardens" in w. NC; no specimens have been seen to document this occurrence. Additional documentation is needed to confirm this record. [= RAB, K, S; = *Rapunculus persicifolius* (Linnaeus) Fournier; = *Neocodon persicifolius* (Linnaeus) A.A.Kolakovskiĭ & L.B.Serdyukova]

* ***Campanula rapunculoides*** Linnaeus, Rampion Bellflower, Rover Bellflower. Disturbed areas; native of Eurasia. June-August (-October). [= RAB, C, F, G, K, S, Z; *Rapunculus*]



Campanula rotundifolia Linnaeus, Bluebell, Harebell, Bluebell-of-Scotland. Limestone outcrops, high elevation rocky summits (in thin soil over amphibolite). July-August; August-September. A circumboreal species, widespread and common in n. North America and n. Eurasia, south to nw. NC, TN, MO, TX, NM, AZ, and CA. In our area rare, and generally limited to limestone in its occurrences in the Central Appalachians of WV and VA and to mafic rocks in nw. NC. It was added to the flora of NC in 1991 (Three Top Mountain, Ashe County). See Shetler (1982) for a detailed study of the species. [= C, F, G, K, Y, Z; *Rapunculus*]

397. MENYANTHACEAE Dumortier 1829 (Buckbean Family) [in ASTERALES]

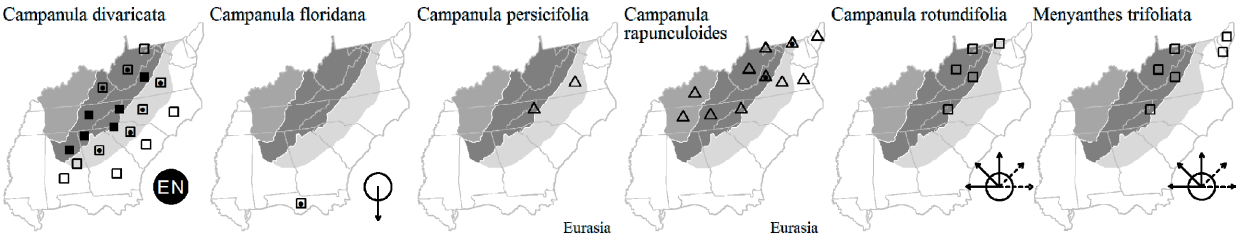
A family of about 5 genera and 40 species, wetland herbs, of cosmopolitan distribution. References: Wood (1983a)=Z.

1 Leaves trifoliate; inflorescence a raceme ..... ***Menyanthes***
1 Leaves simple; inflorescence an umbel ..... ***Nymphoides***

Menyanthes Linnaeus 1753 (Buckbean, Bogbean)

The genus is monotypic, an herb, circumboreal. References: Wood (1983a)=Z

Menyanthes trifoliata Linnaeus, Buckbean, Bogbean. Mucky soils of mountain bogs at high elevations over amphibolite (in the Blue Ridge), boggy marshes over calcareous rocks (in the Ridge and Valley), seepage swamps (in the Coastal Plain). May-June. This circumboreal species is widespread in n. North America and n. Eurasia, ranging south in North America to NJ, DE, w. VA, IN, MO, and CA, and disjunct to Long Hope Valley, Watauga County, NC. The NC populations are disjunct about 400 km from the next nearest populations in VA and WV. McDowell (1984) reported the first documentation of the species for NC. [= C, G, K, W, WV, Z; > *M. trifoliata* var. *minor* Rafinesque – F]



Nymphoides Séquier 1754 (Floating Heart)

A genus of about 20 species, aquatic herbs, cosmopolitan. References: Wood (1983a)=Z; Burks (2002).

Identification notes: As the scientific name indicates, the leaves of *Nymphoides* bear a superficial resemblance to those of *Nymphaea*. The leaves of *Nymphoides* are more cordate, the two basal lobes more rounded, rather than having a rather sharp corner or angle. *Nymphoides cordata* has much smaller leaves than *Nymphaea*, while the thickly pebbled texturing of *Nymphoides aquatica* is very unlike the glossy smoothness of *Nymphaea*.

1 Flowers yellow; floating stems usually with multiple leaves; capsules 12-25 mm long ..... ***N. peltata***
1 Flowers white; floating stems with single leaves; capsules 3-14 mm long.
  2 Adaxial petal surface bearing a ruffled crest down its length in the middle ..... ***N. cristata***
  2 Adaxial petal surface not crested.
    3 Leaves 5-15 cm wide, roughly pebbled below, thick in texture; stems 1.3-2.5 mm in diameter a few cm below the inflorescence, with conspicuous red spots; tuberous roots of floating clusters stout, blunt-tipped; seeds conspicuously papillate; capsule 10-14 mm long ..... ***N. aquatica***
    3 Leaves 3-7 cm wide, smooth below, thin in texture; stems 0.6-0.9 mm in diameter a few cm below the inflorescence, rarely spotted with red; tuberous roots of floating clusters slender, with pointed tips; seeds smooth (rarely papillate); capsule 4-5 mm long ..... ***N. cordata***

Nymphoides aquatica (Walter ex J.F. Gmelin) Kuntze, Big Floating Heart, Banana Floating Heart. Limesink ponds (dolines), other acidic and nutrient-poor water-filled depressions, sluggish streams, beaverponds, primarily in the Outer and Middle Coastal Plain. Late April-September. A Southeastern Coastal Plain endemic: NJ south to FL and west to TX. [= RAB, C, F, GW, K, S, Z; = *N. aquaticum* – G, orthographic variant]

Nymphoides cordata (Elliott) Fernald, Little Floating Heart. Upland depression ponds, sluggish streams, beaverponds, primarily in the fall-line Sandhills. NL (Newfoundland) and ON south MD; disjunct in the Coastal Plain of NC and SC; disjunct from sw. GA and Panhandle FL west to e. LA. [= RAB, C, F, GW, K, Z; = *N. cordatum* – G, orthographic variant; ? *N. lacunosa* (Ventenat) Kuntze – S, misapplied]

* ***Nymphoides cristata*** (Roxburgh) Kuntze, Crested Floating Heart, Water Snowflake. Ponds and lakes; native of China and India. Apparently first naturalizing in North America in FL in 2000; introduced for water gardens and aquariums, and considered a noxious aquatic weed in our area.

* ***Nymphoides peltata*** (S.G. Gmelin) Kuntze, Yellow Floating Heart. Ponds; native of Europe. This European native is sparingly naturalized in e. North America; it is sold for cultivation in water gardens, and will likely become more widely naturalized. [= C, F, K; = *N. peltatum* – G, orthographic variant]

398. GOODENIACEAE R. Brown 1810 (Goodenia Family) [in ASTERALES]

A family of about 11 genera and 440 species, herbs and shrubs, mostly of the Southern Hemisphere, and especially Autralia. References: Carolin in Kadereit & Jeffrey (2007).

Scaevola Linnaeus 1771 (Fanflower, Half-flowerr, Scaevola)

A genus of about 130 species, perennial herbs, shrubs, woody scramblers and trees, tropical nd subtropical, especially in Australia and nearby islands. References: Carolin in Kadereit & Jeffrey (2007).

Scaevola plumieri (Linnaeus) Vahl, Beachberry, Inkberry, Gull-feed. Coastal dunes, marsh edges. January-December. N. peninsular FL south to s. FL; s. LA; s. TX south through Mexico into Central and South America; West Indies. [= K, S, WH]

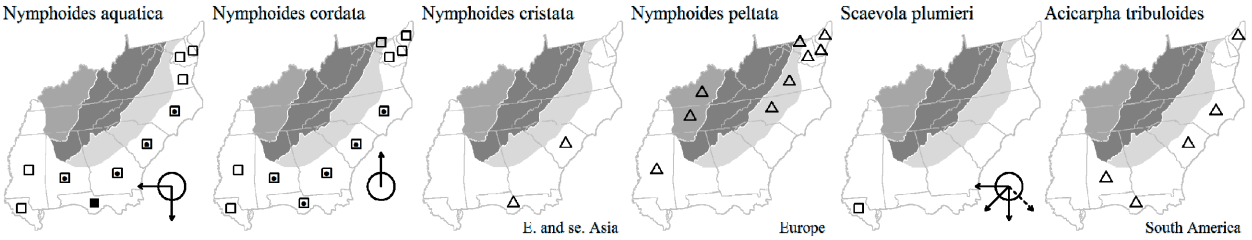
399. CALYCERACEAE R. Brown ex Richard 1820 (Calycera Family) [in ASTERALES]

A family of 4 genera and ca. 60 species, perennial and annual herbs, endemic to s. South America. References: Hellwig in Kadereit & Jeffrey (2007).

Acicarpha Antoine Laurent de Jussieu

A genus of 3-5 species, of subequatorial South America. References: DeVore (1991)=Z; Hellwig in Kadereit & Jeffrey (2007).

* ***Acicarpha tribuloides*** Antoine Laurent de Jussieu, Madam Gorgon. On ship's ballast near old port-cities; probably no longer present, native of South America (Brazil, Uruguay, Paraguay, and Argentina). The NC and SC records were both collected by Gerald McCarthy in 1888; though the localities are not specified, the likely sites (based on his itinerary and what is known of the species) are Wilmington (New Hanover County, NC) and Charleston (Charleston County, SC). DeVore (1991) discusses ballast plants and the apparent failure of *Acicarpha* to naturalize in North America. This species has not been collected in our area (or North America) since 1888; it is here treated for historical interest and to increase the likelihood that it will be relocated, if it is, indeed, actually naturalized. [= K, S, WH, Z]



400. ASTERACEAE Dumortier 1822 or ***COMPOSITAE*** Giseke 1792 (Aster Family) [in ASTERALES]

A family of about 1500-1700 genera and 20,000-25,000 species, shrubs, herbs, trees, and vines, cosmopolitan. References: Cronquist (1980)=SE throughout family treatment.

Identification notes: {define liguliflorous, discoid, disciform, radiant, and radiate heads; define various pappus characters. define calyculus. define palea and phyllary}

1 Plant a shrub or woody vine, definitely with woody growth well above ground level ..... **Key A**
1 Plant an annual, biennial, or perennial, lacking woody growth above ground level.
  2 Leaves opposite or whorled, at least on the lower stem nodes (the leaves higher on the stem sometimes alternate).
    3 Heads discoid or disciform ..... **Key B** {under construction}
    3 Heads radiate.
      4 Rays yellow, orange, or red (sometimes with some brown, maroon, or purple coloration as well) ..... **Key C** {under construction}
      4 Rays white, cream-colored, or pale pink or lavender ..... **Key D** {under construction}
  2 Leaves **either** alternate (not opposite even at lower nodes of the stem) **or** basal only (the heads on scapiform stems).
    6 Heads liguliflorous (composed of ligulate florets); sap usually milky ..... **Key E**
    6 Heads discoid, disciform, radiant, or radiate; sap usually clear.
      7 Heads discoid or disciform ..... **Key F** {under construction}
      7 Heads radiate or radiant ..... {under construction}

Key A – shrubby composites

1 Leaves strictly alternate; [tribe *Astereae*].
  2 Heads discoid; shrubs to 5 m tall; [widespread in our area] ..... ***Baccharis***
  2 Heads radiate (most or all on a plant); [of se. NC southwards, native in the Coastal Plain only].
    3 Leaves with clasping base, with a midvein and lateral veins and tertiary reticulation; rays pink or rose; sprawling viny shrub to 4 m tall; [of wet habitats of SC (or se. NC) southwards, also cultivated] ..... ***Ampelaster***
    3 Leaves with a cuneate base, with a midvein and otherwise minutely pebbled; rays yellow; intricately branched shrub to 1 m tall, with persistent sterile shoots with evergreen leaves and annual flowering shoots (the entire shoot and leaves deciduous); [of xeric sandy barrens, of se. NC southwards] ..... ***Chrysoma***
1 Leaves opposite, at least on the lower stem nodes (the leaves higher on the stem sometimes alternate); [tribe *Heliantheae*].
  4 Heads radiate, ray florets yellow; disc florets yellow; leaves strictly opposite; [of tidally inundated salt and brackish marshes of the outer Coastal Plain]; [tribe *Heliantheae*; subtribe *Ecliptinae*] ..... ***Borrichia***
  4 Heads discoid or disciform, ray florets lacking; disc florets pink, purple, or whitish; leaves opposite, but usually at least in part alternate higher on the stem; [collectively of various habitats, Coastal Plain and inland].
    5 Heads solitary, axillary in the axils of leaves or leafy bracts; heads nodding, the involucre 2-7 mm high; [collectively widespread in our area, of maritime and inland wetlands or moist disturbed areas]; [tribe *Heliantheae*; subtribe *Ambrosiinae*] ..... ***Iva***
    5 Heads many, terminal on the branches of corymbiform arrays; heads erect, the involucre 4-12 mm high; [of Coastal Plain of FL, s. GA, s. AL, and c. MS, of dry, sandy scrub and pinelands, blackland prairies, or dry, disturbed areas].
      6 Leaves with punctate glands; pappus of 60-70 barbellate bristles, 8-12 mm long; [tribe *Heliantheae*; subtribe *Eupatoriae*] .... ***Garberia***
      6 Leaves lacking punctuate glands; pappus of 4-10 scales, 0.3-7 mm long; [tribe *Heliantheae*; subtribe *Chaenactidinae*] ..... ***Palafoxia***

Key B – herbaceous composites with opposite or whorled leaves and discoid or disciform heads (lacking ray florets)

1 Disc florets yellow.
2
2
Acmella
Flaveria
Pulicaria
Dittrichia
Inula

1 Disc florets white, pink, purplish.
6
6
Ambrosia
Xanthium
Iva
Cyclachaena
Melanthera
Lagascea
Palafoxia
Eupatorium
Eutrochium
Conoclinium
Ageratum
Brickellia
Hartwrightia
Fleischmannia
Chromolaena
Mikania
Chevreulia
Sclerolepis

Key C – herbaceous composites with opposite leaves and radiate heads, the rays predominantly yellow, orange, or red

Key D – herbaceous composites with opposite leaves and radiate heads, the rays predominantly white, cream or pale lavender or pink

Key E – herbaceous composites with leaves alternate or basal, liguliflorous heads (composed of ligulate florets), and sap usually milky

1 Cypselas (at least of the inner florets of the head) beaked.
2 Heads solitary and terminal at the end of a stem unbranched to its base.
3 Leaves basal and cauline, grasslike (untoothed and unlobed); stem leafy ..... ***Tragopogon***
3 Leaves basal only, variously toothed to pinnately lobed; stem scapiform (leafless).
4 Pappus of bristles ..... ***Taraxacum***
4 Pappus **either** of outer scales and inner bristles **or** entirely of aristate scales.
5 Pappus of outer scales and inner plumose bristles; leaves oblanceolate to oblong; plants annual or perennial ..... ***Leontodon***
5 Pappus of aristate scales; leaves linear to narrowly lanceolate; plants annual ..... ***Uropappus***
2 Heads several per stem, in various corymbiform, umbrelliform, spiciform, or paniculiform arrays (rarely solitary and terminal in the smallest and most depauperate individuals in a population.
6 Achenes distinctly flattened ..... ***Lactuca***
6 Achenes terete or prismatic.
7 Pappus of plumose bristles, at least the inner series; plant an annual or biennial.
8 Receptacles lacking paleae ..... ***Helminthotheca***
8 Receptacles with paleae ..... ***Hypochaeris***
7 Pappus of simple capillary bristles; plant an annual, biennial, or perennial.
9 Beak of the cypsela with a ring of soft white reflexed hairs at the summit (just below the pappus) ..... ***Pyrrhopappus***
9 Beak of the cypsela lacking a ring of hairs as described.
10 Pappus of 80-150 barbellulate bristles; plant an annual or biennial ..... ***Crepis***
10 Pappus **either** of 40-50 (or more) smooth bristles **or** of 20-30 barbellulate bristles; plant a perennial
11 Pappus of 40-50 (or more) smooth bristles ..... ***Chondrilla***
11 Pappus of 20-30 barbellulate bristles ..... ***Ixeris***
1 Cypselas beakless.
12 Leaves basally disposed (stem leaves few or none generally smaller in size than the basal leaves, which are persistent into flowering and fruiting); corollas yellow, orange, or red.
13 Pappus absent **or** of both scales and barbellulate bristles ..... ***Krigia***
13 Pappus of bristles only (these barbellulate or plumose).
14 Pappus of plumose bristles (these somewhat flattened at their bases) ..... ***Oporinia***

14 Pappus of barbellulate bristles.
15 Leaves with entire margins; plants perennials, **either** from long to short rhizomes **or** from a short caudex with fibrous roots..... ***Hieracium***
15 Leaves coarsely toothed or pinnately lobed; plants annuals, from a taproot.
16 Involucre 5-12 mm high; achenes usually > 2.5 mm long; pappus bristles distinct, 3-7 mm long..... ***Crepis***
16 Involucre 3-5 mm high; achenes 1.5-2.5 mm long; pappus bristles basally connate, 2.5-3.5 mm long ..... ***Youngia***
12 Leaves basal and cauline (plant often beginning with a basal rosette, but by flowering bearing well-developed stem leaves about as large as the basal leaves, the basal rosette often withering prior to flowering and fruiting); corollas yellow, orange, red, blue, pink, white, or lavender.
17 Pappus absent or of scales.
18 Corollas pale blue (rarely pink or white)..... ***Cichorium***
18 Corollas yellow (rarely orange).
19 Stem winged and spiny; leaves spiny-margined; receptacle with paleae..... ***Scolymus***
19 Stem not winged or spiny; leaves not spiny-margined; receptable lacking paleae.
20 Cypselas 1.2-2.8 mm long; heads borne single at the ends of scapiform stems that are unbranched (rarely few-branched near the base); plnats to 7 dm tall..... ***Krigia***
20 Cypselas 3-5 mm long; heads borne in corymbiform or thyrsiform arrays; plants to 15 dm tall ..... ***Lapsana***
17 Pappus of numerous smooth or barbellate bristles.
21
21
Lygodesmia
Crepis
Sonchus
Hieracium
Picris
Prenanthes

Key F

Key G

Acanthospermum Schrank 1820 (Paraguay Bur)

A genus of about 6 species, herbs, of tropical America. References: Strother in FNA (2006c); Cronquist (1980)=SE.

1 Stems prostrate and rooting at the nodes; bur 7-9 mm long, slightly compressed, strongly 5-7-ribbed ..... ***A. australe***
1 Stems erect; bur 2-6 mm long, obviously compressed, obscurely ribbed or 3-ribbed.
2 Leaves (2-) 4-12 (-15) cm long, sessile or subsessile; bur with prickles on all surface ..... ***A. hispidum***
2 Leaves 1-3 (-4.5) cm long, petiolate, the petiole 4-18 mm long; bur unarmed or nearly so on the side faces, the prickles along the ribs and around the tip ..... ***A. humile***

* ***Acanthospermum australe*** (Loefling) Kuntze, Paraguay Bur, Sheep Bur. Cp (FL, GA, NC, SC, VA), Pd (GA, NC, SC), Mt (SC): disturbed areas; common (rare in VA), native of South America. May-November. [= RAB, C, F, FNA, G, K, S, SE, WH]
* ***Acanthospermum hispidum*** A.P. de Candolle, Hispid Starbur. Cp (FL, GA, SC, VA): disturbed areas, soybean and peanut fields, gardens; uncommon, native of n. South America. July-November. First reported from SC by Hill & Horn (1997). [= FNA, K, S, SE, WH]
* ***Acanthospermum humile*** (Swartz) A.P. de Candolle, Low Starbur. Cp (FL, SC): disturbed areas; rare, native of the West Indies. Reported for SC by Nelson (2003). [= FNA, K, S, SE, WH; = *Melampodium humile* Swartz]

Achillea Linnaeus 1753 (Yarrow, Milfoil, Thousand-leaf)

A genus of about 115 species, herbs, primarily Eurasian. References: Ramsey, Robertson, & Husband (2008)=Y; Guo, Ehrendorfer & Samuel (2004); Guo et al. (2005); Cronquist (1980)=SE; Arriagada & Miller (1997)=Z; Trock in FNA (2006a).

1 Leaves pinnately dissected into linear segments; [section *Achillea*]..... ***A. millefolium***
1 Leaves serrate to almost entire; [section *Ptarmica*]..... ***A. ptarmica***

Achillea millefolium Linnaeus, Yarrow, Thousandleaf. Mt (GA, NC, SC, VA, WV), Pd (DE, GA, NC, SC, VA), Cp (DE, FL, GA, NC, SC, VA): grassy balds, roadsides, disturbed areas; common (rare in FL). April-November. Circumboreal (as here broadly treated). A taxonomically very complex entity, with races of different ploidies, and apparently both introduced and native genotypes in e. North America. It would be desirable to treat the variation, but a workable treatment has not yet been produced. Ramsey, Robertson & Husband (2008) have recommended treating native North American races as *A. borealis*, but it is not clear what (if any) eastern North American races are native. [= RAB, FNA, SE; > *A. millefolium* ssp. *millefolium* – C, G; > *A.*

millefolium ssp. *lanulosa* (Nuttall) Piper – C, G, W; > *A. lanulosa* Nuttall – F, Z; > *A. millefolium* – F, Y, Z; > *A. millefolium* var. *millefolium* – K; > *A. millefolium* var. *occidentalis* de Candolle – K; > *A. borealis* Bongard – Y]

* ***Achillea ptarmica*** Linnaeus, Sneezeweed, Sneezewort. Mt (WV): disturbed areas; rare, native of Eurasia. Naturalized south to WV and at scattered sites in PA (Rhoads & Klein 1993). [= C, F, FNA, G, K, Z]

* ***Achillea filipendulina*** Lamarck, Fern-leaf Yarrow. Cp (DE): {habitat}; uncommon. [= FNA, K] {not yet keyed; add to synonymy}

Acmella L.C. Richard ex C.H. Persoon 1807 (Spotflower)

A genus of about 30 species, herbs, primarily of tropical distribution. References: Jansen (1985)=Z; Strother in FNA (2006c); Cronquist (1980)=SE.

1 Leaves linear to lanceolate; petioles 2-4.5 mm long; outer series of phyllaries narrowly to broadly ovate, the apex acute; heads radiate or discoid ..... ***A. pusilla***
1 Leaves narrowly to broadly ovate; petioles (3-) 5-43 mm long; outer series of phyllaries lanceolate, the apex acuminate; heads radiate ..... ***A. repens***

* ***Acmella pusilla*** (Hooker & Arnott) R.K. Jansen, Argentine Spotflower. Cp (FL, GA, NC, SC): lawns, disturbed areas (especially around old seaports); rare, native of South America. May-September. Known from scattered locations in the se. United States (NC, SC, GA, FL), associated with old seaports, such as Wilmington, NC, Savannah, GA, Pensacola and Apalachicola, FL, and perhaps not well-established at some of the reported locations. Reported as naturalized and "locally common" at a site in Chatham County, GA (Carter, Baker, & Morris 2009). [= FNA, K, WH, Z]

Acmella repens (Walter) L.C. Richard in Persoon, Creeping Spotflower. Cp (FL, GA, NC, SC), Pd (NC, SC): floating vegetation mats, roadsides, streambanks, other moist, open, habitats; common (uncommon in GA, rare in NC, SC). July-December. Se. NC south to s. FL, west to e. TX, north in the Mississippi Embayment to w. TN and s. MO. Jansen (1985) treats this as var. *repens* of *A. oppositifolia*, the typic var. *oppositifolia* widely distributed from c. Mexico south through Central America into n. South America, stating that var. *repens* "can be easily separated from var. *oppositifolia* by its lanceolate, acuminate phyllaries and short double hairs on the achene margins." Jansen also states that "four factors have caused extreme difficulties in delimiting taxa at the specific and infraspecific level within this group: very close morphological similarity; polyploidy; hybridization, especially between different ploidy levels; and asexual reproduction." In his more statistical taxonomic analyses, his var. *repens* (tetraploid, and the only taxon out of 39 native to North America) separates rather well from *A. oppositifolia* (diploid, tetraploid, and hexaploid). Given the morphological distinctiveness and substantial allopatry of the two taxa, I prefer not to associate this taxon as a variety of the complex *A. oppositifolia*. [= FNA; = *Spilanthes americana* (Mutis ex Linnaeus f.) Hieronymus var. *repens* (Walter) A.H. Moore – RAB, F; < *Spilanthes americana* – C, G, GW, S, SE; = *Acmella oppositifolia* (Lamarck) R.K. Jansen var. *repens* (Walter) R.K. Jansen – K, WH, Z]

Acroptilon Cassini 1827 (Russian Knapweed)

A monotypic genus, native of Eurasia. References: Keil in FNA (2006a); Susanna & Garcia-Jacas in Kadereit & Jeffrey (2007)=Z.

* *Acroptilon repens* (Linnaeus) de Candolle, Russian Knapweed. Reported for VA (FNA), but there is apparently no documentation for its occurrence there; this serious invasive weed is widespread in western North America, east to OH, KY, and AR. [= FNA, K; = *Centaurea repens* Linnaeus – C, F, G; = *Rhaponticum repens* (Linnaeus) Hidalgo – Z]

Ageratina Spach 1847 (Milk-poison, White Snakeroot)

A genus of about 250-290 species, American. The separation of *Ageratina* from *Eupatorium* is clearly warranted, on morphological, karyological, and molecular grounds. References: Nesom in FNA (2006c); Clewell & Wooten (1971)=Z; Cronquist (1980)=SE. Key based in part on Z and SE.

1 Leaves subcoriaceous in texture; leaves crenate or crenate-serrate; leaf blades 3-7 (-10) cm long, 2-5 cm wide; [primarily of xeric or submesic sites].
  2 Larger leaf blades >5× as long as the petiole; leaf margins crenate; corolla lobes densely long-pubescent; achenes glabrous; [widespread in our area] ..... ***A. aromatica***
  2 Larger leaf blades (1-) 2-4× as long as the petiole; leaf margins crenate, dentate, or incised; corolla lobes glabrous or sparsely short-pubescent; achenes usually short-pubescent, at least near the apex; [of e. GA southward] ..... ***A. jucunda***
1 Leaves membranaceous in texture; leaves serrate or coarsely dentate; leaf blades 6-18 cm long, 3-12 cm wide (at least the larger on a given plant usually more 8 cm long); [primarily of mesic sites].
  3 Leaves delicately membranaceous, coarsely dentate; larger leaf blades 1.0-1.4× as long as the petiole; [of seepage and waterfall splash zones associated with sandstone rockhouses and cliff bases] ..... ***A. luciae-brauniae***
  3 Leaves membranaceous, of a "typical" herbaceous character, coarsely serrate; larger leaf blades 1.4-5× as long as the petiole; [of a wide variety of mesic habitats, especially moist forests and forest openings].

4 Phyllaries mostly 3-5 mm long, acute (to obtuse); heads with (9-) 12-25 flowers; leaves deltoid to ovate (the base generally broadly cuneate); heads arranged in open corymbs; [widespread in our area]..... ***A. altissima*** *var*. ***altissima***
4 Phyllaries mostly 5-7 mm long, cuspidate-acuminate; heads with (15-) 20-34 flowers; leaves generally deltoid (the base generally subcordate or truncate); heads arranged in dense corymbs; [of moderate to high elevation forests and openings, in the Mountains and upper Piedmont] ..... ***A. altissima*** *var* ***roanensis***

Ageratina altissima King & H.E. Robinson *var*. ***altissima***, Common White Snakeroot, Common Milk-poison. Mt (GA, NC, SC, VA, WV), Pd (DE, GA, NC, SC, VA), Cp (DE, FL, GA, NC, SC, VA): moist forests, such as cove forests; common (uncommon in Coastal Plain south of DE). Late July-October. Var. *altissima* ranges from QC west to se. ND, south to Panhandle FL and c. TX. Var. *angustata* (A. Gray) Clewell & Wooten ranges from IL and e. KS south to LA and c. TX. This species has been shown to be the cause of the "milk sickness" of pioneer days; the plants contain a poison which is transmissable to humans through cow milk. [= FNA, K; < *Eupatorium rugosum* Houttuyn – RAB, G, W; = *E. rugosum* Houttuyn var. *rugosum* – C, SE; > *E. rugosum* var. *rugosum* – F; > *E. rugosum* var. *chlorolepis* Fernald – F; > *E. rugosum* var. *tomentellum* (B.L. Robinson) Blake – F; = *Eupatorium urticifolium* Reichard – S; < *A. altissima* var. *altissima* (also see *A. luciae-brauniae*) – WH, Z]

Ageratina altissima King & H.E. Robinson *var*. ***roanensis*** (Small) Clewell & Wooten, Appalachian White Snakeroot, Appalachian Milk-poison. Mt (GA, NC, SC, VA): moist forests, often abundant at high elevations; common. August-October. Endemic to moderate to high elevations of the Southern Appalachians, from nw. VA south to w. SC, n. GA, e. TN, e. KY, and possibly ne. AL. [= FNA, K, Z; < *Eupatorium rugosum* Houttuyn – RAB, G, W; = *Eupatorium rugosum* var. *roanense* (Small) Fernald – C, F, SE; = *Eupatorium roanensis* Small – S]

Ageratina aromatica (Linnaeus) Spach, Small-leaved White Snakeroot, Wild-hoarhound. Cp (DE, FL, GA, NC, SC, VA), Pd (DE, GA, NC, SC, VA), Mt (GA, NC, SC, VA, WV): woodlands and forests, usually xeric, and often fire-maintained, also woodland edges; common (uncommon in Piedmont and Mountains, rare in DE and WV). Late August-October. MA, NY, and OH, south to ne. FL, Panhandle FL, and e. LA (Florida parishes). Two varieties have been delineated, both of them occurring in our area. Var. *incisa* (A. Gray) C.F. Reed is described as differing from var. *aromatica* in having the leaves cuneate (vs. truncate to rounded), acuminate (vs. acute), sharply toothed (vs. bluntly toothed, thin in texture (vs. thick), and the petioles slender and 0.5-2 cm long (vs. less slender and 0.1-1.5 cm). It is supposed to be Southeastern in range, from se. VA south to FL, on the Coastal Plain. The validity of this variety needs further assessment. [= FNA, WH, Z; = *Eupatorium aromaticum* Linnaeus – RAB, C, G, SE, W; > *Eupatorium aromaticum* var. *aromaticum* – F; > *Eupatorium aromaticum* var. *incisum* A. Gray – F; > *A. aromatica* var. *aromatica* – K; > *A. aromatica* var. *incisa* (Gray) C.F. Reed – K; > *Eupatorium latidens* Small – S; > *Eupatorium aromaticum* Linnaeus – S]

Ageratina jucunda (Greene) Clewell & Wooten, Hammock Snakeroot. Cp (FL, GA): sandhills, dry pinelands, and subxeric hardwood hammocks; common (uncommon in GA). Se. GA south to s. FL, west to e. Panhandle FL. [= FNA, K, WH, Z; = *Eupatorium jucundum* Greene – S, SE]

Ageratina luciae-brauniae (Fernald) King & H.E. Robinson, Rockhouse White Snakeroot. Mt (KY, TN): sandstone rockhouses, at the base of sandstone cliffs (usually overhanging) in seepage or splash; rare. Endemic to the Cumberland Plateau of ne. TN (Chester, Wofford, & Kral 1997) and se. KY. Although considered by Clewell & Wooten (1971) as mere aberrant plants, Wofford (1976) determined that *A. luciae-brauniae* is a species. [= FNA, K; = *Eupatorium luciae-brauniae* Fernald – C, F, G, SE; < *A. altissima* var. *altissima* – Z]

Ageratum Linnaeus 1753 (Ageratum, Flossflower, Pussyfoot)

A genus of about 44 species, herbs, of tropical America. References: Nesom in FNA (2006c); Cronquist (1980)=SE. Key based in part on SE.

1 Peduncles with short and long non-glandular hairs; phyllaries glabrous to sparsely pubescent with non-glandular hairs..... ***A. conyzoides***
1 Peduncles with shrt and long hairs, many of them glandular; phyllaries stipitate-glandular and sparsely pubescent with non-glandular hairs..... ***A. houstonianum***

* ***Ageratum conyzoides*** Linnaeus, Ageratum. Cp (NC): disturbed areas; rare, apparently native of South America. July-August. [= FNA, K, S, SE, WH]

* ***Ageratum houstonianum*** P. Miller, Ageratum. Cp (NC, SC): disturbed areas; rare, apparently native of se. Mexico and Central America. July-August. [= FNA, K, S, SE, WH]

Amblyolepis A.P. de Candolle 1836 (Huisache-daisy)

A monotypic genus, an annual herb, native of Texas and n. Mexico. References: Bierner in FNA (2006c).

* ***Amblyolepis setigera*** A.P. de Candolle, Huisache-daisy. Cp (SC): wool-combing mill waif (Nesom 2004d); rare, native of TX and n. Mexico. [= FNA, K]

Ambrosia Linnaeus 1753 (Ragweed)

A genus of about 43 species, herbs, cosmopolitan. References: Cronquist (1980)=SE; Strother in FNA (2006c).

1 Leaves either undivided, with 2 lateral teeth, or palmately 3-5-lobed.
2 Leaves sessile to clasping, 2.5-7 cm long, undivided, with 2 teeth near the base ..... ***A. bidentata***
2 Leaves petiolate, 7-30 cm long, (1-) 3 (-5) lobed..... ***A. trifida*** *var.* ***trifida***
1 Leaves 1- to 2-pinnatifid.
3 Annual, with fibrous roots; fruiting involucre with short, sharp spines ..... ***A. artemisiifolia***
3 Perennial, with deep-seated, creeping roots; fruiting involucre with bumps..... ***A. psilostachya***

Ambrosia artemisiifolia Linnaeus. Mt (GA, NC, SC, VA, WV), Pd (DE, GA, NC, SC, VA), Cp (DE, FL, GA, NC, SC, VA): roadsides, gardens, disturbed soils, thin soils on rock outcrops; common. August-November. NL (Newfoundland), Nunuvut, and BC south to FL, TX, CA and southward. [= RAB, C, FNA, G, SE; > *A. artemisiifolia* Linnaeus var. *elatior* (Linnaeus) Descourtils – F, K; > *A. artemisiifolia* Linnaeus var. *paniculata* (Michaux) Blank – F, K; > *A. artemisiifolia* Linnaeus var. *artemisiifolia* – F, K; > *A. elatior* Linnaeus – S; > *A. monophylla* (Walter) Rydberg – S; > *A. glandulosa* Scheele – S]

Ambrosia bidentata Michaux. Pd (VA), Mt (GA, NC, WV); {SC}: mafic woodlands; uncommon (rare in WV). August-November. CT, NY, and MN south to Panhandle FL and TX. Widely scattered throughout TN, east to e. TN (Chester, Wofford, & Kral 1997) and in nw. GA (Jones & Coile 1988). [= RAB, C, FNA, G, K, S, SE]

Ambrosia psilostachya A.P. de Candolle, Perennial Ragweed. Cp (FL, GA, NC, SC), Pd (VA): loamy sandy soil of flats and slight depressions in periodically burned longleaf pine uplands, also in disturbed areas; uncommon. September-November. MI west to MT, south to LA and NM; also scattered along eastern seaboard states (ME, NH, NY, NC, SC, GA, FL), where perhaps some of the distribution is adventive. Apparently first collected in VA in 2000. [= C, FNA, G, K, SE, WH; > *A. psilostachya* – RAB; > *A. rugelii* Rydberg – RAB, S; > *A. psilostachya* var. *coronopifolia* (Torrey & Gray) Farwell – F]

Ambrosia sp. 1, Glade Ragweed. Under investigation by P. McMillan and colleagues at CLEMS. {not yet keyed}

Ambrosia trifida Linnaeus *var.* ***trifida***. Mt (GA, NC, SC, VA, WV), Pd (DE, GA, NC, SC, VA), Cp (DE, FL, GA, NC, SC, VA): floodplains, moist pastures; disturbed ground; common (uncommon in VA Coastal Plain, rare in Coastal Plain south of VA). July-November. NS and BC south to n. peninsular FL, Panhandle FL, TX, and CA. [= C, F, G; < *A. trifida* var. *trifida* – K; < *A. trifida* – RAB, FNA, SE; = *A. trifida* – S]

Ampelaster Nesom 1995 (Climbing-aster)

A monotypic genus, a vining shrub, of se. North America. References: Semple in FNA (2006b); Nesom (2000b); Nesom (1994)=X; Cronquist (1980)=SE.

Ampelaster carolinianus (Walter) Nesom, Climbing Aster. Cp (FL, GA, NC, SC): swamps, thickets, marshes, streambanks; common (uncommon in GA and SC, rare in NC). Late September-October. Se. NC south to s. FL. Grown horticulturally. [= FNA, K, X; = *Aster carolinianus* Walter – RAB, GW, S, SE; = *Virgulus carolinianus* (Walter) Reveal & Keener; = *Symphyotrichum carolinianum* (Walter) Wunderlin & B.F. Hansen – WH]

Amphiachyris (A.P. de Candolle) Nuttall 1840 (Broomweed)

A genus of 2 species, herbs, of sc. North America. References: Nesom in FNA (2006b); Nesom (2000b); Cronquist (1980)=SE.

* ***Amphiachyris dracunculoides*** (A.P. de Candolle) Nuttall, Prairie Broomweed, Broom Snakeroot. Mt (VA), Cp (SC): disturbed areas over calcareous rocks, wool-combing mill waif (Nesom 2004d); rare, presumably adventive from further west. August-September. This species is common and weedy in disturbed cedar glade habitats in the Nashville Basin of c. TN, where apparently native (Chester, Wofford, & Kral 1997). [= FNA, K, S; = *Gutierrezia dracunculoides* (A.P. de Candolle) Blake – F, G, SE; = *Xanthocephalum dracunculoides* (A.P. de Candolle) Shinners]

Anaphalis A.P. de Candolle 1838 (Pearly-everlasting)

A genus of about 35 to 110 species, herbs, of tropical and temperate areas, with a center of diversity in Asia. References: Nesom in FNA (2006a); Arriagada (1998)=Z; Cronquist (1980)=SE.

Anaphalis margaritacea (Linnaeus) Bentham & Hooker f., Pearly-everlasting. Mt (NC*, VA, WV), Pd (DE, VA): dry open places, probably persistent from cultivation in NC, seemingly native in DE and VA; uncommon (rare in DE, NC, and VA). July-September. Interruptedly circumboreal, in North America from NL (Labrador) and NL (Newfoundland) west to AK, south to NC, TN, OK, TX, NM, CA, and Baja California. Very abundant and weedy in large parts of n. and w. North America, sometimes grown for ornament (especially dried arrangements) in our area. [= C, FNA, G, K, S, SE, W, Z; > *A. margaritacea* var. *angustior* (Miquel) Nakai – F; > *A. margaritacea* var. *intercedens* Hara – F]

Antennaria Gaertner 1791 (Pussytoes)

A genus of about 70 species, herbs, of temperate and subtropical areas. Of our species, *A. neglecta*, *A. solitaria*, *A. virginica*, and *A. plantaginifolia* are sexual diploids. *A. parlinii* is of multiple hybrid origin, includes sexual and asexual populations, and is derived from *A. plantaginifolia*, *A. solitaria*, and *A. racemosa*. *A. howellii* is strictly asexual, and is derived from *A. plantaginifolia*, *A. racemosa*, *A. virginica*, and *A. neglecta* (Bayer 1985). For reasons discussed in Bayer & Stebbins (1982) and parallel to those applied in this work to allopolyploid taxa in *Eupatorium*, the treatment of Bayer (1985) and Bayer & Stebbins (1993, 1982) is preferable to Cronquist's treatments, used in most of the floras covering or approaching our area. Much remains to be learned about the relative habitats and distributions of the various taxa in our area. References: Bayer in FNA (2006a); Bayer & Stebbins (1993)=Z; Bayer & Stebbins (1982)=Y; Arriagada (1998)=X; Cronquist (1980)=SE; Bayer (1985); Bayer & Stebbins (1987); Bayer (1984). Key closely adapted from Z, Y.

1 Flowering stalks with 1 head.....***A. solitaria***
1 Flowering stalks with 2 or more heads.
2 Basal leaves prominently 3-5 (-7)-nerved, mostly > 1.5 cm wide.
3 Pistillate involucres 5-7 mm high; pistillate corollas 3-4 mm high; staminate corollas 2-3.5 mm high; basal leaves tomentose on the upper surface; young stolons mostly ascending; staminate and pistillate plants equally common .....***A. plantaginifolia***
3 Pistillate involucres 7-10 mm high; pistillate corollas 4-7 mm high; staminate corollas 3.5-5 mm high; basal leaves tomentose or glabrous on the upper surface; young stolons mostly decumbent; sexual and apomictic populations present.
4 Basal leaves tomentose on the upper surface (becoming glabrate in age); summit of young cauline stem usually glandless..... ..... ***A. parlinii*** *ssp.* ***fallax***
4 Basal leaves glabrous or nearly so on the upper surface (even when young); summit of young cauline stem usually with purple glandular hairs.....***A. parlinii*** *ssp.* ***parlinii***
2 Basal leaves prominently 1-nerved (sometimes with 2 additional obscure veins), mostly < 1.5 cm wide.
5 Young and mature basal leaves glabrous on the upper surface; phyllary tips whitish; flags (flat scarious appendages similar to the tips of phyllaries on the tip of the leaf) present on the upper cauline leaves; species apomictic, populations consisting of pistillate plants only ... .***A. howellii*** *ssp.* ***canadensis***
5 Young basal leaves pubescent on the upper surface, mature leaves either remaining pubescent or becoming glabrous with age; phyllary tips white, ivory, to light brown; flags present or absent on the upper cauline leaves; species apomictic or sexual.
6 Largest basal leaves < 6.0 mm wide and < 20 mm long; pistillate involucres 4.5-7 mm high; species sexual, populations consisting of both pistillate and staminate plants; [of shale barrens from w. VA northward and westward].....***A. virginica***
6 Largest basal leaves > 6.0 mm wide and > 20 mm long; pistillate involucres 7-10 mm high; species apomictic or sexual; [collectively of various habitats and more widespread].
7 Middle and upper cauline leaves tipped with flags; mature basal leaves glabrous, young basal leaves pubescent, glabrescent with age; species sexual, populations consisting of both pistillate and staminate plants.....***A. neglecta***
7 Middle and upper cauline leaves blunt or with subulate tips (only those leaves immediately around the corymb with flags); mature and young basal leaves pubescent; species apomictic, populations consisting of pistillate plants only.
8 Basal leaves spatulate, with a distinct petiole; stolons mostly 5-8 cm long, with leaves along the stolon almost equal in size to those of the terminal rosette.....***A. howellii*** *ssp.* ***neodioica***
8 Basal leaves oblanceolate, lacking a distinct petiole; stolons mostly 8-12 cm long, with leaves along the stolon smaller than those of the terminal rosette.....***A. howellii*** *ssp.* ***petaloidea***

Antennaria howellii Greene *ssp.* ***canadensis*** (Greene) Bayer. Mt (VA): dry woodlands; rare? NL (Newfoundland) wet to YT, south to VA, WV, OH, IN, and MN. [= FNA, K, Z; = *A. neglecta* Greene var. *canadensis* (Greene) Cronquist – C; = *A. canadensis* Greene – F; = *A. neglecta* Greene var. *randii* (Fernald) Cronquist – G, SE; = *A. neodioica* Greene ssp. *canadensis* (Greene) Bayer & Stebbins – Y]

Antennaria howellii Greene *ssp.* ***neodioica*** (Greene) Bayer. Mt (NC, VA, WV), Pd (DE, NC, VA), Cp (DE): dry woodlands and rock outcrops; common (uncommon in WV). NL (Newfoundland) west to North West Territory, south to NC, TN, KS, CO, and OR. [= FNA, K, Z; = *A. neglecta* Greene var. *neodioica* (Greene) Cronquist – C; > *A. neodioica* Greene var. *neodioica* – F; > *A. neodioica* Greene var. *attenuata* Fernald – F; = *A. neglecta* Greene var. *attenuata* (Fernald) Cronquist – G, SE; = *A. neodioica* Greene ssp. *neodioica* – Y]

Antennaria howellii Greene *ssp.* ***petaloidea*** (Fernald) Bayer, Field Pussytoes. Mt (NC, VA, WV), Pd (VA): dry woodlands; rare. March-May. NL (Newfoundland) west to BC, south to NC, WV, IN, IL, CO, and OR. [= FNA, K, Z; = *A. neglecta* Greene var. *petaloidea* (Fernald) Cronquist) – C; = *A. petaloidea* Fernald var. *petaloidea* – F; < *A. neglecta* Greene var. *neglecta* – G, SE; = *A. neodioca* Greene ssp. *petaloidea* (Fernald) Bayer & Stebbins – W]

Antennaria neglecta Greene, Field Pussytoes. Pd (DE, NC, VA), Mt (VA, WV), Cp (DE): dry woodlands and fields; (uncommon in NC, VA, and WV). NS west to NT, south to VA, KY, AR, OK, and CO. *A. neglecta* is a sexual diploid ancestor of the *A. howellii* complex (FNA). [= F, FNA, K, X, Y, Z; = *A. neglecta* var. *neglecta* – C; < *A. neglecta* Greene var. *neglecta* – G, SE]

Antennaria parlinii Fernald *ssp.* ***fallax*** (Greene) Bayer & Stebbins, Big-head Pussytoes. Pd (DE, NC, VA), Cp (DE, NC, VA), Mt (NC, VA, WV), {GA, SC}: dry woodlands; common. Late March-early May. NS west to MN, south to GA, AL, MS, LA, and TX. [= FNA, K, X, Z; = *A. plantaginifolia* (Linnaeus) Richardson var. *ambigens* (Greene) Cronquist – RAB, C, G, SE; = *A. fallax* Greene var. *calophylla* (Greene) Fernald – F; > *A. calophylla* Greene – S; > *A. fallax* Greene – S; < *A. parlinii* – W]

Antennaria parlinii Fernald *ssp.* ***parlinii***, Parlin's Pussytoes. Mt (NC, VA, WV), Pd (DE, NC, VA), Cp (DE, NC, VA), {GA}: woodlands, roadbanks; common. Late March-early May. NS west to SK, south to GA, AL, MS, LA, and TX. [= FNA, K, X, Z; = *A. plantaginifolia* (Linnaeus) Richardson var. *arnoglossa* (Greene) Cronquist – RAB, G, SE; = *A. plantaginifolia* var. *parlinii* (Fernald) Cronquist – C; > *A. parlinii* Fernald var. *parlinii* – F; > *A. parlinii* var. *arnoglossa* (Greene) Fernald – F; < *A. parlinii* – W]

Antennaria plantaginifolia (Linnaeus) Richardson, Plantain Pussytoes. Pd (DE, GA, NC, SC, VA), Mt (GA, NC, SC, VA, WV), Cp (DE, FL, GA, NC, SC, VA): dry woodlands; common (rare in FL). Late March-early May. NS west to SK, south to FL, AL, MS, AR, and OK. *A. plantaginifolia* is a sexual diploid ancestor of the *A. howellii* complex (FNA). [= FNA, K, W, X, Z,

WH; = *A. plantaginifolia* var. *plantaginifolia* – RAB, C, G, SE; > *A. plantaginifolia* var. *plantaginifolia* – F; > *A. plantaginifolia* var. *petiolata* (Fernald) Heller – F; > *A. plantaginifolia* – S; > *A. caroliniana* Rydberg – S; > *A. plantaginifolia* – S]

Antennaria solitaria Rydberg, Southern Single-head Pussytoes. Mt (NC, VA), Pd (NC, VA), Cp (NC, VA), {GA, SC}: forests and woodlands, often mesic; common (uncommon in NC and VA). Late March-early May. VA, WV, sw. PA, and s. IN south to GA, LA, and OK. *A. solitaria* is a sexual diploid ancestor of the *A. parlinii* complex (FNA). [= RAB, C, F, FNA, G, K, S, SE, W, X, Z]

Antennaria virginica Stebbins, Shale-barren Pussytoes. Mt (VA, WV), Pd (VA): shale barrens and other dry, rocky habitats; uncommon. C. PA and w. VA west to OH. *A. virginica* is a sexual diploid (and tetraploid) ancestor of the *A. howellii* complex (FNA). [= C, FNA, K, W, Y, Z; > *A. virginica* var. *virginica* – F; > *A. virginica* var. *argillicola* Stebbins – F; = *A. neglecta* Greene var. *argillicola* (Stebbins) Cronquist – G, SE]

Anthemis Linnaeus 1753 (Chamomille)

A genus of about 175-210 species, herbs, mainly Eurasian. References: Watson in FNA (2006a); Cronquist (1980)=SE; Arriagada & Miller (1997)=Z. Key adapted from C. [also see *Chamaemelum, Cota*]

1 Rays yellow ..... ***[see Cota tinctoria]***
1 Rays white.
  2 Rays sterile and usually neutral; receptacle chaffy only toward the middle ..... ***A. cotula***
  2 Rays pistillate and fertile; receptacle chaffy throughout.
    3 Achenes not tuberculate; leaves not glandular-punctate beneath ..... ***A. arvensis***
    3 Achenes tuberculate; leaves glandular-punctate beneath ..... ***[A. secundiramea]***

* ***Anthemis arvensis*** Linnaeus, Corn Chamomille. Mt (GA, NC, SC, VA, WV), Pd (DE, GA, NC, SC, VA), Cp (DE, FL, GA, NC, SC, VA): roadsides, disturbed areas; common (uncommon in DE, rare in FL), native of Europe. Late April-July. Var. *agrestis* differs from var. *arvensis* in having chaff shorter than the disk flowers; both varieties apparently occur in our area. [= RAB, C, FNA, G, S, SE, W, WH, Z; > *A. arvensis* var. *arvensis* – F, K; > *A. arvensis* var. *agrestis* (Wallroth) A.P. de Candolle – F, K]

* ***Anthemis cotula*** Linnaeus, Mayweed, Stinking Chamomille, Mayweed, Dog-fennel. Mt (GA, NC, SC, VA, WV), Pd (DE, GA, NC, SC, VA), Cp (DE, FL, GA, NC, SC, VA): roadsides, disturbed areas; common (uncommon in GA, NC, SC, VA, rare in FL), native of Eurasia. May-July. [= RAB, C, F, FNA, G, K, SE, W, WH, Z; = *Maruta cotula* (Linnaeus) A.P. de Candolle – S]

* *Anthemis secundiramea* Bivona-Bernardi. Cp (VA): railroad embankment; rare, native of Mediterranean Europe, probably merely a waif and not established. [= C, F, FNA, K, SE]

Aphanostephus A.P. de Candolle 1836 (Doze-daisy)

A genus of 4 species, of s. United States and Mexico. References: Nesom in FNA (2006b).

Aphanostephus skirrhobasis (Alphonse deCandolle) Trelease *var.* ***thallasius*** Shinners, Dune Doze-daisy. Cp (FL): dunes, disturbed coastal sands; rare. S. LA west to coastal TX and Tamaulipas; scattered in n. FL, both Panhandle FL (Bay and Escambia counties) and ne. FL (St. Johns County) (Wunderlin & Hansen 2004). [= FNA, K, SE, WH; = *A. skirrobasis* – S, orthographic variant]

Arctium Linnaeus 1753 (Burdock)

A genus of about 11 species (though circumscription remains uncertain), herbs, of the temperate Old World. References: Keil in FNA (2006a); Cronquist (1980)=SE; Duistermaat (1996)=Z.

1 Inner phyllaries constricted above the middle, widened toward the truncate (or rarely acuminate) apex ..... ***[A. tomentosum]***
1 Inner phyllaries never constricted above the middle, gradually narrowing toward the acute to acuminate apex.
  2 Petiole of the basal leaves solid; heads in the upper part of the inflorescence on peduncles > 2.5 cm long; heads corymbosely arranged on the main branches ..... ***A. lappa***
  2 Petiole of the basal leaves hollow (at least toward its base); heads in the upper party of the inflorescence on peduncles < 2 cm long; heads racemosely arranged on the main branches.
    3 Heads 1.1-2.4 cm in diameter; heads on terminal branches sessile or pedunculate; middle phyllaries < 1.8 mm wide; corolla with glandular hairs ..... ***A. minus***
    3 Heads 1.9-2.9 cm in diameter; heads on terminal branches sessile; middle phyllaries (1.6-) 1.7-2.5 mm wide; corolla glabrous ..... ***[A. nemorosum]***

* ***Arctium lappa*** Linnaeus, Great Burdock. Pd (DE), Cp (DE), Mt (NC): fields and roadsides; common (uncommon in DE Coastal Plain, rare in NC), native of Eurasia. July-November. [= RAB, C, F, FNA, G, K, SE, Z]

* ***Arctium minus*** Bernhardi, Common Burdock. Mt (GA, NC, SC, VA, WV), Pd (DE, NC, SC, VA), Cp (DE, SC, VA): pastures, barnyards, roadsides, other disturbed areas; common (uncommon in Piedmont south of DE, uncommon in Coastal Plain south of DE), native of Eurasia. Late June-November. [= RAB, C, F, FNA, K, S, SE, W, Z; < *A. minus* – G; = *A. minus* ssp. *minus*]

* *Arctium nemorosum* Lejeune & Courtois. Reported for VA by Kartesz (1999) on the basis of Fernald (1950); it is probable that this record is a misidentification. [= C, F, FNA, Z; < *A. minus* – G; = *A. vulgare* (Hill) Evans – K; = *A. minus* Bernhardi ssp. *nemorosum* (Lejeune & Courtois) Syme]

* *Arctium tomentosum* P. Miller, Cotton Burdock. Material purporting to be this taxon from Union County, SC, and the basis of its occurrence in that state, is actually a pubescent form of *A. minus*. May-November. [= C, F, FNA, G, K, SE, Z; = *A. nemorosum* Lejeune & Courtois – RAB, misapplied]

Arctotis Linnaeus 1753 (African-daisy, Arctotis)

A genus of about 60 species, annual and perennial herbs, native of South Africa. References: Norlindh (1965)=Z; Mahoney in FNA (2006a); McKenzie et al. (2006).

* ***Arctotis venusta*** T. Norlindh, Blue-eyed African-daisy, Silver Arctotis. Cp (SC): disturbed areas; rare, native of s. Africa. [= Z; < *Arctotis stoechadifolia* P.J. Bergius – FNA, K]

Arnica Linnaeus 1753 (Arnica)

A genus of about 29-32 species, perennial herbs, north temperate, boreal, and arctic. References: Wolf in FNA (2006c); Cronquist (1980)=SE.

Arnica acaulis (Walter) Britton, Sterns, & Poggenburg, Leopard's-bane, Southeastern Arnica. Cp (DE, FL, GA, NC, SC, VA), Pd (GA, NC, SC, VA): pine savannas, sandhills, clayey or sandy woodlands, powerline rights-of-way, roadbanks; common (rare in DE and FL). Late March-early June. DE (historical) and se. PA (where on serpentine) south to Panhandle FL, on the Coastal Plain and lower Piedmont. [= RAB, C, F, FNA, G, GW, K, S, SE; = *Doronicum acaule* Walter]

Arnoglossum Rafinesque 1817 (Indian-plantain)

A genus of about 8 species, herbs, of e. North America. References: Anderson in FNA (2006b); Cronquist (1980)=SE; Anderson (1998)=Z; Barkley (1999)=Y; Kral & Godfrey (1958)=X; Ward (2004c)=Q; Harper (1905)=V; Pippen (1978)=U; Robinson (1974).

1 Larger leaves palmately veined, cordate at the base, either strongly toothed or lobed.
  2 Leaves glaucous beneath; stem glaucous and terete (or slightly striate) ..... ***A. atriplicifolium***
  2 Leaves green beneath; stem green and conspicuously grooved ..... ***A. reniforme***
1 Larger leaves parallel-veined (the primary veins parallel and converging toward the leaf apex), lanceolate to elliptic-lanceolate, cuneate at the base, entire to remotely toothed (usually fewer than 10 teeth per leaf).
  3 Phyllaries not wing-keeled; stem terete.
    4 Basal and lower cauline leaves linear to lanceolate, green to slightly glaucous below; plants 0.5-2.5 m tall; [usually of pine savannas, se. NC south to s. FL, west to e. TX] ..... ***A. ovatum*** *var.* ***lanceolatum***
    4 Basal and lower cauline leaves ovate to ovate-lanceolate, glaucous beneath; plants 1.5-2.5 m tall; [usually of shaded, moist to bottomland habitats, e. GA west to e. LA] ..... ***A. ovatum*** *var.* ***ovatum***
  3 Phyllaries wing-keeled; stem strongly angled or sulcate.
    5 Basal and low-cauline leaves truncate or subcordate at the base; larger leaves irregularly angulate-lobed or toothed, often somewhat hastate at the base; corolla usually pale lavender ..... ***A. diversifolium***
    5 Basal and low-cauline leaves cuneate at the base; larger leaves entire, crenate, sinuate, but not lobed or hastate; corolla creamy yellow (or greenish or tinged with pink).
      6 Phyllary wings highest towards the base; phyllary wings chalky white, erose; leaves with main lateral veins running with the midrib for 2-4 cm into the blade before diverging; [of FL Panhandle] ..... ***A. album***
      6 Phyllary wings uniform or highest towards the tip; phyllary wings pale green, entire; leaves with main lateral veins diverging from the midrib at or very near the base of the blade, not concurrent; [collectively more widespread].
        7 Involucres 12-15 mm high; corollas (9-) 11-12 mm long ..... ***A. floridanum***
        7 Involucres 8-14 mm high; corollas 7-11.5 mm long.
          8 Involucres (9.5-) 10-12 (-14) mm high; corollas 8-10 (-11.5) mm long; leaves usually with 7-9 main parallel veins; mid-stem leaves petiolate, with rounded bases) ..... ***[A. plantagineum]***
          8 Involucres (8-) 9.5-10 (-12) mm high; corollas 6-8 (-9.5) mm long; leaves usually with 3-5 main parallel veins; mid-stem leaves sessile, with broadly cuneate bases ..... ***A. sulcatum***

Arnoglossum album L.C. Anderson. Cp (FL): wet pine savannas; rare. Endemic to FL Panhandle (Bay and Gulf counties). [= FNA, K, WH, Z]

Arnoglossum atriplicifolium (Linnaeus) H.E. Robinson, Pale Indian-plantain. Mt (GA, NC, SC, VA, WV), Pd (DE, GA, NC, SC, VA), Cp (DE, FL, GA, NC, SC, VA): mesic forests, woodland edges, clearings; common (rare in DE and FL). June-October. NY, MN, and NE south to Panhandle FL and LA (attribution to MA is in error, A.Haines, pers.comm.). [= FNA, K, WH, Y, Z; = *Cacalia atriplicifolia* Linnaeus – RAB, C, F, G, SE, U, W; = *Mesadenia atriplicifolia* (Linnaeus) Rafinesque – S]

Arnoglossum diversifolium (Torrey & A. Gray) H.E. Robinson, Variable-leaf Indian-plantain. Cp (AL, FL, GA): calcareous swamps; rare. Sw. GA and Panhandle FL, west to s. AL; disjunct in nw. peninsular FL. May-August; July-September. [= FNA, GW, K, WH, Y, Z; = *Mesadenia diversifolia* (Torrey & A. Gray) Greene – S; = *Cacalia diversifolia* Torrey & A. Gray – SE, U, X]

Arnoglossum floridanum (A. Gray) H.E. Robinson. Cp (FL): sandhills; uncommon. Ne. FL and e. FL Panhandle south to c. peninsular FL. [= FNA, K, WH, Z; = *Cacalia floridana* A. Gray – SE, U, X; = *Mesadenia floridana* (A. Gray) Greene – S]

Arnoglossum ovatum (Walter) H.E. Robinson *var.* ***lanceolatum*** (Nuttall) D.B. Ward, Savanna Indian-plantain. Cp (FL, GA, NC, SC): wet savannas, especially over coquina limestone ("marl"); rare. Late July-October. Se. NC to s. FL, west to e. TX. [= Q; < *Arnoglossum ovatum* – FNA, GW, K, WH, Y, Z; = *Cacalia lanceolata* Nuttall – RAB; < *Cacalia ovata* Walter – SE, U; = *Mesadenia lanceolata* (Nuttall) Rafinesque – S; > *Mesadenia lanceolata* var. *lanceolata* – V; > *Mesadenia lanceolata* var. *virescens* Harper – V; = *Cacalia lanceolata* var. *lanceolata* – X]

Arnoglossum ovatum (Walter) H.E. Robinson *var.* ***ovatum***, Broadleaf Indian-plantain. Cp (FL, GA), Pd (GA): bottomlands, bay forests, moist or wet forests; uncommon. Late July-October. E. GA west to e. LA. The division of *A. ovatum* into two taxa (species or, as done here, varieties) needs additional study. [= Q; < *Arnoglossum ovatum* – FNA, GW, K, WH, Y, Z; < *Cacalia ovata* Walter – SE, U; > *Mesadenia elliottii* R.M. Harper – S; > *Mesadenia maxima* R.M. Harper – S; = *Cacalia lanceolata* var. *elliottii* (Shinners) Kral & Godfrey – X]

Arnoglossum reniforme (Hooker) H.E. Robinson, Great Indian-plantain. Mt (GA, NC, VA, WV): cove forests, other mesic forests; common (uncommon in WV, rare in VA). June-October. The very large, reniform leaves (sometimes up to 80 cm across) are conspicuous in rich cove forests. PA and MN, south to GA, MS, and OK. [= FNA, Y, Z; = *Arnoglossum muehlenbergii* (Schultz 'Bipontinus') H.E. Robinson – K; = *Cacalia muhlenbergii* (Schultz 'Bipontinus') Fernald – RAB, C, F, G, SE, U, V, W; = *Mesadenia reniformis* (Hooker) Rafinesque – S]

Arnoglossum sulcatum (Fernald) H.E. Robinson, Grooved-stem Indian-plantain. Cp (GA): bottomland forests; uncommon (rare in GA). Sw. GA and Panhandle FL west to s. AL. [= FNA, GW, K, Y, WH, Z; = *Mesadenia sulcata* (Fernald) Harper – S; = *Cacalia sulcata* Fernald – SE, U, X]

Arnoglossum plantagineum Rafinesque. Reported for sc. SC, in the unpublished flora of the Savannah River Site by Batson, Angerman, and Jones. It is known definitely from the Nashville Basin of c. TN (Chester, Wofford, & Kral 1997), AL, MS, LA, and KY. [= FNA, K, Y, Z; = *Cacalia tuberosa* Nuttall – G; = *Mesadenia tuberosa* (Nuttall) Britton – S; = *Cacalia plantaginea* (Rafinesque) Shinners – SE, U]

Artemisia Linnaeus 1753 (Wormwood, Mugwort, Sage)

If defined (as here) to include the segregate genus *Seriphidium*, a genus of about 500 species, shrubs and herbs, north temperate, boreal, and arctic. References: Shulz in FNA (2006a); Ling Yeou-Ruenn (1995)=Z; Cronquist (1980)=SE; Arriagada & Miller (1997)=Y. Key based primarily on C.

1 Disk flowers sterile, with abortive ovaries; plant not aromatic when fresh; [subgenus *Dracunculus*] ..... ***A. caudata***
1 Disk flowers fertile, with normal ovaries; plant variously aromatic or not when fresh.
  2 Receptacle bearing dense long hairs between the flowers; plant strongly aromatic when fresh; [subgenus *Absinthium*] ..... ***A. absinthium***
  2 Receptacle not pubescent; plant variously aromatic or not when fresh; [subgenus *Artemisia*].
    3 Leaves green, essentially glabrous on the lower surface; annuals or biennials from a taproot; plants lacking nonflowering shoots.
      4 Inflorescence obviously paniculate, the branches evident, the heads on slender peduncles; involucres 1-2 mm high and 1-2 mm wide; fresh plants sweet-aromatic ..... ***A. annua***
      4 Inflorescence spike-like, the heads crowded and hiding the branches; involucres 2-3 mm high, 2-3 mm wide; fresh plants not aromatic..... ***A. biennis*** *var.* ***biennis***
    3 Leaves tomentose on the lower surface, densely so in many species; perennials from a branched rhizome or woody caudex; plants with nonflowering shoots.
      5 Principal leaves 2-3-pinnatifid, the terminal segments < 1.5 mm wide; plant a shrub or suffrutescent herb.
        6 Leaves green above, 3-6 cm long..... ***A. abrotanum***
        6 Leaves white-tomentose above, 1-3 cm long..... ***A. pontica***
      5 Principal leaves entire to 2-pinnatifid, the terminal segments > 2 mm wide; plant an herb (sometimes somewhat woody at the base).
        7 Involucres 6-10 mm high; disk corollas 3.2-4 mm long..... ***A. stelleriana***
        7 Involucres 2.5-5 mm high; disk corollas 1-3 mm long.
          8 Leaves entire to 1-pinnatifid; leaves lacking stipule-like lobes at the base..... ***A. ludoviciana***
          8 Leaves 2-pinnatifid; leaves with 1-2 stipule-like lobes at the base ..... ***A. vulgaris***

* ***Artemisia abrotanum*** Linnaeus, Southernwood, Lad's Love, Old Man. Pd (DE, NC?), Cp (DE, VA), {SC}: disturbed areas; rare, native of Eurasia. August-September. Also reported as a waif in e. VA (Reed 1964). [= C, F, FNA, G, K, S, SE, Y, Z]

* ***Artemisia absinthium*** Linnaeus, Common Wormwood, Absinthium. Pd? (NC), {SC}: disturbed areas; rare, native of Europe. July-September. [= C, F, FNA, G, K, S, SE, Y, Z; > *A. absinthium* var. *insipida* Stechmann]

* ***Artemisia annua*** Linnaeus, Sweet Annie, Sweet Wormwood, Annual Mugwort. Cp (DE, SC, VA), Pd (DE, VA), Mt (VA, WV), {NC?}: roadsides, disturbed areas, waste areas around wool-combing mills (Nesom 2004d); common (uncommon in NC, SC, VA, and WV), native of Asia and e. Europe. August-November. [= C, F, FNA, G, K, S, SE, Y, Z]

* ***Artemisia biennis*** Willdenow *var.* ***biennis***, Biennial Wormwood. Cp (DE, SC), Pd (DE), Mt (WV): disturbed areas, waste area around wool-combing mills; rare, native of the w. United States. Reported for SC by Nesom (2004d); also reported to be naturalized as far east as TN and WV (Hardy County). [= C, K; < *A. biennis* – F, FNA] {synonymy incomplete}

* ***Artemisia caudata*** Michaux. Cp (SC): sandy woodlands; rare, presumably introduced from western United States. September-October. [= RAB, S, Z; = *A. campestris* Linnaeus ssp. *caudata* (Michaux) H.M. Hall & Clements – FNA, K, SE, WH, Y; > *A. caudata* var. *caudata* – F; > *A. caudata* var. *calvens* Lunell – F; = *Oligosporus caudatus* (Michaux) Poljakov; = *Oligosporus campestris* (Linnaeus) Cassini ssp. *caudatus* (Michaux) W.A. Weber]

* ***Artemisia ludoviciana*** Nuttall, White Sage, Prairie Sage. Pd (DE, NC, SC, VA), Cp (DE, FL, NC, VA), Mt (VA), {GA}: roadsides, disturbed areas; common (rare in FL), native of western North America. Late August-November. [= WH; > *A. ludoviciana* – RAB, Z; = *A. ludoviciana* var. *ludoviciana* – C, G, SE; > *A. ludoviciana* Nuttall var. *gnaphalodes* (Nuttall) Torrey & A. Gray – F; > *A. ludoviciana* var. *ludoviciana* – F; = *A. ludoviciana* ssp. *ludoviciana* – FNA, K]

* ***Artemisia pontica*** Linnaeus, Roman Wormwood, Green-ginger. Cp (DE), Pd (DE), Mt (WV): disturbed areas, old fields, woodland edges, roadsides, ditches; rare, native of Europe. Naturalized at least as far south as DE, se. PA (Rhoads & Klein 1993), and KY. [= C, F, FNA, G, K]

* ***Artemisia stelleriana*** Besser, Beach Wormwood, Dusty Miller, Hoary Mugwort. Cp (DE, NC, VA), Pd (DE), Mt (WV): sandy roadsides, dunes, other disturbed areas; uncommon (rare in NC and VA), native of Japan and ne. Asia. May-September. This plant is reported (with documenting photograph) as naturalized and spreading in Nags Head (Dare County, NC) (Graetz 1973). [= C, F, FNA, G, K, SE, WH, Z; = *A. stellerana* – Y, orthographic variant]

* ***Artemisia vulgaris*** Linnaeus, Mugwort, Felon Herb. Cp (DE, FL, GA, NC, SC, VA), Pd (DE, GA, NC, SC, VA), Mt (GA, NC, VA, WV): roadsides, pastures, disturbed areas; common, native of Eurasia. Late August-November. [= RAB, C, FNA, S, SE, WH, Y, Z; > *A. vulgaris* var. *vulgaris* – F, K]

Aster Linnaeus 1753 (Aster)

It is now abundantly clear that the traditional, broad circumscription of *Aster*, as a genus of some 250 species of North America and Eurasia, is untenable. All of our native asters have affinities elsewhere than with Old World Aster; most are now placed in *Symphyotrichum* and *Eurybia*, with fewer species in *Ampelaster*, *Doellingeria*, *Ionactis*, *Oclemena*, and *Sericocarpus*. These changes will undoubtedly cause uproar. It may be worth noting for those that consider the dissolution of *Aster* as radical, that most of the segregate genera were recognized in the 19th century, and many have been widely recognized for much of the time since. For instance, *Sericocarpus* and *Doellingeria* were both segregated from *Aster* in the early 1830's, and were frequently recognized as distinct, including by Small (1903, 1913, 1933); *Sericocarpus* was in fact usually regarded as a good genus until sunk by Cronquist. References: Brouillet in FNA (2006b); Semple & Brouillet (1980a, 1980b); Jones (1980a, 1980b); Brouillet & Semple (1981); Reveal & Keener (1981); Jones & Young (1983); Jones (1984); Semple, Chmielewski, & Lane (1989); Nesom (1993a, 1993b, 1994a, 1994b, 2000b); Semple, Heard, & Xiang (1996); Noyes & Rieseberg (1999); Nesom (1994)=X; Semple, Heard, & Xiang (1996); Cronquist (1980)=SE; R. Jones (1992); Lamboy (1992); Nesom (1997); Xiang & Semple (1996). [also see *Ampelaster, Doellingeria, Eurybia, Ionactis, Oclemena, Sericocarpus, Symphyotrichum*]

* ***Aster tataricus*** Linnaeus f., Tartarian Aster. Pd (NC, VA), Mt (GA, NC, VA, WV), Cp (DE, VA): commonly cultivated, rarely persisting or spreading short distances from plantings; rare, native of Eurasia. September-November. [= RAB, C, FNA, G, K, SE, W, X]

Astranthium Nuttall 1840 (Western-daisy)

A genus of about 11 species, herbs, of sc. North America and Mexico. References: Nesom in FNA (2006b); Cronquist (1980)=SE; Nesom (2005a)=Z; DeJong (1965)=Y; Nesom (2000b).

Astranthium integrifolium (Michaux) Nuttall. Mt (GA, WV): limestone glades; rare. Nc. KY south through c. TN to nw. GA and ne. AL (primarily in the Interior Low Plateau); disjunct in c. MS and also disjunct in nc. WV, where perhaps introduced. The related *A. ciliatum* (Rafinesque) Nesom of the Ozarkian region and Texas is sometimes treated as a variety, subspecies, or unnamed component of *A. integrifolium*, but see Nesom (2005a) for rationale for recognition at the specific rank. The report for NC by Kartesz (1999) is erroneous; the cited documentation does not mention NC. [= FNA, Z; = *A. integrifolium* var. *integrifolium* – C; = *A. integrifolium* ssp. *integrifolium* – K, Y; < *A. integrifolium* – F, G, SE, W]

Baccharis Linnaeus 1753 (Silverling, High-tide Bush, Mullet Bush, Groundsel Tree)

A genus of about 350-450 species, shrubs, perennial herbs, and trees, of tropical, subtropical, and warm temperate America. References: Sundberg & Bogler in FNA (2006b); Nesom (2000b); Cronquist (1980)=SE. Key based in part on SE.

1 Leaves linear, 1-3 mm wide, entire ..... ***B. angustifolia***
1 Leaves obovate, oblanceolate, or elliptic, the larger > 7 mm wide and generally coarsely toothed toward the tip.
  2 Leaves entire, spatulate-obovate, 1.5-3 (-3.5) cm long (including the petiole) ..... ***[B. dioica]***

2 Leaves (at least the larger) with coarse teeth and > 3.5 cm long (including the petiole).
3 Most of the heads sessile (a few pedunculate), the glomerules scattered along leafy branches in the axils of well-developed leaves; [strictly of the outer Coastal Plain, not spread inland as a weed] ..... ***B. glomeruliflora***
3 Most of the heads pedunculate (a few sessile), the glomerules grouped into terminal paniculiform inflorescences; [of the outer Coastal Plain and also spread extensively inland as a weed] ..... ***B. halimifolia***

Baccharis angustifolia Michaux, False-willow. Cp (FL, GA, NC, SC): interdune swales, wet hammocks, marsh edges; uncommon (rare in GA, NC, SC). September-October. Ne. NC (Dare County) south to s. FL, west to LA; Bahamas. [= RAB, FNA, GW, K, S, SE, WH]

Baccharis glomeruliflora Persoon. Cp (FL, GA, NC, SC): wet hammocks, marsh edges, interdune swales; common (rare in GA, NC, SC). October-November. Se. NC (Brunswick County) south to s. FL, west to MS; West Indies. [= RAB, FNA, GW, K, S, SE, WH]

Baccharis halimifolia Linnaeus, Silverling, High-tide Bush, Mullet Bush, Groundsel Tree. Cp (DE, FL, GA, NC, SC, VA), Pd (GA, NC, SC, VA), Mt (NC, SC): fresh and brackish marshes, marsh borders, hammocks, moist abused land, roadsides, ditches, old fields, and a wide variety of disturbed areas; common (rare in Mountains and VA Piedmont). September-October. Se. MA south to s. FL, west to TX, AR, and OK; West Indies. *B. halimifolia* is becoming increasingly common inland, and can be an aggressive invader in sunny sites after silvicultural disturbance. [= RAB, C, F, FNA, G, GW, K, S, SE, WH]

Baccharis dioica Vahl, Broombush False-willow. Dunes and shores. S. AL; s. FL; West Indies. [= FNA, K, S, SE, WH]

Balduina Nuttall 1818 (Honeycomb-head, Balduina)

A genus of 3 species, herbs, of se. North America. References: Keener in FNA (2006c); Parker & Jones (1975)=Z; Cronquist (1980)=SE.

Identification notes: The common name alludes to the honeycomb-like texture of the receptacle, made up of connected receptacular bractlets which surround the achenes. This condition is diagnostic of the genus, and can be seen even when the plant is in flower by stripping the flowers from the receptacle. Superficially, the perennial species resemble some *Helenium* (particularly *H. pinnatifidum* and *H. vernale*), but these bloom months earlier. The punctate leaves are very distinctive.

1 Plant an annual or biennial; cauline leaves numerous, linear, 0.5-1.9 mm wide; outer involucral bracts 0.6-1.7 mm wide, lanceolate, acuminate; disk 6-15 mm wide; pappus scales obovate-orbicular, 0.3-0.6 mm long ..... ***[B. angustifolia]***
1 Plant a perennial; cauline leaves few, linear-spatulate, 2-7 mm wide; outer involucral bracts 1.7-3.1 mm wide, ovate, acute; disk (10-) 15-25 mm wide; pappus scales lanceolate, 1.1-2.1 mm long.
2 Disk corollas purple; basal leaves linear-spatulate, (7-) avg. 14 (-32) cm long, about 20× as long as wide; cauline leaves 3.8-6.2 cm long; outer phyllaries 2.9-5.4 mm long; inner phyllaries 4.5-7.6 mm long; ray flower ligules 2.3-4.7 mm wide at apex ..... ***B. atropurpurea***
2 Disk corollas yellow to reddish-orange; basal leaves spatulate, (5-) avg. 7.5 (-10.5) cm long; about 8× as long as wide; cauline leaves 2.7-4.3 cm long; outer phyllaries 4-7.2 mm long; inner phyllaries 5.1-11 mm long; ray flower ligules 3.2-8.6 mm wide at apex ..... ***B. uniflora***

Balduina angustifolia (Pursh) B.L. Robinson. Cp (FL, GA): sandhills and other dry, sandy soils; common. GA south to s. FL, west to s. MS; it should be sought in s. SC. [= FNA, K, SE, WH, Z; = *Actinospermum angustifolium* (Pursh) Torrey & A. Gray – S]

Balduina atropurpurea R.M. Harper, Bog Honeycomb-head, Purple Honeycomb-head, Purple Balduina. Cp (FL, GA, NC, SC): peaty seepage bogs and wet pine savannas; rare. Late August-early November; October-December. A southeastern Coastal Plain endemic, very rare and disjunct in se. NC and nc. SC (where not recently seen), primarily in ne. to sc. GA and ne. FL. [= RAB, FNA, GW, K, SE, Z; = *Endorima atropurpurea* (R.M. Harper) Small – S]

Balduina uniflora Nuttall, Savanna Honeycomb-head, Yellow Balduina. Cp (FL, GA, NC, SC): wet pine savannas and pine flatwoods; common (uncommon in GA and NC, rare in SC). Late July-September. A southeastern Coastal Plain endemic: se. NC and immediately adjacent ne. SC (apparently absent from much of SC), and from extreme s. SC south to ne. FL, FL Panhandle, and west to e. LA. [= RAB, FNA, GW, K, SE, Z; = *Endorima uniflora* (Nuttall) Rafinesque – S]

Bellis Linnaeus 1753 (English Daisy)

A genus of about 8 species, herbs, of Europe. References: Nesom (2000b); Brouillet in FNA (2006b); Cronquist (1980)=SE.

* ***Bellis perennis*** Linnaeus, English Daisy. Mt (NC, VA, WV), Pd (VA), Cp (VA): lawns, grassy roadsides; uncommon (rare in NC and VA), native of Europe. April-May. [= RAB, C, F, FNA, G, K, SE]

Berlandiera A.P. de Candolle 1836 (Green-eyes)

A genus of 4-5 species, perennial herbs and subshrubs, of s. North America and Mexico. References: Pinkava in FNA (2006c); Cronquist (1980)=SE; Nesom & Turner (1998)=Z.

1 Leaves mainly cauline; leaves unlobed; disk flowers red to maroon; [of nc. SC south to n. FL, west to TX] ..... ***B. pumila*** *var.* ***pumila***

1 Leaves basally disposed; leaves deeply lobed; disk flowers yellow; [of n. FL southward] ..... ***B. subacaulis***

Berlandiera pumila (Michaux) Nuttall *var.* ***pumila***, Eastern Green-eyes. Cp (FL, GA, SC): sandhills, disturbed sandy areas; common. Late May-November. Nc. SC south to n. peninsular FL, west to s. AL; w. LA to c. TX. Plants in w. LA and e. TX accepted here as *B. pumila* var. *scabrella* Nesom & Turner (1998) are also considered to represent introgression between *B. pumila* and *B. texana* de Candolle (Pinkava in FNA 2006c). [= K, Z; < *B. pumila* – RAB, FNA, S, SE, WH]

Berlandiera subacaulis (Nuttall) Nuttall, Florida Green-eyes. Cp (FL): sandhills; rare. Endemic to FL, from ne. FL (Clay and Columbia counties) and e. Panhandle FL (Leon, Jefferson, and Taylor counties) south to s. FL (Wunderlin & Hansen 2004). [= FNA, K, S, SE, WH]

Bidens Linnaeus 1753 (Beggar-ticks, Bur-marigold)

A genus of about 240 species, herbs, cosmopolitan. Recent molecular studies suggest that the relationship between *Bidens* and *Coreopsis* is complex, and that changes in taxonomy will be needed to more accurately reflect relationships (Kim et al. 1999; Crawford & Mort 2005). References: Strother & Weedon in FNA (2006c); Cronquist (1980)=SE; Sherff & Alexander (1955)=Z; Ballard (1986)=Y. Key based on FNA.

Identification notes: The involucre of phyllaries is subtended by an additional series of bracteal structures, the **calyculus**.

1 Plant aquatic, the leaves finely divided into segments < 0.5 mm wide; pappus awns 13-25 (-40) mm long ..... ***[B. beckii]***
1 Plant terrestrial or wetland, but not aquatic, the leaf segments > 0.5 mm wide; pappus awns lacking or present, if present < 10 mm long.
2 Inner cypselas more-or-less equally 4-angled, thickest near the middle and equally tapered to both ends; ray florets white, pink, or pale yellow (or absent).
3 Leaves 2-3× dissected, primary lobes > 20, the ultimate segments rounded to acute, 2-10 mm wide; ray florets yellowish .... ***B. bipinnata***
3 Leaves mostly once-pinnate, primary lobes 3-7, the ultimate segments serrate and acute, 8-50 mm wide; ray florets white or absent.
4 Ray florets 5-8, the ligule 5-16 mm long; cypselas 2-awned, the awns 1-2 mm long; outer phyllaries (8-) 12 (-16) ..... ***B. alba*** *var.* ***radiata***
4 Ray florets 0 (or if a few present, the ligule < 3 mm long); cypselas 3 (-5)-awned, the awns 1-3 mm long; outer phyllaries 7-10 ..... ***B. pilosa***
2 Inner cypselas flattened (if 4-angled, the alternating angles acute and obtuse), thickest towards the tip; ray florets yellow or orange (or absent).
5 Most leaves simple, the margins dentate to serrate or incised (with 3-7 lobes).
6 Leaves (except sometimes the lower) sessile; heads usually nodding, at least in age.
7 Rays absent, or present and 2-15 (-18) mm long; pales (receptacular bracts) with tan or yellow tips; outer cypselas (3-) 5-6+ mm long, inner cypselas 4-8 mm long (the margins ± thickened or winged); pappus of (2-) 4 awns (1-) 2-4 mm long ..... ***B. cernua***
7 Rays present, (10-) 15-25 (-30) mm long; pales (receptacular bracts) with orange or red tips; outer cypselas 6-8 mm, inner cypselas 8-10 mm (margins not notably thickened or winged); pappus of 2-4 awns 3-5 mm long ..... ***B. laevis***
6 Leaves with a distinct petiole 1-4 cm long (this sometimes winged); heads erect.
8 Rays 12-25+ mm long; cypselas 2.5-4.5 mm long, the margins not barbed or ciliate ..... ***B. mitis***
8 Rays absent or 2-5 (-12) mm long; cypselas (3-) 6-13 mm long, the margins sometimes barbed or ciliate.
9 Involucres usually campanulate to cylindric, sometimes ± hemispheric; disc florets (6-) 10-25 (-60); cypsela faces usually ± striate, sometimes tuberculate ..... ***[B. bidentoides]***
9 Involucres campanulate to hemispheric or broader; disc florets (5-) 20-60 (-150+); cypsela faces usually smooth or tuberculate (not notably striate).
10 Cypselas ± flattened, sometimes weakly 3 (-4)-angled and 3 (-4)-awned, the faces usually smooth, seldom notably tuberculate; disc corollas 4-lobed, light yellow; anthers usually pale ..... ***B. comosa***
10 Cypselas (at least inner) usually ± 4-angled and 4-awned, the faces usually strigose or tuberculate; disc corollas 5-lobed, orange-yellow; anthers usually blackish ..... ***B. connata***
5 Most leaves **either** 1-pinnately compound, the 3-5 (-7) leaflets petiolulate, **or** -1-2× pinnately lobed.
11 Ray florets 0, or rays 1-3, the laminae 2-3.5 mm long.
12 Calyculus bractlets (3-) 4 (-5), seldom ciliate; disc florets usually 10-20 ..... ***B. discoidea***
12 Calyculus bractlets 5-21, usually ciliate; disc florets 20-150.
13 Calyculus bractlets (5-) 8 (-10); leaves usually 3 (-5)-foliolate ..... ***B. frondosa***
13 Calyculus bractlets 10-16 (-21); leaves usually laciniate or pinnatisect ..... ***B. vulgata***
11 Ray florets (5-) 8-13, the laminae 10-30 mm long.
14 Cypselas 2.5-4× as long as wide ..... ***B. trichosperma***
14 Cypselas 1.5-2 (-2.5)× as long as wide.
15 Cypselas 2.5-5 mm long, the margins not winged, barbed, or ciliate ..... ***B. mitis***
15 Cypselas (4-) 5-8 mm long, the margins usually barbed or ciliate, and often also corky-winged.
16 Calyculus bractlets 8-12 (-16), these (4-) 5-7 (-12) mm long ..... ***B. aristosa***
16 Calyculus bractlets 12-21, these (6-) 8-12 (20) mm long ..... ***B. polylepis***

Bidens alba (Linnaeus) A.P. de Candolle *var.* ***radiata*** (Schultz 'Bipontinus') Ballard ex T.E. Melchert. Cp (FL, GA, NC, SC, VA): disturbed areas; common (uncommon in GA, NC, SC, rare in VA), adventive from the New World tropics. [= K, Y; < *B. pilosa* Linnaeus – RAB, FNA, S, SE; < *B. alba* – WH; = *B. pilosa* Linnaeus var. *radiata* Schultz 'Bipontinus' – Z]

Bidens aristosa (Michaux) Britton, Midwestern Tickseed-sunflower. Cp (DE*, GA, NC, SC, VA), Pd (GA, NC, SC, VA), Mt (GA, NC, SC, VA, WV): marshes, wet meadows, ditches; common (rare in DE). August-October (-November). DE, MD,

IL, and MO south to FL and TX (and adventive farther north). [= RAB, C, FNA, G, GW, S, SE, W; > *B. aristosa* var. *aristosa* – F, S, Z; > *B. aristosa* var. *fritcheyi* Fernald – F, Z; > *B. aristosa* var. *mutica* (A. Gray) Gattinger – F, S, Z; < *B. aristosa* – K (also see *B. polylepis*)]

Bidens bidentoides (Nuttall) Britton. Cp (DE), Pd (DE): tidal shores and mudflats; rare. NY south to se. PA, DE, and e. MD. July-October. [= C, FNA, G, K; > *B. bidentoides* – F; > *B. mariana* Blake – F; > *B. bidentoides* var. *bidentoides* – Z; > *B. bidentoides* var. *mariana* – Z]

Bidens bipinnata Linnaeus, Spanish Needles. Cp (DE, FL, GA, NC, SC, VA), Pd (DE, GA, NC, SC, VA), Mt (GA, NC, SC, VA, WV): floodplains, disturbed areas, gardens, fields, roadsides, ditches; common (uncommon in FL). MA, NY, ON, IA, NE, and AZ south to Mexico; also e. Asia. [= RAB, C, F, FNA, G, K, S, SE, W, WH; > *B. bipinnata* var. *bipinnata* – Z]

Bidens cernua Linnaeus, Bur-marigold. Mt (GA, NC, VA, WV), Pd (DE, VA), Cp (DE, GA, VA): marshes, wet meadows, bogs, ditches; common. August-October. Circumboreal, south in North America to GA, AL, LA, NM, AZ, and CA. [= RAB, C, FNA, G, GW, K, S, SE, W; > *B. cernua* var. *cernua* – F, Z; > *B. cernua* var. *elliptica* Wiegand – F; > *B. cernua* var. *integra* Wiegand – F]

Bidens comosa (A. Gray) Wiegand, Strawstem Beggar-ticks. Cp (DE, VA), Pd (DE, VA), Mt (VA, WV), {GA, NC, SC}: marshes, bogs, wet meadows, disturbed areas; common. August-October. NL (Newfoundland) and BC south to GA, TX, and CA. Closely related to, and sometimes included in, the Eurasian *B. tripartita*. [< *B. comosa* (A. Gray) Wiegand – C, F, G, S; < *B. tripartita* – RAB, FNA, K; = *B. tripartita* ssp. *comosa* (A. Gray) A. Haines]

Bidens connata Muhlenberg, Purplestem Beggar-ticks. Mt (GA, WV), Cp (DE, VA), {NC, SC}: marshes, bogs, wet meadows, disturbed areas; uncommon? (rare in VA and WV). August-October. QC, ON, and ND south to GA, AL, and KS. [= C, FNA, G, K, S; < *B. tripartita* Linnaeus – RAB; > *B. connata* var. *anomala* Farwell – F, Z; > *B. connata* var. *connata* – F, Z; > *B. connata* var. *fallax* (Warnstorf) Sherff – F, Z; > *B. connata* var. *petiolata* (Nuttall) Farwell – F, Z]

Bidens discoidea (Torrey & A. Gray) Britton, Few-bracted Beggar-ticks. Cp (DE, FL, GA, NC, SC, VA), Pd (GA, NC, SC, VA), Mt (GA, VA, WV): floodplain forests, marshes; common (rare in FL, rare in VA and WV Mountains). Late August-November. NS and MN south to ne. FL, Panhandle FL, and TX. [= RAB, C, F, FNA, G, GW, K, S, SE, W, WH, Z]

Bidens frondosa Linnaeus, Devil's Beggar-ticks. Cp (DE, FL, GA, NC, SC, VA), Pd (DE, GA, NC, SC, VA), Mt (GA, NC, SC, VA, WV): fields, pastures, wet meadows, swamp forests, ditches; common (uncommon in FL). June-October. Nova Scaotia and AK south to FL, TX, CA, and southward. [= RAB, C, FNA, G, GW, K, S, SE, W, WH; > *B. frondosa* var. *frondosa* – F, Z; > *B. frondosa* var. *anomala* Porter – Z]

Bidens laevis (Linnaeus) Britton, Sterns, & Poggenburg, Showy Bur-marigold. Cp (DE, FL, GA, NC, SC, VA), Pd (NC, VA), Mt (VA, WV): marshes, stream banks, ditches; common (uncommon in FL, rare in VA and WV Mountains). August-November. ME, NY, IN, MO, NV, and CA southward. [= RAB, C, F, FNA, G, GW, K, SE, W, WH, Z; > *B. laevis* – S; > *B. nashii* Small – S]

Bidens mitis (Michaux) Sherff, Coastal Plain Tickseed-sunflower. Cp (DE, FL, GA, NC, SC), Pd (GA), Mt (NC): brackish marshes, fresh marshes, bogs (inland); uncommon (rare in Mountains, rare in DE). July-October. NJ south to FL, west to TX, primarily Coastal Plain, rare and scattered inland. [= RAB, C, F, FNA, G, GW, K, SE, W, WH, Z; > *B. mitis* var. *leptophylla* (Nuttall) Small – S; > *B. mitis* var. *mitis* – S]

* ***Bidens pilosa*** Linnaeus. Cp (FL, GA?, NC?, SC): waste areas near wool-combing mill, ballast, other disturbed areas; rare, native of tropical America. Reported for NC (Kartesz 1999), perhaps based on confusion with *B. alba*; known from ballast in se. PA (Rhoads & Klein 1993). [= K, WH; > *B. pilosa* – FNA; > *B. pilosa* var. *pilosa* – Z; > *B. pilosa* Linnaeus var. *bimucronata* (Turczaninov) Schultz 'Bipontinus' – Z]

* ***Bidens polylepis*** Blake, Ozark Tickseed-sunflower. Mt (GA, NC, SC, VA), Pd (DE, GA, NC, SC, VA), Cp (DE, NC, SC, VA): marshes, wet meadows, bogs, ditches; uncommon (common in DE Coastal Plain). August-October. NJ, QC, and CO south to SC, AL, TX, and NM. [= RAB, C, FNA, G, GW, SE, W; > *B. polylepis* var. *polylepis* – F, Z; > *B. polylepis* var. *retrorsa* Sherff – F, Z; < *B. aristosa* – K]

Bidens trichosperma (Michaux) Britton, Northern Tickseed-sunflower. Cp (DE, FL, GA, NC, VA), Mt (WV): tidal marshes, other marshes; uncommon (rare in WV). August-October. QC, MN, and SD south to GA, LA, and NE. [= FNA; = *B. coronata* (Linnaeus) Britton – RAB, C, G, GW, K, S, SE (name invalid); > *B. coronata* var. *coronata* – F, Z; > *B. coronata* var. *brachyodonta* Fernald – F; > *B. coronata* var. *trichosperma* (Michaux) Fernald – F]

Bidens vulgata Greene, Tall Beggar-ticks. Mt (NC, SC, VA, WV), Pd (DE, NC, VA), Cp (DE, VA): fields, marshes, wet places; common (uncommon south of DE). August-October. QC and BC south to GA, LA, and CA. [= RAB, C, FNA, G, GW, K, S, SE, W; > *B. vulgata* var. *vulgata* – F, Z]

Bidens beckii Torrey ex Sprengel, Water-marigold, Water Beggar-ticks. South to c. PA and NJ. July-October. This species is sometimes treated in the monotypic genus *Megalodonta*; this is contradicted by molecular evidence, which shows *B. beckii* as a component of *Bidens* (Ganders 2000). [= C, FNA, G; = *Megalodonta beckii* (Torrey ex Sprengel) Greene – F, K; > *Megalodonta beckii* var. *beckii* – Z]

* *Bidens tripartita* Linnaeus. Eurasian; not known to be in our area. {combined distribution of *comosa*, *connata*, and *tripartita*: Mt (GA, NC, SC, VA), Pd (NC, SC, VA), Cp (VA): marshes, swamps} [> *B. tripartita* – F, G, W, Z; < *B. comosa* (A. Gray) Wiegand – C, F, G, S; < *B. tripartita* – FNA, K; < *B. tripartita* – RAB, GW (also see *B. connata* and *B. comosa*)] {not keyed}

Bigelowia A.P. de Candolle 1836 (Rayless-goldenrod)

A genus of 2 species (one with 2 varieties), herbs, of se. North America. References: Nesom in FNA (2006b); Anderson (1970)=Z; Cronquist (1980)=SE; Nesom (2000b).

1 Basal leaves many, 1-2 mm wide; plants strongly rhizomatous and colonial; [of dry clayey or rocky places] ..... ***B. nuttallii***
1 Basal leaves few, 2-14 mm wide; plants cespitose, or weakly rhizomatous; [of wet to mesic pine savannas and flatwoods].
  2 Leaves mostly > 10 cm long, 2-4 mm wide; involucre 6-7.5 mm high ..... ***B. nudata*** *var.* ***australis***

2 Leaves mostly < 10 cm long, 4-14 mm wide; involucre 4.5-6 mm high ..... ***B. nudata*** *var.* ***nudata***

Bigelowia nudata (Michaux) A.P. de Candolle *var.* ***australis*** (L.C. Anderson) Shinners. Cp (FL): mesic pine flatwoods; rare. Ne. FL (Bradford County) south to s. FL. [= FNA, SE; = *B. nudata* ssp. *australis* L.C. Anderson – GW, K, WH, Z; < *Chondrophora nudata* (Michaux) Britton – S]

Bigelowia nudata (Michaux) A.P. de Candolle *var.* ***nudata***, Rayless-goldenrod. Cp (AL, FL, GA, LA, MS, NC, SC): savannas, pine flatwoods, pocosin edges; common. August-October. E. NC south to n. FL and west to LA. [= FNA, SE; = *B. nudata* ssp. *nudata* – GW, K, WH, Z; < *Chondrophora nudata* (Michaux) Britton – RAB, S]

Bigelowia nuttallii (Michaux) A.P. de Candolle. Cp (AL, FL, GA), Pd (GA), Mt (AL): prairies, sandstone glades, granite flatrocks, Altamaha Grit glades, and roadbanks; rare. September-October. W. LA west to e. TX; disjunct eastward in Mountains of ne. AL, Piedmont of c. GA, and Coastal plain of s. AL, ec. GA (Jones & Coile 1988, Bridges & Orzell 1989), Panhandle FL, and wc. peninsular FL. [= FNA, GW, K, SE, WH, Z; = *Chondrophora virgata* (Nuttall) Greene – S, misapplied]

Boltonia L'Héritier 1789 (Doll's-daisy)

(contributed by John F. Townsend and Alan S. Weakley)

A genus of about 6-7 species, herbs, of e. and c. North America. References: Karaman-Castro & Urbatsch in FNA (2006b); Townsend & Karaman-Castro (2006)=X; Morgan (1966)=Z; Anderson (1987)=Y; Cronquist (1980)=SE; Nesom (2000b).

1 Achenes with pappus reduced to a short ring of bristles to 0.15 mm long or with occasional slender awns to 0.6 mm; achene wings lacking or up to 0.1 mm wide; faces of achenes glabrous.
  2 Phyllaries 0.2-0.5 mm wide, whitened throughout or with greenish tip, midrib relatively prominent (25-35% phyllary width); heads 4.3-6.1 mm wide, peduncles 0.25-0.5 mm in diameter; ray corollas white fading to pinkish in age; bracteal leaves narrowly oblanceolate to linear; [of Coastal Plain and Piedmont of VA southwards] ..... ***B. caroliniana***
  2 Phyllaries 0.4-0.9 mm wide, whitened in lower 1/3 to 1/2 only, distal portion green, midrib relatively narrow (8-14% phyllary width); heads 6-11.5 mm wide, peduncles 0.5-1.1 mm in diameter; ray corollas lilac or pinkish (-white); bracteal leaves oblanceolate to oblong; [of Mountains of VA (Augusta County) northwards] ..... ***B. montana***
1 Achenes with two distinct pappus awns in addition to a shorter ring of bristles, the awns mostly 0.3-1.8 mm long; achene wings obvious, mostly 0.2-0.5 mm wide; faces of achenes pubescent.
  3 Phyllaries spatulate, oblanceolate, or linear-oblanceolate, apices cuspidate, pappus awns 2/3 or more as long as the achenes; inflorescence diffusely branched, with numerous heads.
    4 Phyllaries spatulate to obovate-spatulate, (2-) 2.5-6 mm wide, membranaceous margins broad ..... ***B. asteroides*** *var.* ***latisquama***
    4 Phyllaries oblanceolate to linear-oblanceolate, 1-2.5 (-3) mm wide, membranaceous margins narrow ..... ***B. asteroides*** *var.* ***recognita***
  3 Phyllaries linear-subulate to lanceolate; inflorescence various.
    5 Inflorescence subulate-bracteate.
      6 Phyllaries subulate; peduncles filiform ..... ***B. diffusa*** *var.* ***diffusa***
      6 Phyllaries linear-oblong; peduncles thick ..... ***B. diffusa*** *var.* ***interior***
    5 Inflorescence more or less leafy-bracteate.
      7 Inflorescence diffusely branched, heads relatively numerous, phyllaries (0.2-) 0.3-0.4 (-0.5) mm wide, (1.3-) 1.4-1.8 (-2.1) mm long, pappus awns 0.3-0.8 mm long ..... ***B. apalachicolensis***
      7 Inflorescence with loosely ascending branches, heads relatively few, phyllaries (0.5-) 0.7-0.9 (-1.1) mm wide, (1.5-) 2.1-2.4 (-3.5) mm long, pappus awns (0.2-) 0.8-1.1(-1.3) mm long.
        8 Plants reproducing vegetatively by basal offsets, culms ascending, leaves elliptic to obovate with rounded or blunt apices, held at various angles from culm and inflorescence branches, plants with weak apical dominance; [of the Susquehanna River of MD and PA] ..... ***B. asteroides*** *var.* ***asteroides***
        8 Plants reproducing vegetatively by elongate stolons, culms more strictly erect, leaves lanceolate with acute apices, the leaves oriented at an acute angle to the culm and inflorescence branches, plants with relatively strong apical dominance; [more widespread in our area] ..... ***B. asteroides*** *var.* ***glastifolia***

Boltonia apalachicolensis L.C. Anderson, Apalachicola Doll's-daisy. Cp (FL): floodplain forests; rare. August-October. Panhandle FL, s. MS, west to LA. [= FNA, K, WH; < *Boltonia* sp. – GW]

Boltonia asteroides (Linnaeus) L'Héritier *var.* ***asteroides***, Susquehanna Doll's-daisy. Riverbanks. Along the Susquehanna River, MD and PA. [= Y; < *B. asteroides* var. *asteroides* – C, FNA, G, K, SE, X, Z; = *B. asteroides* var. *asteroides* – F]

Boltonia asteroides (Linnaeus) L'Héritier *var.* ***glastifolia*** (Hill) Fernald, Eastern Doll's-daisy. Cp (DE, FL, NC, SC, VA), Mt (NC), {GA}: marshes, ditches; common (rare in Mountains, rare in FL and VA). August-October. NJ south to Panhandle FL, west to MS and LA, mostly on the Coastal Plain, but with a few disjunct occurrences inland, such as Henderson County, NC. [= F; < *B. asteroides* – RAB, W, WH, Y; < *B. asteroides* var. *asteroides* – C, FNA, G, K, SE, X, Z; < *Boltonia* sp. – GW]

Boltonia asteroides (Linnaeus) L'Héritier *var.* ***recognita*** (Fernald & Griscom) Cronquist. MI, OH, KY, TN west to SK and OK. [= C, FNA, G, K; = *Boltonia recognita* (Fernald & Griscom) G.N. Jones] {synonymy incomplete}

* ***Boltonia asteroides*** (Linnaeus) L'Héritier *var.* ***latisquama*** (A. Gray) Cronquist, Midwestern Doll's-daisy. Cp (NC, VA): ditches; rare, native of mw. United States. August-October. WI west to ND, south to MS and OK; disjunct (presumably introduced) in NC and se. VA. [= C, FNA, G, K, SE, Z; > *B. latisquama* var. *latisquama* – F; > *B. latisquama* var. *recognita* Fernald & Griscom – F; < *Boltonia sp.* – GW]

Boltonia caroliniana (Walter) Fernald, Carolina Doll's-daisy. Cp, Pd (NC, SC, VA), {GA}: bottomlands, ditches, roadsides, prairies; common (rare in GA and VA). August-October. Se. VA south to s. SC (and GA according to Kartesz 1999),

primarily on the Coastal Plain and Piedmont. [= C, FNA, G, K, SE, X, Y; < *B. caroliniana* – RAB (also see *B. diffusa* var. *diffusa*); > *B. caroliniana* – F; > *B. ravenelii* Fernald & Griscom – F; < *Boltonia* sp. – GW; = *B. diffusa* var. *caroliniana* – Z]

Boltonia diffusa Elliott *var.* ***diffusa***, Southern Doll's-daisy. Cp (FL, GA, SC), Pd* (NC*, VA*): clay-based Carolina bays, roadsides, powerline rights-of-way, and other artificially open areas; uncommon (rare in NC, SC, VA). August-October. Se. SC south to s. FL, west to e. TX, inland in the interior to c. TN, s. IL, s. MO, AR, and se. OK; disjunct in the Bahamas (Mangrove Cay of Andros Island). See Sorrie & LeBlond (2008) for comments on distribution and nativity. [= FNA, K, Z; < *B. caroliniana* – RAB; < *B. diffusa* – C, G, SE, WH, Y; < *Boltonia* sp. – GW]

Boltonia diffusa Elliott *var.* ***interior*** Fernald & Griscom. KY and TN west to IL, OK, and LA. [= FNA, K; < *B. diffusa* – C; < *Boltonia* sp. – GW] {synonymy incomplete}

Boltonia montana J.F. Townsend & V. Karaman-Castro, Valley Doll's-daisy. Mt (VA): sinkhole ponds; rare. August-October. Augusta Co. VA and Ridge and Valley wetlands in NJ. See Townsend & Karaman-Castro (2006) for detailed information. [= X; < *B. asteroides* (Linnaeus) L'Héritier var. *asteroides* – FNA; < *Boltonia* sp. – GW]

Borrichia Adanson 1763 (Seaside Oxeye)

A genus of 2 species, shrubs, of se. United States and West Indies. References: Semple in FNA (2006c); Cronquist (1980)=SE.

Borrichia frutescens (Linnaeus) A.P. de Candolle, Seaside Oxeye. Cp (FL, GA, NC, SC, VA): salt and brackish marshes; common. May-September. DC and e. VA south to s. FL, west to TX and Mexico; also in Bermuda. This species often forms nearly pure stands of many hectares, conspicuous from the fleshy, gray leaves. [= RAB, C, F, FNA, G, K, SE, WH]

Brickellia Elliott 1823 (False-boneset)

A genus of about 110 species, herbs and shrubs, primarily of sw. North America, Central America, and South America. *Kuhnia* appears to be a part of *Brickellia* (King & Robinson 1987; Shinners 1971). References: Scott in FNA (2006c); Cronquist (1980)=SE; Shinners (1971)=Z; Shinners (1946)=Y; Turner (1989)=X.

1 Leaves rounded at base; upper stem leaves reduced in size but similar in shape to the lower leaves; pappus purplish, of ca. 40 bristles; [of s. GA south] ..... ***B. cordifolia***

1 Leaves cuneate at base; upper stem leaves (at least) linear-lanceolate; pappus whitish, of 20-25 bristles; [widespread in our area] ..... ***B. eupatorioides*** *var.* ***eupatorioides***

Brickellia cordifolia Elliott, Flyr's False-boneset. Cp (FL, GA): mesic pine-hardwood or oak-hickory woods of upland hammocks; rare. Late August-late October. Sw. GA (Jones & Coile 1988; Carter, Baker, & Morris 2009) and AL south to Panhandle FL and n. peninsular FL. [= FNA, K, SE, WH; = *Coleosanthus cordifolius* (Elliott) Kuntze – S]

Brickellia eupatorioides (Linnaeus) Shinners var. *corymbulosa* (Torrey & Gray) Shinners, Midwestern False-boneset. Var. *corymbulosa* (Torrey & Gray) Shinners ranges as far east as IN, IL, MO, and AR (and allegedly to KY) and has larger heads than var. *eupatorioides* (9-15 mm high, with mostly 15-35 florets, vs. 7-11 mm high, with mostly 6-15 florets). [] {investigate; add synonymy; add to key}

Brickellia eupatorioides (Linnaeus) Shinners *var.* ***eupatorioides***, Eastern False-boneset. Pd (GA, NC, SC, VA), Mt (GA, NC, SC, VA, WV), Cp (FL, GA, NC, SC, VA): dry slopes, shale barrens, dry woodlands, thickets; common (uncommon in Mountains, uncommon in VA Piedmont, rare in VA Coastal Plain). June-October. NJ west to IN, south to c. peninsular FL and se. TX. In addition to var. *eupatorioides*, *B. eupatorioides* includes several other varieties, of more southern or western distribution. Var. *floridana* (R.W. Long) B.L. Turner [= *B. mosieri* Small] has all leaves linear and is apparently restricted to s. FL; previous references to its occurrence further north (as by SE) are now interpreted as being based on narrow-leaved forms of *B. eupatorioides* var. *eupatorioides*. Var. *texana* (Shinners) Shinners [= var. *ozarkana* (Shinners) Shinners] has the outer phyllaries prolonged into setae, nearly or fully as long as the inner phyllaries, and should be considered a possibility for our area, in dry open habitats with prairie or midwestern affinities; it is known from as far eastward as AR and MO. [= FNA, K, X, Z; < *Kuhnia eupatorioides* Linnaeus – RAB, S, W; = *Kuhnia eupatorioides* var. *eupatorioides* – C, F, G, SE; < *Brickellia eupatorioides* – WH; = *Kuhnia eupatorioides* var. *pyramidalis* Rafinesque – Y]

Brintonia Greene 1895 (Brintonia)

A monotypic genus of the East Gulf Coastal Plain of the Southeastern United States, though sometimes combined with *Solidago*. References: Semple in FNA (2006b); Nesom (1993).

Brintonia discoidea (Elliott) Greene, Brintonia, Rayless Mock-goldenrod. Cp (FL, GA): rich bluff forests; rare. August-October. A Southeastern Coastal Plain endemic: sw. GA and Panhandle FL west to LA. [= FNA, S, SE, WH; = *Solidago discoidea* Elliott – K]

Calotis R. Browne 1820

* ***Calotis cuneifolia*** R. Browne. Cp (SC): waste areas near wool-combing mill; rare, native of Australia. Reported by Nesom (2004d). [= K]

Calyptocarpus Lessing 1832 (Straggler-daisy, Lawnflower)

A genus of 3 species, herbs, of sw. North America south to Central America. References: Strother in FNA (2006c); Sherff & Alexander (1955)=Z; Cronquist (1980)=SE.

* ***Calyptocarpus vialis*** Lessing, Straggler-daisy, Lawnflower. Cp (FL, GA, SC): disturbed areas, lawns; rare, native of tropical America. [= FNA, K, S, SE, WH, Z]

Carduus Linnaeus 1753 (Plumeless Thistle)

A genus of about 90 species, herbs, of temperate Old World. References: Keil in FNA (2006a); Cronquist (1980)=SE. [also see *Cirsium*]

1 Phyllaries 2-8 mm wide; heads mostly nodding (declined at least slightly from the vertical) ..... ***C. nutans***
1 Phyllaries 1-2 mm wide; heads erect.
  2 Involucres cylindrical or narrowly ellipsoid..... ***C. pycnocephalus*** *ssp.* ***pycnocephalus***
  2 Involucres spherical or hemispherical.
    3 Involucre 14-20 mm high, 25-35 mm across (excluding the flowers); leaves glabrate to glabrous beneath; plants very spiny; stem tough. ..... ***C. acanthoides*** *ssp.* ***acanthoides***
    3 Involucre 12-17 mm high, 15-20 (-25) mm across (excluding the flowers); leaves cottony-tomentose beneath, at least when young; plants not very spiny; stem brittle ..... ***C. crispus***

* ***Carduus acanthoides*** Linnaeus *ssp.* ***acanthoides***, Plumeless Thistle. Mt (NC, VA, WV), Pd (VA), Cp (VA): disturbed areas, pastures; common (uncommon in WV, rare in NC), native of Eurasia. June-October. [= FNA; < *C. acanthoides* – RAB, C, F, G, K, SE, W]
* ***Carduus crispus*** Linnaeus, Welted Thistle. Cp (VA), Mt (WV): disturbed areas, naturalized around large ports; rare, native of Eurasia. June-September. [= C, F, FNA, G, K, SE]
* ***Carduus nutans*** Linnaeus, Musk Thistle, Nodding Thistle. Mt (VA, WV), Pd (GA, NC, VA), Cp (DE, SC, VA): fields, roadsides, disturbed areas; uncommon (rare in DE, NC, and SC), native of Eurasia. Late May-November. *C. nutans* in its native range consists of a complex of taxa variously treated at specific, subspecific, and varietal rank; the application of these taxa to North American material is problematic and unresolved (see FNA for discussion). [= RAB, C, F, FNA, G, SE, W; > *Carduus nutans* Linnaeus ssp. *macrolepis* (Petermann) Kazmi – K]
* ***Carduus pycnocephalus*** Linnaeus *ssp.* ***pycnocephalus***, Italian Plumeless-thistle. Cp (SC): waste areas around wool-combing mill; rare, native of n. Africa and w. Asia. Reported by Nesom (2004d). Scattered other occurrences in e. North America, including old ballast collections (FNA). [= FNA; < *C. pycnocephalus* – K]

* *Carduus tenuiflorus* W. Curtis. Known from ballast collections from se. PA from 1877-1879 (Rhoads & Klein 1993) and from NJ (Kartesz 1999). [= FNA, K] {not keyed}

Carphephorus Cassini 1816

A genus of 4 species, herbs, endemic to the Southeastern Coastal Plain of North America. The merger of *Trilisa* and *Litrisa* into *Carphephorus* has been questioned (Schmidt & Schilling 2000) and Schilling (2011) provides evidence that both *Trilisa* and *Litrisa* should be maintained as separate genera. The only species of this complex not occurring in our area is *Litrisa carnosa* Small (of c. peninsular FL). References: Nesom in FNA (2006c); Schilling (2011)=V; Correa & Wilbur (1969)=Z; DeLaney, Bissett, & Weidenhamer (1999)=Y; Orzell & Bridges (2002)=X; Cronquist (1980)=SE.

Identification notes: *Trilisa* can be distinguished from *Carphephorus* by its smaller heads (involucres 3.5-6 mm high vs. 6-15 mm high) and fewer phyllaries (6-12 vs. 15-40). When vegetative, *Trilisa* lacks shining resin dots on the leaves, while *Carphephorus* has numerous resin dots.

1 Stem glabrous or nearly so, the pubescence (if present) short and appressed; surfaces of the basal leaves glabrous; inflorescence corymbiform.
  2 Stem leaves few, most of the stem exposed; basal leaves 4-20 cm long, 0.5-2.5 cm wide, dull, minutely punctate-pitted, fairly thick in texture, but not succulent; stems 1-5 dm tall, (1-) 2-5 per plant; [se. VA south to e. GA]..... ***C. bellidifolius***
  2 Stem leaves numerous, densely clothing the stem at least below; basal leaves 9-50 cm long, 2-10 cm wide, shiny, succulent, not glandular-punctate; stems 6-20 dm tall, 1 per plant; [se. NC south to FL, west to e. LA] ..... ***[Trilisa odoratissima]***
1 Stem conspicuously spreading hirsute, at least on the lower part of the stem; surfaces of the basal leaves conspicuously pubescent to glabrous; inflorescence corymbiform or thyrsoid-paniculate.
  3 Leaves linear, the widest 1-3 mm wide; [sw. GA west through the East Gulf Coastal Plain] ..... ***C. pseudoliatris***
  3 Leaves oblancolate, the widest 7-40 mm wide; [collectively widespread in the Coastal Plain of our area].

4 Inflorescence thyrsoid-paniculate; florets 4-10 per head; basal leaves glabrous, minutely and inconspicuously punctate, lacking resin droplets; phyllaries in 1-2 (-3) series, scarcely overlapping.....***[Trilisa paniculata]***
4 Inflorescence corymbiform; florets 15-30 per head; leaves generally conspicuously pubescent (sometimes glabrate or with a few long hairs on the upper surface), not punctate, copiously beset with resin droplets; phyllaries in 3-6 series, closely imbricate.
5 Phyllaries glabrous on the back; phyllaries subacute to rounded, entire to erose; phyllaries mostly 15-20.....***C. corymbosus***
5 Phyllaries viscid-pubescent on the back; phyllaries acute to subacute, entire and often callus-tipped; phyllaries 20-40.....***C. tomentosus***

Carphephorus bellidifolius (Michaux) Torrey & A. Gray, Sandhill Chaffhead. Cp (GA, NC, SC, VA): xeric sandy forests and woodlands, primarily in sandhills; common (rare in GA and VA). August-October. Se. VA to extreme e. GA. The leaf apices are generally blunt, giving the leaves a nearly spatulate shape. Although often occurring with other species of *Carphephorus*, *C. bellidifolius* ranges into drier habitats than its congeners. [= RAB, C, F, FNA, G, K, S, SE, V, Z]

Carphephorus corymbosus (Nuttall) Torrey & A. Gray. Cp (FL, GA, SC): wet flatwoods; common (rare in GA and SC). August-October. Se. SC south to s. FL. This species was reported as far north as NC by Small (1933); Correa & Wilbur (1969) considered the northern limit of the species to be e. GA, but it is now known from Jasper County, SC. [= RAB, FNA, K, S, SE, V, WH, Y, Z]

Carphephorus pseudoliatris Cassini, Lavender Lady. Cp (FL, GA): seepage bogs, savannas, wet to moist pinelands; common (rare in GA). Sw. GA and FL Panhandle west to e. LA. [= FNA, GW, K, S, V, WH, Y, Z; = *C. pseudo-liatris* – SE, orthographic variant]

Carphephorus tomentosus (Michaux) Torrey & A. Gray. Cp (GA, NC, SC, VA): savannas, flatwoods, and sandhills; common (rare in VA). August-October. Se. VA south to s. GA. The specific epithet is somewhat misleading; *C. tomentosus* is highly variable in its pubescence, ranging from glabrate to densely hirsute. [= RAB, C, FNA, G, GW, K, S, SE, V, Z; > *C. tomentosus* var. *tomentosus* – F; > *C. tomentosus* var. *walteri* (Elliott) Fernald – F]

Carthamus Linnaeus 1753 (Distaff-thistle)

A genus of 14 specoies, annual and perennial herbs, of the Mediterranean region. Closely related to *Centaurea*, and perhaps to be included there. References: Keil in FNA (2006a).

* ***Carthamus creticus*** Linnaeus, Smooth Distaff-thistle. Cp (SC): waste area around wool-combing mill; rare, native of s. Europe and n. Africa. Reported by Nesom (2004d) for SC, as *C. baeticus*. [= FNA; ? *Carthamus lanatus* Linnaeus ssp. *baeticus* (Boissier & Reuter) Nyman – K; ? *Carthamus baeticus* Boissier & Reuter; = *Centaurea cretica* (Linnaeus) Sprengel]

Centaurea Linnaeus 1753 (Star-thistle, Knapweed)

A genus of about 500 species, herbs, native of Eurasia and n. Africa. References: Keil & Ochsmann in FNA (2006a); Cronquist (1980)=SE. Key adapted from C, SE, and FNA. [also see *Acroptilon*, *Carthamus,* and *Plectocephalus*]

1 Phyllaries evidently spine-tipped.
2 Leaf bases not decurrent on the stem, the stem merely angled; pappus absent; corollas purple
3 Central spines of the principal phyllaries 10-25 mm long.....***C. calcitrapa***
3 Central spines of the principal phyllaries 1-3 mm long.....***[C. diffusa]***
2 Leaf bases decurrent on the stem as wings (only shortly so in *C. benedicta*); pappus present in at least the central flowers in the head; corollas yellow.
4 Heads sessile, closely subtended and partially concealed by large foliar bracts.....***C. benedicta***
4 Heads obviously pedunculate, lacking large foliar bracts subtending the head.
5 Larger spines of the middle and outer phyllaries 5-9 mm long; marginal and central flowers of the head with pappus.....***C. melitensis***
5 Larger spines of the middle and outer phyllaries 11-22 mm long; marginal flowers of the head lacking pappus.....***C. solstitialis***
1 Phyllaries not spine-tipped.
6 Plant an annual; flowers pale to medium blue, flowering April-June.....***C. cyanus***
6 Plant a perennial; flowers pink to purple, flowering June-October.
7 Phyllary appendages tapering to long, often recurved, pectinately dissected, filiform tips.....***C. phrygia***
7 Phyllary appendages obtuse to acute, erect or ascending.
8 Involucres 10-13 mm high.....***C. stoebe*** *ssp.* ***micranthos***
8 Involucres 15-25 mm high.
9 Phyllary appendages evidently decurrent along phyllary margins.....***[C. scabiosa]***
9 Phyllary appendages not or only slightly decurrent along phyllary margins.
10 Phyllary appendages roundish (seldom triangular), scarious, light to dark brown, undivided to irregularly lacerate.....***C. jacea***
10 Phyllary appendages more-or-less triangular, brown to black, more-or-less wholly pectinate-margined.
11 Heads discoid (the peripheral florets not expanded and showy); pappus blackish, < 1 mm long; green parts of phyllaries nearly or completely covered by black appendages, the involucres thus appearing totally black.....***C. nigra***
11 Heads radiate (the peripheral florets expanded and showy); pappus absent or rudimentary (when present usually not black); green part of phyllaries sometimes evident, or the appendages light to dark brown.
12 Heads relatively broad, the pressed involucres usually as wide as or wider than long; green parts of phyllaries usually covered by brown, variously pectinate fimbriate appendages, the involucres thus light to dark brown..... ***C. ×moncktonii***

12 Heads relatively narrow, the pressed involucres usually longer then wide; green parts of phyllaries not fully covered by black appendages, the involucres black and green.....***C. nigrescens***

* ***Centaurea benedicta*** (Linnaeus) Linnaeus, Blessed-thistle. Pd (GA, NC, SC, VA), Cp (FL, GA, NC, SC, VA), Mt (VA): fields, roadsides, disturbed areas; uncommon (rare in FL), native of Mediterranean Europe. Late March-June. [= RAB, FNA; = *Cnicus benedictus* Linnaeus – C, F, G, K, S, SE, W, WH]

* ***Centaurea calcitrapa*** Linnaeus, Purple Star-thistle, Caltrops. Mt, Cp, Pd (VA): roadsides, disturbed areas; rare, native of Europe. June-September. [= C, F, FNA, G, K, S, SE]

* ***Centaurea cyanus*** Linnaeus, Cornflower, Batchelor's-buttons. Cp (DE, FL, GA, NC, SC, VA), Pd (DE, GA, NC, SC, VA), Mt (NC, SC, VA, WV): roadsides, disturbed areas; common (uncommon in VA and WV Mountains, uncommon in DE, rare in FL), native of Mediterranean Europe. April-June. [= RAB, C, F, FNA, G, K, S, SE, W, WH]

* ***Centaurea jacea*** Linnaeus, Brown Knapweed. Mt (NC, VA, WV), Pd (DE, VA), Cp (DE): roadsides, disturbed areas; uncommon (rare south of DE), native of Europe. June-September. This species is increasing rapidly in the VA Ridge and Valley. Reported for Alleghany County, NC (D. Poindexter, pers. comm. 2009). [= C, F, FNA, G, K, SE; = *Jacea pratensis* Lamarck]

* ***Centaurea melitensis*** Linnaeus, Maltese Star-thistle. Cp (GA, SC): waste areas near wool-combing mill, roadsides, disturbed areas; rare, native of Mediterranean Europe. June-September. [= C, F, FNA, G, K, S, SE]

* ***Centaurea ×moncktonii*** C.E. Britton, Meadow Knapweed. Mt (VA), Pd (VA): roadsides, disturbed areas; rare, native of Europe. July-October. [= FNA; = *C. ×pratensis* Thuillier – C; ? *C. nigra* var. *radiata* A.P. de Candolle – F; ? *C. debeauxii* Godron & Grenier ssp. *thuillieri* Dostál]

* ***Centaurea nigra*** Linnaeus, Black Knapweed, Spanish-buttons. Mt (WV), Pd (DE, VA), Cp (DE): roadsides, disturbed areas; uncommon (rare in VA), native of Europe. July-October. [= C, F, FNA, G, K, SE]

* ***Centaurea nigrescens*** Willdenow, Tyrol Knapweed, Short-fringed Knapweed. Mt (VA, WV), Pd (DE, VA): roadsides, disturbed areas; uncommon (rare in DE and VA), native of Europe. July-October. This species is increasing rapidly in the n. VA Piedmont. *C. transalpina* Schleicher ex de Candolle was also reported for VA by Kartesz (1999). [= FNA; = *C. dubia* Suter – C, SE, W (not a valid name); > *C. vochinensis* Bernhardi ex Reichenbach – F; > *C. dubia* ssp. *vochinensis* (Berhardi ex Reichenbach) Hayek – G; > *C. nigrescens* – K; > *C. transalpina* Schleicher ex de Candolle – F, K]

* ***Centaurea phrygia*** Linnaeus, Wig Knapweed. {VA}. Reported for VA in FNA. [= FNA, K; > *Centaurea austriaca* Willdenow]

* ***Centaurea solstitialis*** Linnaeus, Barnaby's-thistle, Yellow Star-thistle. Mt (VA, WV), Pd (VA), Cp (NC, SC): roadsides, disturbed areas; rare, native of Mediterranean Europe. June-August. First reported for South Carolina by Hill & Horn (1997). [= RAB, C, F, FNA, G, K, S, SE, WV]

* ***Centaurea stoebe*** Linnaeus *ssp.* ***micranthos*** (S.G. Gmelin ex Gugler) Hayek, Spotted Knapweed, Bushy Knapweed. Mt (NC, SC, VA, WV), Pd (NC, SC, VA), Cp (DE, FL, VA): roadsides, disturbed areas; common (rare in FL and SC), native of Europe. Late June-November. [= FNA, WH; = *Centaurea biebersteinii* A.P. de Candolle – K; = *C. maculosa* Lamarck – RAB, C, F, G, SE, W, misapplied]

* *Centaurea diffusa* Lamarck, Tumble Knapweed. Naturalized in Davidson County, TN (Chester, Wofford, & Kral 1997); also in KY (FNA). [= C, F, FNA, G, K; = *Acosta diffusa* (Lamarck) Soják]

* *Centaurea scabiosa* Linnaeus, Greater Knapweed, Hardheads. Naturalized in KY, PA, NJ (FNA), MD (Kartesz 1999), and other states in e. North America. [= FNA, C, F, G, K]

Chaetopappa A.P. de Candolle 1836 (Least-daisy)

A genus of 11 species, annual or perennial herbs, of sc. and sw. United States and n. Mexico. References: Nesom in FNA (2006b).

* ***Chaetopappa asteroides*** (Nuttall) A.P. de Candolle *var.* ***asteroides***, Tiny Lazy-daisy. Cp (SC): waste areas near wool-combing mills; rare, native of sc. United States. Reported by Nesom (2004d). [= FNA, K, SE]

Chamaemelum P. Miller 1754 (Chamomile)

A genus of 2 species, herbs, of the Medterrannean region. References: Cronquist (1980)=SE. [also see *Cladanthus*]

1 Rays white with a yellow base; plant an annual .....***[see Cladanthus mixtus]***
1 Rays white; plant a perennial ..... ***C. nobile***

* ***Chamaemelum nobile*** (Linnaeus) Allioni, Garden Chamomile. Pd (NC): persistent from cultivation in gardens; rare, native of Europe. [= FNA, K; = *Anthemis nobilis* Linnaeus – C, F, G, S, SE]

Chaptalia Ventenat 1802 (Sunbonnets)

A genus of about 60 species, herbs, of warm temperate, subtropical, and tropical America. The remainder of the genus is distributed in the West Indies, Central America, and South America. References: Nesom in FNA (2006a); Vuilleumier (1969)=Z; Nesom (1995a)=Y; Cronquist (1980)=SE.

Identification notes: The basal leaves are distinctive, the undersurface permanently and tightly white floccose, the upper surface floccose when young but glabrate in age, and the margins with obscure denticulations.

Chaptalia tomentosa Ventenat, Sunbonnets, Pineland Daisy, Night-nodding Bog-dandelion, Woolly Sunbonnets. Cp (FL, GA, NC, SC): savannas, sandhill seeps, pine flatwoods; common. February-May. A Southeastern Coastal Plain endemic: e. NC south s. FL and west to e. TX. [= RAB, FNA, GW, K, S, SE, WH, Y, Z]

Chevreulia Cassini 1817

* ***Chevreulia sarmentosa*** (Persoon) S.F. Blake. Cp (SC): waste area near wool-combing mill; rare, native of s. South America. Reported for SC by Nesom (2004d).

Chondrilla Linnaeus 1753 (Skeleton-weed)

A genus of about 25 species, herbs, of temperate Eurasia. References: Gottlieb in FNA (2006a); Cronquist (1980)=SE.

* ***Chondrilla juncea*** Linnaeus, Skeleton-weed, Gum-succory. Pd (DE, GA, VA), Cp (DE, VA), Mt (VA, WV): cultivated fields, disturbed areas, roadsides; uncommon, native of Eurasia. June-August. [= C, F, FNA, G, K, SE]

Chromolaena A.P. de Candolle 1836

A genus of about 165 species, perennial herbs and shrubs, of s. North America, Central America, and South America. References: Nesom in FNA (2006c).

*? ***Chromolaena ivifolia*** (Linnaeus) King & Robinson, Ivy-leaf Thoroughwort. Cp (FL): prairies and fields; rare. August-November. S. FL, Panhandle FL, s. AL, s. MS, TX; West Indies, Mexico, Central America, South America (Woods, Diamond, & Searcy 2003; Kartesz 1999, Nesom in FNA 2006c). [= FNA, K, WH; = *Osmia ivaefolia* (Linnaeus) Schultz 'Bipontinus' – S; = *Eupatorium ivaefolium* – SE, orthographic variant]

Chrysanthemum Linnaeus 1753 (Chrysanthemum)

If circumscribed narrowly, a genus of 3 species, herbs, of n. Africa and Europe. References: Cronquist (1980)=SE; Arriagada & Miller (1997)=Z. [also see *Glebionis, Leucanthemum,* and *Tanacetum*]

* *Chrysanthemum indicum* Linnaeus, Garden Chrysanthemum, is persistent or perhaps naturalized as far south as se. PA (Rhoads & Klein 1993). [= *Dendranthema* ×*grandiflorum* Kitam. – K; *? Dendranthema morifolium* (Ramat.) Tzvelev; *? Chrysanthemum morifolium* Ramat.; *Dendranthema indicum* × *japonicum*]

Chrysogonum Linnaeus 1753 (Green-and-gold)

A genus of 1 species (with varieties), herbs, of se. North America. References: Nesom in FNA (2006c); Nesom (2001b)=Z; Cronquist (1980)=SE. Key based on Nesom (2001b).

1 Plants occurring individually, not producing stolons; earliest flowering stems leafless, later flowering stems leafy; leafy flowering stems mostly 15-35 (-50) cm high; [of e. VA, sc. PA, and se. OH south to se. NC, nc. SC, nw. NC, and sw. VA]..... ***C. virginianum*** *var.* ***virginianum***

1 Plants colonial, forming mats by stolons; flowering stems leafless or leafy; leafy flowering stems (if present) 15-25 cm high; [of ne. SC, sc. NC, nw. NC, ne. TN. and se. KY southward].

2 Earliest flowering stems leafless, mostly 2-10 cm high; later flowering stems leafy, 15-25 cm high; longest stolon internodes 2-6 cm long; [of ne. SC, sc. NC, nw. NC, sw. VA, ne. TN. and se. KY south to e. GA, c. GA, and ec. AL]..... ***C. virginianum*** *var.* ***brevistolon***

2 Earliest flowering stems leafless, 2-10 cm high; later flowering stems leafless as well, 2-10 cm high; longest stolon internodes 12-60 cm long; [of sc. and sw. GA west to e. LA]..... ***C. virginianum*** *var.* ***australe***

Chrysogonum virginianum Linnaeus *var.* ***australe*** (Alexander ex Small) Ahles, Gulf Coast Green-and-gold. Cp (FL, GA): moist to fairly dry woodlands and forests; uncommon (rare in FL). Late March-early June. A Gulf Coastal Plain endemic: sc.

and sw. GA west to e. LA. [= FNA, WH, Z; < *C. virginianum* var. *australe* – RAB, K, SE, W (also see var. *brevistolon*); < *C. australe* Alexander ex Small – S (also see var. *brevistolon*)]

Chrysogonum virginianum Linnaeus *var.* ***brevistolon*** Nesom, Carolina Green-and-gold. Pd (GA, NC, SC), Cp (GA, SC), Mt (GA, NC, SC, VA): moist to fairly dry woodlands and forests; common (rare in VA). Late March-early June. Ne. SC, sc. NC, nw. NC, sw. VA, ne. TN. and se. KY south to e. GA, c. GA, and ec. AL. [= FNA, Z; < *C. virginianum* var. *australe* – RAB, K, SE, W; < *C. australe* Alexander ex Small – S]

Chrysogonum virginianum Linnaeus *var.* ***virginianum***, Northern Green-and-gold, Virginia Green-and-gold. Cp (NC, SC, VA), Pd (NC, VA), Mt (VA, WV): moist to fairly dry woodlands and forests; common (uncommon in WV). Late March-early June. E. VA, sc. PA, and se. OH south to se. NC, nc. SC, nw. NC, and sw. VA. [= RAB, C, FNA, K, SE, W, Z; = *C. virginianum* – S]

Chrysoma Nuttall 1834 (Woody Goldenrod)

A monotypic genus, a shrub, of se. North America. References: Nesom in FNA (2006b); Nesom (2000b); Cronquist (1980)=SE.

Chrysoma pauciflosculosa (Michaux) Greene, Woody Goldenrod. Cp (FL, GA, NC, SC): xeric sands of very barren, open, white-sand sandhills, in our area primarily on fluvial dunes, and less commonly in the fall-line Sandhills; uncommon (rare north of FL). Late July-October. S. NC south to n. FL and west to s. MS. *Chrysoma* has a growth habit unlike any other shrub in our flora. From a trunk-like base, numerous branches ascend, forming a flat-topped shrub 3-5 dm tall. Each branch has a cluster of evergreen leaves restricted to its terminal few cm, the internodes very short (a few mm at most). In summer, some of the woody branches produce terminal, deciduous, flowering branches, which elongate rapidly, the leaves widely spaced, reaching a height of a meter or more. Following flowering and fruiting, the deciduous branches die back to the summit of the woody branches. The leaves are gray-green, rather thick-textured, and finely reticulate, the reticulations giving an appearance rather like anole skin. The midrib is prominent below, almost invisible on the upper surface. Godfrey (1988) has an excellent drawing and description of this distinctive shrub. [= FNA, K, S, SE, WH; = *Solidago pauciflosculosa* Michaux – RAB; = *Chrysoma solidaginoides* Nuttall]

Chrysopsis (Nuttall) Elliott 1823 (Golden-aster)

A genus of about 10 species, herbs, of se. North America, Mexico, and the Bahamas. This remains a difficult and rather poorly understood group. The appropriate taxonomic status of many of the entities remains unclear; for the moment, I am recognizing a number of entities at the specific level that should perhaps be recognized at lower taxonomic levels; in some cases, the appropriate nomenclatural combinations are not already available. References: Semple in FNA (2006b); Semple (1981)=Z; Harms (1974)=Y; Semple (1996)=X; Cronquist (1980)=SE; Nesom (2000b); DeLaney, Wunderlin, & Semple (2003). Key adapted from Semple (1981). [also see *Heterotheca* and *Pityopsis*]

1 Stem, leaves, and phyllaries sparsely to densely pubescent with spreading non-glandular hairs as well has having minutely glandular pubescence; annuals with taproots; [section *Bradburia*] ..... ***C. pilosa***
1 Stems, leaves, and phyllaries various but lacking spreading non-glandular hairs; biennials or perennials, either fibrous-rooted or with a mostly short and quickly disintegrating taproot; [section *Chrysopsis*].
  2 Peduncles and phyllaries glabrous or the outer phyllaries basally with a few stipitate glands; achenes usually with raised yellow-red translucent ribs.
    3 Stems erect; leaf margins serrate-ciliate, the surfaces sparsely pubescent to glabrous; all phyllaries glabrous ..... ***C. hyssopifolia***
    3 Stems decumbent to ascending; leaf margins entire, either eciliate and glabrous, or sometimes ciliate with glabrate to sparsely woolly surfaces; phyllaries either glabrous and glandular punctate or the outer basally stipitate-glandular.
      4 Stem leaves glabrous and eciliate (but rosette leaves densely woolly), lower stem leaves absent at flowering; outer phyllaries with a few stipitate glands basally, the involucre otherwise glabrous ..... ***C. cruiseana***
      4 Stem leaves eciliate or ciliate, the surfaces glabrate to sparsely woolly, the hairs often only or mostly near the margin, lower stem leaves usually present at flowering; phyllaries glabrous, glandular-punctate ..... ***C. trichophylla***

{Add *linearifolia* under 2a}

  2 Peduncles and phyllaries evidently stipitate-glandular or woolly-hairy, or both; achenes with or without raised yellow-red translucent ribs.
    5 Upper stem leaves woolly-hairy; not stipitate-glandular; peduncles and involucres sparsely pubescent to woolly, sometimes stipitate-glandular as well.
      6 Stems decumbent; inflorescence loosely corymbose-cymose, buds not nodding; peduncles stipitate-glandular or not, ligules 7-12 mm long; achenes sparsely to moderately strigose, usually with raised yellow-red translucent ribs; [of se. VA to FL] ..... ***C. gossypina***
      6 Stems decumbent to ascending; inflorescence corymbose, buds nodding; peduncles densely stipitate-glandular, ligules 10-15 mm long; achenes densely strigose, lacking raised yellow-red translucent ribs; [of barrier islands of w. FL Panhandle] ..... ***C. godfreyi***
    5 Upper stem leaves arachnoid to glabrate or densely stipitate-glandular; peduncles and involucres stipitate-glandular but otherwise glabrous.
      7 Upper stem leaves lacking stipitate glands, either arachnoid to glabrate, or woolly ..... ***C. mariana***
      7 Upper stem leaves densely stipitate-glandular, not woolly.
        8 Stems decumbent to ascending; leaves lanceolate; inflorescence compactly corymbose; involucres 9-12 mm long; phyllaries acute to attenuate; ligules 10-15 mm long ..... ***C. godfreyi***
        8 Stems erect; leaves linear-elliptic; inflorescence open flat-topped corymbose; involucres 6-9 mm long; phyllaries obtuse; ligules 6-8 mm long ..... ***C. scabrella***

{Add *lanuginosa* & *latisquamea* under 2b}

Chrysopsis cruiseana Dress. Cp (AL, FL): coastal sand dunes. October-December. FL Panhandle and s. AL. [= *Chrysopsis gossypina* (Michaux) Elliott ssp. *cruiseana* (Dress) Semple – FNA, K, WH, Z] {add synonymy}

Chrysopsis godfreyi Semple. Cp (AL, FL): coastal sand dunes. November-December. FL Panhandle and s. AL. Plants with densely stipitate-glandular, non-woolly upper stem leaves have been treated as forma *viridis* (Semple 1981). [= FNA, K, WH, Z] {add synonymy}

Chrysopsis gossypina (Michaux) Elliott, Cottonleaf Golden-aster. Cp (FL, GA, NC, SC, VA): sandhills, coastal dunes, other dry sandy places; common (rare in VA). September-October. Se. VA south to c. peninsular FL and sw. GA. [< *Chrysopsis gossypina* ssp. *gossypina* – FNA, K, WH, Z; < *Heterotheca gossypina* (Michaux) Shinners – RAB (also see *C. pilosa*); < *C. gossypina* – C, G, SE; > *C. longii* Fernald – F; >< *C. arenicola* Alexander – S; > *C. decumbens* Chapman – S; > *C. pilosa* – S, misapplied; < *Heterotheca gossypina* (Michaux) Shinners – Y]

Chrysopsis hyssopifolia Nuttall. Cp (FL): dry sands; uncommon. October-December. N. FL peninsula west to FL Panhandle, s. AL, s. MS, and se. LA. [= SE; = *Chrysopsis gossypina* (Michaux) Elliott ssp. *hyssopifolia* (Nuttall) Semple – FNA, K, WH, Z; > *Chrysopsis hyssopifolia* – S; > *Chrysopsis gigantea* Small – S; = *Heterotheca hyssopifolia* (Nuttall) Harms – Y]

Chrysopsis mariana (Linnaeus) Elliott, Maryland Golden-aster. Cp (DE, GA, NC, SC, VA), Pd (DE, GA, NC, SC, VA), Mt (GA, NC, SC, VA, WV): dry forests and woodlands, roadsides, other dry habitats; common. Late June-October. Se. NY west to se. OH, c. KY, w. TN, south to c. peninsular FL and se. TX. [= C, FNA, G, K, S, SE, W, WH, Z; = *Heterotheca mariana* (Linnaeus) Shinners – RAB, Y; > *Chrysopsis mariana* var. *mariana* – F; > *C. mariana* var. *macradenia* Fernald – F]

* ***Chrysopsis pilosa*** Nuttall. Cp (FL, GA?, NC, SC, VA): sandy roadsides; rare, introduced from a primary, native range from s. MO and se. KS, south to TX. See Anderson (2007) for FL record. [= F, G, K, SE, Z; < *Heterotheca gossypina* (Michaux) Shinners – RAB; = *Heterotheca pilosa* (Nuttall) Shinners – Y; = *Bradburia pilosa* (Nuttall) Semple – FNA, X]

* ***Chrysopsis scabrella*** Torrey & A. Gray. Cp (NC?, SC): sandy roadsides; rare, presumably introduced from FL (but possibly native and disjunct). [= FNA, K, SE, S, WH, Z; < *Chrysopsis scabrella* – SE; = *Heterotheca scabrella* (Torrey & A. Gray) Harms – Y]

Chrysopsis trichophylla (Nuttall) Elliott. Cp (GA?, NC, SC): sandhills, sandy roadsides, coastal dunes; rare (NC Watch List). The taxon treated by many authors as *C. trichophylla* was reduced to a form by Semple (1981), as *C. gossypina* ssp. *gossypina* f. *trichophylla* (Nuttall) Semple. He suggests, though, that varietal status may be warranted. Plants in SC previously identified as *C. cruiseana* are referrable to *C. trichophylla*. [= SE; = *Heterotheca trichophylla* (Nuttall) Shinners – RAB; < *Chrysopsis gossypina* ssp. *gossypina* – FNA, K, Z; < *C. gossypina* – C, G; > *C. trichophylla* – S; >< *C. arenicola* Alexander – S; >< *C. pilosa* – S, misapplied; < *Heterotheca gossypina* (Michaux) Shinners – Y]

Chrysopsis lanuginosa Small, Lynn Haven Goldenaster. Cp (FL): dry pinelands; rare. Endemic to FL Panhandle. [= FNA, K, WH; < *Chrysopsis scabrella* Torrey & A. Gray – SE] {not yet keyed; synonymy incomplete}

Chrysopsis latisquamea Pollard. Cp (FL): sandhills; uncommon. Ne. FL south to c. peninsular FL. [= FNA, K, SE, WH; = *Heterotheca latisquamea* (Pollard) V.L. Harms] {not yet keyed; synonymy incomplete}

Chrysopsis linearifolia Semple. Cp (FL): scrub, sandhills; uncommon. Endemic to FL Panhandle. [= *Chrysopsis linearifolia* ssp. *linearifolia* – FNA, K, WH] {not yet keyed; synonymy incomplete}

Cichorium Linnaeus 1753 (Chicory)

A genus of 7 species, herbs, of Europe and n. Africa. References: Strother in FNA (2006a); Cronquist (1980)=SE; Kiers (1999)=Z.

* ***Cichorium intybus*** Linnaeus, Chicory, Succory, Blue-sailors. Mt (GA, NC, SC, VA, WV), Pd (DE, GA, NC, SC, VA), Cp (DE, FL, NC, SC, VA): roadsides, fencerows, vacant lots, disturbed areas; common (rare in FL), native of Europe. Late May-November. The dried roasted root is used as a flavoring or substitute for coffee. See Anderson (2007) for FL record. [= RAB, C, F, FNA, G, K, S, SE, W, WH, Z]

Cirsium P. Miller 1754 (Thistle)

A genus of about 250 species, herbs, north temperate. References: Keil in FNA (2006a); Cronquist (1980)=SE. Key adapted in part from SE.

1 Plant colonial from creeping rhizomes; heads 13-20 (-25) mm high; phyllaries all lacking spine tips, or the outermost tipped with spines < 1 mm long; plant perennial; [alien weeds, generally in altered habitats] ..... ***C. arvense***

1 Plant not colonial; heads 25-50 mm high (as small as 15-25 mm in *C. carolinianum, C. nuttallii, C. muticum,* and *C. virginianum*); phyllaries mostly spine-tipped, with at least some of the spines > 1 mm long (except sometimes mostly or entirely spine free in *C. muticum*); plant biennial (to weakly perennial); [native (except *C. vulgare*), in natural or some species also in disturbed habitats].

2 Leaves decurrent onto the stem below, the decurrency extending as a wing at least several cm down the stem, and often to the leaf below; leaves scabrous-hispid above; phyllaries lacking a glutinous dorsal ridge; [alien weed] ..... ***C. vulgare***

2 Leaves not decurrent as a conspicuous wing, or the decurrency extending < 1 cm (sometimes more decurrent in *C. lecontei*); leaves not scabrous-hispid above; [native, sometimes in disturbed habitats].

3 Phyllaries lacking spine tips (the outermost sometimes with a weak spine-tip to 0.5 mm long); leaves deeply lobed, to 55 cm long and 20 cm wide ..... ***C. muticum***

3 Phyllaries (at least the outer and middle) with well-developed spine-tips > 1 mm long; leaves lobed or merely toothed, generally < 30 cm long and < 10 cm wide (except in *C. altissimus*).

4 Heads immediately subtended by several spiny-toothed leaves (appearing as a leafy involucre); flowers yellow, white, or purple.
5 Involucres more-or-less densely tomentose; stems densely tomentose; [of the Coastal Plain and Piedmont]..... ***C. horridulum** var. **horridulum***
5 Involucres glabrous; stems glabrous or sparsely tomentose; [of the Coastal Plain].
6 Leaves shallowly to deeply pinnatifid; main spines of the leaves 10-30 mm long; [of s. AL and Panhandle FL westward] ..... ***[C. horridulum var. megacanthum]***
6 Leaves spinose-dentate to shallowly pinnatifid; main spines mostly 5-10 mm long; [widespread in the Coastal Plain] ..... ***C. horridulum** var. **vittatum***
4 Heads pedunculate (rarely with 1 or 2 reduced leaves below); flowers pink, purple, lavender, or white.
7 Lower surface of the leaves densely white-tomentose beneath, this persistent and entirely obscuring the green surface.
8 Heads 15-25 mm high; plants 4-15 dm tall; larger leaves < 5 cm wide.
9 Cauline leaves mostly 10-25; plants flowering April-June; [of dry soils of the Piedmont] ..... ***C. carolinianum***
9 Cauline leaves mostly 30-70; plants flowering August-October; [of moist to dry soils of the Coastal Plain (and rarely the lower Piedmont in association with other Coastal Plain species, such as *Pinus palustris*)]..... ***C. virginianum***
8 Heads 25-35 mm high; plants 10-40 dm tall; larger leaves usually > 5 cm wide.
10 Leaves toothed or shallowly lobed ..... ***C. altissimum***
10 Leaves deeply pinnatifid ..... ***C. discolor***
7 Lower surface of the leaves thinly and loosely white-tomentose beneath, this sloughing off in age, the green surface visible through the tomentum except on very small, young leaves.
11 Heads 15-25 mm high; plants 5-35 dm tall, usually much branched and with numerous heads ..... ***C. nuttallii***
11 Heads 25-50 mm high; plants 2-10 dm tall, usually strict or few-branched and with 1 or a few heads.
12 Heads on well-developed peduncles; [of moist to wet pinelands of the Coastal Plain from NC and SC south] ..... ***C. lecontei***
12 Heads on short peduncles; [of various habitats, mostly inland from the Coastal Plain, or of dry pinelands of the Coastal Plain].
13 Plants generally with well-developed, persistent basal leaves; cauline leaves with internodes usually > 2 cm; [of various habitats, mostly inland from the Coastal Plain] ..... ***C. pumilum***
13 Plants lacking well-developed basal leaves; cauline leaves with internodes mostly 0.5-2 cm long; [of dry pinelands of the Coastal Plain]..... ***C. repandum***

Cirsium altissimum (Linnaeus) Hill, Tall Thistle. Mt (GA, NC, SC, VA, WV), Pd (DE, GA, NC, SC, VA), Cp (FL, GA): pastures, woodlands, thickets; uncommon (rare in DE, FL, and VA). September-November. MA west to ND, south to Panhandle FL (Jackson County) and TX. [= C, F, FNA, G, K, S, SE, W, WH; = *Carduus altissimus* Linnaeus – RAB]

* ***Cirsium arvense*** (Linnaeus) Scopoli, Canada Thistle, Field Thistle. Mt (NC, VA, WV), Pd (DE, Cp (DE): pastures, disturbed areas; common (uncommon in NC and VA), native of Europe. July-November. Two varieties are often recognized: var. *arvense*, with leaves shallowly undulate-lobed and with only a few fine marginal prickles, and var. *horridum*, with leaves strongly sinuate-pinnatifid and with numerous well-developed marginal prickles. [= FNA, K, S, W; = *Carduus arvensis* (Linnaeus) Robson – RAB; > *C. arvense* var. *arvense* – C, G, SE; > *Cirsium arvense* (Linnaeus) Scopoli var. *horridum* Wimmer & Gräbner – C, G, SE; > *Cirsium arvense* var. *mite* Wimmer & Gräbner – F; > *Cirsium arvense* var. *arvense* – F, misapplied; = *Breea arvense* (Linnaeus) Lessing]

Cirsium carolinianum (Walter) Fernald & Schubert, Carolina Thistle, Spring Thistle. Pd (GA, NC, SC, VA), Mt (GA): prairies, open woodlands over mafic, ultramafic, or calcareous rocks; rare. April-June (-July). N. VA west to s. OH and MO, south to w. SC, n. GA, AL, and TX. In our area, *C. carolinianum* seems to be restricted to prairies and woodlands (or maintained powerline or road rights-of-way) over circumneutral rocks and soils, in situations which were oak savannas or even prairies prior to fire suppression. [= C, F, FNA, G, K, SE, W; = *Carduus carolinianus* Walter – RAB; > *Cirsium flaccidum* Small – S; > *Cirsium virginianum* – S, misapplied]

Cirsium discolor (Muhlenberg ex Willdenow) Sprengel, Field Thistle. Mt (NC, SC, VA, WV), Pd (DE, GA, NC, VA), Cp (DE, VA): pastures, woodlands, thickets; common. August-November. QC west to MB, south to NC, MS, LA, and KS. [= C, F, FNA, G, K, S, SE, W; = *Carduus discolor* (Muhlenberg ex Willdenow) Nuttall – RAB]

Cirsium horridulum Michaux *var.* ***horridulum***, Common Yellow Thistle. Cp (DE, FL?, GA, NC, SC, VA), Pd (DE, GA, NC, SC, VA), Mt (GA, NC, SC): roadsides, woodlands, pine savannas; common (rare in DE and VA Piedmont, rare in Mountains). Late March-early June. ME south to FL, west to TX, mostly on the Coastal Plain and adjacent provinces; also in Mexico. [= C, K, SE; = *Carduus spinosissimus* Walter – RAB; < *Cirsium horridulum* – F, G, WH; < *Cirsium horridulum* complex – GW; = *Cirsium horridulum* – S]

Cirsium horridulum Michaux *var.* ***megacanthum*** (Nuttall) D.J. Keil, Bigspine Thistle. Cp (AL, FL): moist ground; uncommon. AL and Panhandle FL west to TX and OK. [= FNA; < *Cirsium horridulum* complex – GW; < *Cirsium horridulum* var. *vittatum* – K, SE; > *Cirsium vittatum* – S; < *Cirsium horridulum* – WH]

Cirsium horridulum Michaux *var.* ***vittatum*** (Small) R.W. Long, Southern Yellow Thistle. Cp (FL, GA?, NC, SC): wet pine savannas; uncommon. May-July. Se. NC south to s. peninsular FL and Panhandle FL. [= *Carduus smallii* (Britton) Ahles – RAB; < *Cirsium horridulum* complex – GW; < *Cirsium horridulum* var. *vittatum* – K, SE; > *Cirsium smallii* Britton – S; > *Cirsium vittatum* Small – S; < *Cirsium horridulum* – WH]

Cirsium lecontei Torrey & A. Gray, LeConte's Thistle. Cp (FL, GA, NC, SC): wet pine savannas, bogs; uncommon (rare in GA, NC, SC). June-August. E. NC south to Panhandle FL, west to LA. [= FNA, GW, K, S, SE, WH; = *Carduus lecontei* (Torrey & A. Gray) Pollard – RAB]

Cirsium muticum Michaux, Swamp Thistle. Cp (DE, FL, NC, SC, VA), Mt (GA, NC, VA, WV), Pd (DE, NC, VA): swamps, wet thickets, woodlands, seepage slopes, wet prairies, meadows; uncommon (rare in DE, FL, and GA, VA Piedmont and Coastal Plain). August-November. NL (Newfoundland) west to SK, south to DE, NC, TN, and MO, and less commonly south to FL, AL (Diamond & Woods 2009), and TX. [= C, FNA, G, GW, K, S, SE, W, WH; = *Carduus muticus* (Michaux) Persoon – RAB; > *Cirsium muticum* var. *muticum* – F]

Cirsium nuttallii A.P. de Candolle, Coastal Tall Thistle. Cp (FL, GA, NC, SC, VA): pine savannas, roadsides, pastures; uncommon (rare in VA). June-August. Se. VA south to FL, west to LA; reported for the first time from NC (Krings, Westbrooks, & Lloyd 2002). [= C, F, FNA, G, GW, K, S, SE, WH; = *Carduus nuttallii* (A.P. de Candolle) Pollard – RAB]

Cirsium pumilum (Nuttall) Sprengel, Pasture Thistle. Pd (DE, NC, VA), Cp (DE, VA), Mt (VA, WV): pastures, thickets, and woodlands, perhaps especially over mafic rocks; uncommon (rare in Coastal Plain south of DE). Late May-July. S. ME west to w. NY, south to DE, and w. NC. [= C, F, G, K, SE, W; = *Carduus pumilus* Nuttall – RAB; = *Cirsium pumilum* var. *pumilum* – FNA; = *Cirsium odoratum* (Muhlenberg ex W. Bart.) Petrak – S]

Cirsium repandum Michaux, Sandhill Thistle. Cp (GA, NC, SC, VA): sandhills, other dry sandy habitats; common (rare in VA). May-July. Se. VA south to e. GA, nearly endemic to the Carolinas. Similar in distribution to *Vaccinium crassifolium, Carphephorus bellidifolius,* and *Baptisia cinerea*, which are all locally abundant endemic indicators of Carolina pinelands. [= C, FNA, G, K, S, SE; = *Carduus repandus* (Michaux) Persoon – RAB]

Cirsium virginianum (Linnaeus) Michaux, Virginia Thistle. Cp (DE, FL, GA, NC, SC, VA), Pd (NC): moist to fairly dry pine savannas, bogs; uncommon (rare in DE and VA). August-October. S. NJ south to ne. FL, on the Coastal Plain. [= C, F, FNA, G, GW, K, SE, WH; = *Carduus virginianus* Linnaeus – RAB; = *Cirsium revolutum* (Small) Petrak – S]

* ***Cirsium vulgare*** (Savi) Tenore, Bull Thistle. Mt (GA, NC, SC, VA, WV), Pd (DE, GA, NC, SC, VA), Cp (DE, FL, NC, VA): meadows, pastures, and disturbed areas; common (rare in FL, uncommon in DE Piedmont), native of Europe. Late June-November. [= C, F, FNA, G, K, SE, W, WH; < *Carduus lanceolatus* Linnaeus – RAB; < *Cirsium lanceolatum* (Linnaeus) Scopoli – S, misapplied]

Cladanthus Cassini 1816

A genus of about 5 species, herbs, of the Mediterranean region. References: Watson in FNA (2006a).

* ***Cladanthus mixtus*** (Linnaeus) Chevallier. Cp (FL), Pd (NC): disturbed areas; rare, native of Europe. June. [= FNA; = *Anthemis mixta* Linnaeus – C, F, G, SE; = *Chamaemelum mixtum* (Linnaeus) Allioni – K, WH; = *Ormenis mixta* (Linnaeus) Dumortier – S]

Conoclinium A.P. de Candolle 1836 (Mistflower)

A genus of 4 species, of e. and c. North America extending into Mexico. References: Patterson & Nesom in FNA (2006c); Schmidt & Schilling (2000).

Conoclinium coelestinum (Linnaeus) A.P. de Candolle, Mistflower, Ageratum. Cp (DE, FL, GA, NC, SC, VA), Pd (GA, NC, SC, VA), Mt (GA, NC, SC, VA, WV): moist to wet disturbed areas, especially ditches; common (uncommon in Piedmont of NC and SC, rare in Mountains of GA, NC, SC, and VA), probably more common than formerly. Late July-October. NJ west to IL, c. MO, se. KS, and OK, south to s. FL and c. TX; also in Cuba, and scattered further north (as in NY, n. OH, and n. IN) probably as escapes from cultivation. See Wooten & Clewell (1971) for further discussion of this species. [= FNA, K, WH; = *Eupatorium coelestinum* Linnaeus – RAB, C, F, G, SE, W, WV]

Conyza Lessing 1832 (Horseweed)

A genus of about 60 species, herbs, shrubs, and trees, of temperate, subtropical, and tropical regions. Recent molecular studies have indicated the likely polyphyly of *Conyza* and its close relationship with *Erigeron*; the ultimate circumscription of these genera is in doubt (Nesom 2000b, Noyes 2000). References: Strother in FNA (2006b); Cronquist (1980)=SE; Nesom (2000b). Key based in part on SE.

1 Plants diffusely branched from the base and throughout; plants 1-2.5 (-3) dm tall ..... ***[C. ramosissima]***
1 Plants with a well-developed central axis, sparingly branched (unless mowed or otherwise injured); plants 1-15 dm tall.
  2 Involucre 4-6 mm high, densely pubescent; pistillate flowers (50-) 70-200 or more per head..... ***C. bonariensis***
  2 Involucre 3-4 mm high, glabrous or very sparsely pubescent; pistillate flowers mostly 25-45 per head.
    3 Stem coarsely spreading-hirsute; leaves ciliate, the larger generally with a few to many coarse teeth; phyllaries green-tipped ..... ***C. canadensis*** *var.* ***canadensis***
    3 Stem glabrous or with widely scattered, appressed hairs; leaves with a few cilia toward the base, generally entire; phyllaries purple-tipped ..... ***C. canadensis*** *var.* ***pusilla***

* ***Conyza bonariensis*** (Linnaeus) Cronquist, South American Horseweed. Cp (FL, GA, NC, SC, VA), Pd (SC): fields, disturbed areas; uncommon, apparently native of South America. April-October. Se. VA south into the tropics. [= C, FNA, K, SE, WH; = ***Erigeron bonariensis*** Linnaeus – RAB, F; = *Conyza floribunda* Kunth – G, misapplied; > *Leptilon bonariense* (Linnaeus) Small – S; > *Leptilon linifolium* (Willdenow) Small – S]

Conyza canadensis (Linnaeus) Cronquist *var.* ***canadensis***, Common Horseweed. Cp (DE, FL, GA, NC, SC, VA), Pd (DE, GA, NC, SC, VA), Mt (GA, NC, SC, VA, WV): old fields, disturbed areas, gardens; common. July-November. S. Canada south through nearly all of the United States to tropical America. [= C, G, K, SE, W, WH; = *Erigeron canadensis* Linnaeus var. *canadensis* – RAB; < *C. canadensis* – FNA; = ***Erigeron canadensis*** – F; = *Leptilon canadense* (Linnaeus) Britton – S; < *Erigeron canadensis* – WV]

Conyza canadensis (Linnaeus) Cronquist *var.* ***pusilla*** (Nuttall) Cronquist, Southern Horseweed. Cp (DE, FL, GA, NC, SC, VA), Pd (DE, GA, NC, SC, VA), Mt (GA, NC, SC, VA, WV): dunes, old fields, disturbed areas; common (rare in WV). (May-) July-December. Se. MA and CT west to s. IN, south to FL and TX, and south into tropical America. [= C, G, K, SE, W, WH; = *Erigeron canadensis* Linnaeus var. *pusillus* (Nuttall) Boivin – RAB; < *C. canadensis* – FNA; **= *Erigeron pusillus*** Nuttall – F; = *Leptilon pusillum* (Nuttall) Britton – S; = *Conyza parva* Cronquist]

* *Conyza floribunda* Kunth. Reported as introduced in GA, AL, and MS by Kartesz (1999), probably on the basis of confusion with *C. bonariensis*. [= FNA, K] {rejected; not keyed}

Conyza ramosissima Cronquist. Weedy situations. OH west to MN, south to KY, ec. TN (Chester, Wofford, & Kral 1997), ne. AL, LA, and TX. [= C, FNA, G, K, SE; = *Erigeron divaricatus* Michaux – F; = *Leptilon divaricatum* (Michaux) Rafinesque – S]

Coreopsis Linnaeus 1753 (Coreopsis, Tickseed)

[contributed by Alan S. Weakley and Bruce A. Sorrie]

A genus of about 50 species, herbs, of America. Recent molecular studies suggest that the relationship between *Bidens* and *Coreopsis* (as traditionally circumscribed) is complex, and that changes in taxonomy will be needed to more accurately reflect relationships (Kim et al. 1999; Crawford & Mort 2005). References: Strother in FNA (2006c); Smith (1976)=Z; Sherff & Alexander (1955)=Y; Cronquist (1980)=SE. Key adapted from Y and Z.

1 Disk flowers with 4 corolla lobes and 4 anthers; ray flowers usually apically 3-lobed.
- 2 Leaves pinnately or bipinnately lobed into linear segments or narrowly lanceolate segments; [section *Calliopsis*] ..... ***C. tinctoria*** *var.* ***tinctoria***
- 2 Leaves simple or with 1-2 auriculate lobes at the base; [section *Eublepharis*].
  - 3 All of the major cauline leaves opposite (except in *C. linifolia* the lowermost few leaves may be alternate).
    - 4 Ray flowers pink (white); plant rhizomatous ..... ***C. rosea***
    - 4 Ray flowers yellow; plant fibrous-rooted.
      - 5 Leaf blades ovate (to elliptical), very gradually reduced upward, margins ciliolate, surfaces lacking tiny dark dots; achenes about 5 mm long; [se. SC south to Panhandle FL] ..... ***C. integrifolia***
      - 5 Leaf blades linear-oblanceolate to linear, rapidly reduced upward, margins glabrous, surfaces with numerous tiny dark dots (easiest to see on undersurface); achenes < 2.5 mm long; [se. VA south to ne. and Panhandle FL, west to e. TX] ..... ***C. linifolia***
  - 3 All of the major cauline leaves alternate.
    - 6 Ray flowers pink; leaves juncoid (linear-terete) ..... ***C. nudata***
    - 6 Ray flowers yellow; leaves with an expanded blade.
      - 7 Outer phyllaries deltoid and very short, less than 0.3× as long as the inner phyllaries; flowering late September-January; [endemic to FL] ..... ***C. floridana***
      - 7 Outer phyllaries lanceolate, 0.4-0.8× as long as the inner phyllaries; flowering various but not past early November; [collectively widespread].
        - 8 Basal/lower leaves (at least 4 nodes) absent at anthesis; mid-cauline leaves broadly (to narrowly) elliptical; achene awns average 0.85 mm; [swamp forests and streamside openings, fresh-tidal creek margins, from se. NC south to n. FL]
          - 9 Leaves 4-15 cm long, 10-45 mm wide, the blades broadly to narrowly elliptical, 5-15× as long as wide; achene awns 0.7-1.0 mm long ..... ***C. helianthoides***
          - 9 Leaves 8-15+ cm long, 2-7 mm wide, the blades linear to linear-oblanceolate, 20-50× as long as wide; achene awns 0.2-0.4 mm long ..... ***C. species 1***
        - 8 Basal/lower leaves present at anthesis; leaves rapidly reduced upwards such that mid-cauline leaves are narrow or slender; achene awns various; [wet savannas, seepage slopes, pitcher-plant bogs, streamhead ecotones, pocosin ecotones, collectively more widespread].
          - 10 Leaves (at least one major leaf per plant) with 1-few slender auricles near base (rarely no auricled leaves present or at least readily visible); achene wing broad, >3/4 width of achene body; achene awns averaging 0.5 mm; leaf texture firm but not thick and leathery; flowering early May-early July; [se. VA south to e. GA] ..... ***C. falcata***
          - 10 Leaves without auricles; achene wing narrow, < ½ the width of the achene body; achene awns averaging 1.5 mm long; leaf texture thick and leathery; flowering mid August-early November; [se. NC south to c. FL and west to s. MS; also rarely inland in GA, NC, SC, off the Coastal Plain] ..... ***C. gladiata***

1 Disk flowers with 5 corolla lobes and 5 anthers; ray flowers apically entire, or with (2-) 4-5 teeth.
- 11 All of the leaves simple or the plant with a mixture of simple leaves and leaves with 1-2 (-4) basal auricles or leaflets, these distinctly smaller than the terminal lobe or leaflet.
  - 12 Leaves all simple, 4-12 cm wide, the margins coarsely serrate (some of the lower leaves sometimes pinnately lacerate basally); [section *Silphidium*] ..... ***C. latifolia***
  - 12 Leaves simple, usually (but not always) some of the leaves on a plant with basal auricles or lobes, the leaf blades (or terminal leaflets) 0.5-3.5 cm wide, the margins entire; [section *Coreopsis*].
    - 13 Stems with 1-5 (-8) nodes between the first node > 1 cm above the basal leaves and the first head.
      - 14 Plants spreading by elongate stolons; leaf blades (or terminal leaflets) 1-2.2× as long as wide ..... ***C. auriculata***
      - 14 Plants lacking stolons; leaf blades (or terminal leaflets) > 3× as long as wide (basal leaves sometimes broader) ..... ***C. lanceolata***
    - 13 Stems with (5-) 6-12 nodes between the first node > 1 cm above the basal leaves and the first head.
      - 15 Leaf blades (or terminal leaflets) more or less broadly elliptical, ca. 1.5-4 cm wide, acute; stem (and often also the leaves) rather densely hairy (to glabrate) ..... ***C. pubescens*** *var.* ***pubescens***
      - 15 Leaf blades (or terminal leaflets) narrowly elliptical to oblanceolate, ca. 0.6-2 cm wide, acuminate; stem and leaves glabrous ..... ***C. pubescens*** *var.* ***robusta***

11 Most or all of the leaves deeply lobed or dissected into distinct leaflets or divisions, the leaflets or divisions 3-20 or more, if only 3, then the lateral leaflets nearly or fully as large and well-developed as the terminal.
16 Leaves sessile or with a short subpetiolar base < 2 mm long, the initial division of the leaves palmate into 3 leaflets (these sometimes further divided), giving the 2 opposite leaves the superficial appearance of a whorl of 6 leaves; [section *Gyrophyllum*].
17 Leaves palmately 3-foliolate (rarely simple or 3-foliolate with the middle leaflet 2- or 3-lobed), the total number of leaflets or divisions thus 3 (-5), the middle leaflet of median leaves 5-30 mm wide.
18 Leaf blades rather densely short-pubescent; outer phyllaries rather densely short-pubescent; middle leaflet of median leaves 10-30 mm wide; leaflets herbaceous ..... ***C. major*** *var.* ***major***
18 Leaf blades slightly short-pubescent to glabrous; outer phyllaries slightly short-pubescent to glabrous; middle leaflet of median leaves 5-10 (-12) mm wide; leaflets subcoriaceous and stiff ..... ***C. major*** *var.* ***rigida***
17 Leaves palmately compound, the leaflets simple to lobed or pinnatifid, the total number of leaflets or divisions (3-) 5-25, the middle leaflet of median leaves 0.5-7 mm wide.
19 Leaflets usually lobed (rarely simple), the total number of leaflets or divisions (3-) 5-11 (-15) per leaf, the segments of median leaves (1.5-) 2-7 (-9) mm wide ..... ***C. delphiniifolia***
19 Leaflets pinnatifid, the total number of leaflets or divisions 11-25 or more per leaf, the segments of median leaves 0.2-1.2 mm wide ..... ***C. verticillata***
16 Leaves, at least the lower, distinctly petioled on petioles 5-50 mm or more long.
20 Ray flowers not toothed terminally (or rarely with a few with inconspicuous and irregular teeth); mid-cauline leaves palmately 3-foliolate, the terminal leaflet sometimes again 3-5-foliolate (sometimes giving an appearance of a pinnately 5-7-foliolate leaf), the leaflets 6-35 mm wide, 3-15× as long as wide; [section *Gyrophyllum*] ..... ***C. tripteris***
20 Ray flowers apically with (2-) 4-5 teeth; mid-cauline leaves pinnately 5-11-foliolate, the leaflets either 3-15 mm wide and about 1-3× as long as wide, or 0.5-2 mm wide and > 20× as long as wide; [section *Coreopsis*].
21 Disk flowers reddish; ray flowers usually with a basal red mark; leaflets of mid-cauline leaves 3-15 mm wide and about 1-3× as long as wide ..... ***C. basalis***
21 Disk flowers yellow; ray flowers yellow; leaflets of mid-cauline leaves 0.5-6 (-10) mm wide and > 10× as long as wide.
22 Achene wings fimbriate; [of granitic outcrops of the Piedmont of GA and AL] ..... ***C. grandiflora*** *var.* ***saxicola***
22 Achene wings entire; [collectively more widespread].
23 Divisions of the midstem and upper cauline leaves with 1-3 divisions; plants reclining; flowering late June-July; [of dolomite glades in c. AL] ..... ***[C. grandiflora*** *var.* ***inclinata]***
23 Divisions of the midstem and upper cauline leaves with > 5 divisions; plants erect; flowering May-late June; [of granite outcrops and disturbed areas].
24 Larger divisions of midstem and upper stem leaves 2-6 (-10) mm wide ..... ***C. grandiflora*** *var.* ***grandiflora***
24 Larger divisions of midstem and upper stem leaves 0.5-1.5 mm wide ..... ***C. grandiflora*** *var.* ***harveyana***

Coreopsis auriculata Linnaeus, Lobed Coreopsis. Pd (GA, NC, SC, VA), Cp (GA, NC, SC, VA), Mt (GA, NC, SC, VA, WV): moist slopes and woodlands; common (rare in Coastal Plain and Mountains). April-June. C. and ne. VA, s. WV, and KY south to MS, AL, and GA. [= RAB, C, F, FNA, G, K, S, SE, W, WV, Y, Z]

* ***Coreopsis basalis*** (A. Dietrich) Blake, Texas Coreopsis. Cp (FL, GA, NC, SC), Pd (GA): sandy roadsides and fields; common (uncommon in FL), native of farther west. May-July. Probably native only to e. TX, now distributed across the Coastal Plain from TX east to FL and north to NC. [= RAB, C, F, FNA, G, K, SE, WH, Z; > *C. basalis* var. *basalis* – Y]

Coreopsis delphiniifolia Lamarck, Larkspur Coreopsis. Cp (GA, SC, VA), Pd (GA, NC, SC), Mt (GA): dry woodlands; uncommon (rare north of GA). May-July. The species ranges from e. VA and s. NC south to c. GA, and se. TN (Polk County) (Chester, Wofford, & Kral 1997), and reputedly AL. Smith (1976) indicates that the species is an allopolyploid derivative (at 4x, 6x, and 8x) of *C. major*, *C. tripteris*, and *C. verticillata*. Its range extends south well beyond the range of *C. verticillata*. [= FNA, K; < *C. major* var. *stellata* – RAB; = *C. delphinifolia* – F, G, S, SE (an orthographic variant); > *C. delphinifolia* var. *delphinifolia* – Y; > *C. delphinifolia* var. *chlooidea* Sherff – Y; > *C. major* Walter var. *linearis* Small – Y; = *C.* ×*delphiniifolia* – Z]

Coreopsis falcata Boynton, Pool Coreopsis. Cp (GA, NC, SC, VA), Mt (SC): peat bogs, very wet savannas, ditches and borrow pits in savannas; common (rare in VA). Early May-early July (rarely later, perhaps in response to growing season fire). The species is endemic to the Coastal Plain of se. VA (City of Chesapeake), e. NC, e. SC, and e. GA; disjunct in Oconee County, SC. First reported for VA by Wieboldt et al. (1998). *C. falcata* should not be included (as by Cronquist in C and SE) in *C. gladiata*; the two species are distinctive in ecological preferences, morphology, phenology, and distribution. [= RAB, GW, K, S, Y, Z; < *C. gladiata* var. *gladiata* – C, SE; < *C. gladiata* – FNA, WH]

Coreopsis floridana E.B. Smith, Florida Coreopsis. Cp (FL): wet pine flatwoods; uncommon. Late September-January (-February). Panhandle FL south to s. FL (absent from ne. FL). [= FNA, GW, K, WH, Z]

Coreopsis gladiata Walter, Swamp Coreopsis. Cp (FL, GA, NC, SC), Mt (GA, NC, SC): swamp forests; rare (SC Rare). Mid-August-early November. Se. NC south to c. FL and west to s. MS; scattered inland as a disjunct in montane NC, SC, and GA. See *C. helianthoides* and *C. linifolia* for further discussion of the taxonomy of this group of species. [= RAB, S, Z; < *C. gladiata* var. *gladiata* – C, G, SE (also see *C. falcata*); < *C. gladiata* – FNA, GW, K, WH (also see *C. helianthoides*); > *C. gladiata* – Y; > *C. longifolia* Small var. *longifolia* – Y; > *C. longifolia* Small var. *godfreyi* Sherff – Y]

Coreopsis grandiflora Hogg ex Sweet *var.* ***grandiflora***, Large-flowered Coreopsis. Pd (GA, SC): in thin soils of rock outcrops, especially granitic flatrocks; rare. Late May-late June. Var. *grandiflora* ranges from c. GA and w. SC west to e. TX and e. OK, very scattered in distribution; it differs from var. *harveyana* in having the leaf divisions 2-6 mm wide (vs. 0.5-2 mm wide). [= F, K, Z; < *C. grandiflora* – RAB, FNA, G, S, W; < *C. grandiflora* var. *grandiflora* – C, SE (also see var. *harveyana*); > *C. grandiflora* var. *grandiflora* – Y; > *C. grandiflora* var. *pilosa* Sherff – Y]

* ***Coreopsis grandiflora*** Hogg ex Sweet *var.* ***harveyana*** (A. Gray) Sherff, Large-flowered Coreopsis. Cp (GA, NC, SC, VA), Pd (NC, SC, VA), Mt (NC, SC, VA, WV): disturbed areas; rare, native of farther west. Late May-late June. As treated by Smith (1976), the species consists of 4 varieties. Var. *harveyana* is the most abundant variety, probably originally endemic to AR, n.

LA, ne. TX, OK, e. KS, and s. and c. MO, but now scattered eastward to IN, NC, and SC. Var. *longipes* (Hooker) Torrey & Gray is endemic to e. TX. See Crawford & Smith (1984) for additional discussion of the varieties. [= F, K, Y, Z; < *C. grandiflora* – RAB, FNA, G, S, W, WH, WV; < *C. grandiflora* var. *grandiflora* – C, SE]

Coreopsis grandiflora Hogg ex Sweet *var.* ***saxicola*** (Alexander) E.B. Smith, Stone Mountain Coreopsis. Pd (GA): granitic outcrops; uncommon. As interpreted by Smith (1976) and Cronquist (1980), this variety is endemic to granite outcrops in c. GA and ec. AL and to sandstone outcrops in nc. AR; the AR plants, differing in morphology, phenology, karyotype, and distribution, may well warrant separate status. [= K, SE, Z; < *C. grandiflora* Hogg ex Sweet – FNA; = *C. saxicola* Alexander – S; > *C. saxicola* var. *saxicola* – Y; > *C. saxicola* var. *duncanii* Sherff – Y]

Coreopsis helianthoides Beadle, Beadle's Coreopsis. Cp (GA, NC, SC), Mt (NC), Pd (GA): swamp forests, swamp edges, and bogs; rare. September-October. Se. NC south to c. and w. FL and west to s. MS, with a disjunct occurrence in sw. NC. The validity of this taxon is controversial. Smith (1976) includes it in *C. gladiata*, considering it merely a pubescent form. Cronquist (in SE) regards it as distinct at the species level, despite his serious over-lumping of all its close relatives into a single species with two varieties: *C. gladiata* var. *gladiata* (including *C. falcata* and *C. gladiata*), and var. *linifolia* (including *C. oniscicarpa* and *C. linifolia*). [= RAB, S, SE, Y, Z; < *H. gladiata* – FNA, GW, K, WH]

Coreopsis integrifolia Poiret, Chipola Dye-flower. Cp (GA, SC): banks and floodplains of small blackwater streams (especially over limestone), edges of swamp forests bordering longleaf pinelands or bordering brackish marshes; rare (GA Special Concern). Mid August-early November. Se. SC south to FL Panhandle, apparently uncommon throughout its range. It is related to *C. helianthoides* and *C. linifolia*; the leaves are cauline and opposite, the petioles are ciliate. [= FNA, GW, K, S, SE, WH, Y, Z]

Coreopsis lanceolata Linnaeus, Longstalk Coreopsis. Cp (DE, FL, GA, NC, SC, VA), Pd (GA, NC, SC, VA), Mt (GA, NC, SC, VA, WV): disturbed areas; common (uncommon in DE, rare in Mountains). April-June. S. MA, MI and WI south to c. peninsular FL, e. TX, and NM. Often spread from cultivation, its original range obscure. [= RAB, C, FNA, K, SE, W, WH, WV, Z; > *C. lanceolata* var. *lanceolata* – Y; > *C. lanceolata* var. *villosa* Michaux – F, G, Y; > *C. heterogyna* Fernald – F; > *C. lanceolata* – S; > *C. crassifolia* Aiton – S]

Coreopsis latifolia Michaux, Broadleaf Coreopsis. Mt (GA, NC, SC): in rich, moist, cove forests and slopes at medium elevations, primarily from 500 m in the Blue Ridge Escarpment to nearly 1500 m; rare (though often locally abundant). (July-) August-September. A Southern Appalachian endemic: sw. NC and se. TN (Polk County) (Chester, Wofford, & Kral 1997) south into nw. SC and ne. GA. This species is treated by Smith (1976) in a monotypic section (section *Silphidium*) of *Coreopsis*, and, indeed, it does not closely resemble our other species. Smith (1976) considered it a primitive species, with its closest relatives in Mexico, and all of his attempts to hybridize it with other Southeastern *Coreopsis* failed. Flowering appears to be triggered by canopy tree-fall light gaps. It often occurs with *Helianthus glaucophyllus*. [= RAB, FNA, K, S, SE, W, Y, Z; = *Leiodon latifolius* (Michaux) Shuttleworth]

Coreopsis linifolia Nuttall, Savanna Coreopsis. Cp (FL, GA, NC, SC, VA): savannas, sandhill seeps, sandhill-pocosin ecotones; common (rare in VA). Early July-late October. Se. VA south to ne. and Panhandle FL, west to e. TX. Basal rosettes of this species are abundant in wet savannas and can be distinguished readily by the distinctive leaves: very long-petiolate, about 1 cm across, the pinnate venation very neat (the main lateral veins straight and parallel to the other laterals on the same side of the leaf), with small dark dots when backlit, and very thick (ca. 1 mm) and stiff in texture. The proper taxonomic treatment of this taxon and its relatives remains unclear. Smith (1976) interpreted *C. linifolia* to range from se. VA south and west along the Coastal Plain to e. TX (with a few inland disjunctions) and to consist of two chromosome races, a diploid Gulf Coast race (w. FL to se. TX) and a tetraploid Atlantic Coast race (s. GA to se. VA), "not differing sufficiently morphologically to justify nomenclatural recognition." Fernald, however, named *C. oniscicarpa* (the tetraploid) based on morphologic characters. Given the existence of morphologic characters, the failure of Smith's attempted hybridizations of the two "races," his speculation that the tetraploid could be an allotetraploid (though likely an autotetraploid), and the allopatric ranges of the two races, specific recognition is plausible. Further study is needed. Cronquist (in C, G, SE) does not recognize *C. oniscicarpa* as distinct from *C. linifolia*, and reduces *C. linifolia* (*sensu lato*) to a variety of *C. gladiata*, also including *C. falcata* in the typic variety of *C. gladiata*. The abundant morphologic, phenologic, and ecologic differences between *C. gladiata*, *C. linifolia*, and *C. falcata* render such an approach undesirable. [= GW, K, W, Y, Z; = *C. angustifolia* Aiton – RAB, possibly misapplied; = *C. gladiata* var. *linifolia* (Nuttall) Cronquist – C, G, SE; > *C. oniscicarpa* Fernald var. *oniscicarpa* – F; > *C. oniscicarpa* var. *simulans* Fernald – F; < *C. gladiata* – FNA]

Coreopsis major Walter *var.* ***major***, Woodland Coreopsis. Pd (GA, NC, SC, VA), Mt (GA, NC, SC, VA, WV): woodlands; common (rare in GA, NC, SC, VA). May-July. W. VA, s. OH, and KY south to SC, GA, w. FL, s. AL, and s. MS. How to treat the "*Coreopsis major* complex" (here including *C. major* var. *major*, *C. major* var. *rigida*, *C. delphiniifolia*, and *C. verticillata*) is not clear. The group apparently includes diploids and a variety of allopolyploids and autopolyploids (at various ploidies) variously derived from *C. major* var. *major* and *C. verticillata*. [= RAB, C, F, G, SE, W, Y; < *C. major* – FNA, K, S, WH, Z]

Coreopsis major Walter *var.* ***rigida*** (Nuttall) F.E.Boynton, Stiffleaf Coreopsis. Mt (GA, NC, SC, WV), Pd (GA, NC, SC), Cp (GA, NC, SC), {VA}: dry woodlands and forests; common (rare in WV). June-August. VA, WV, and KY south to w. FL, s. AL, s. MS, and se. LA. The recognition of varieties is problematic and controversial. [= C, SE, Y; >< *C. major* var. *stellata* (Nuttall) B.L. Robinson – RAB, WV; > *C. major* var. *stellata* – F, G, Y; > *C. major* var. *rigida* – F, Y; < *C. major* – FNA, K, S, WH, Z]

Coreopsis nudata Nuttall. Cp (FL, GA): seasonally flooded pineland depressions, either herbaceous-dominated or under a canopy of *Taxodium ascendens*; uncommon. E. GA (in close proximity to SC) south to ne. FL and Panhandle FL, west to e. LA. [= FNA, GW, K, S, SE, WH, Y, Z]

Coreopsis pubescens Elliott *var.* ***pubescens***, Common Hairy Coreopsis. Mt (NC, VA, WV), Pd (GA, NC), Cp (NC): forests, woodlands, and rock outcrops; common, rare in Piedmont and Coastal Plain (rare in VA and WV). July-September. The species as a whole is largely centered in the Southern Appalachians and Ozarks-Ouachitas, with scattered outlying occurrences;

var. *pubescens* has essentially the range of the species, from s. VA, s. KY, s. IL, and s. MO south to nw. FL, MS, and LA. Var. *robusta*, of the Southern Appalachians, is discussed below. [= F, GW, K, Y, Z; < *C. pubescens* – RAB, C, FNA, G, S, SE, W, WH, WV]

Coreopsis pubescens Elliott *var.* ***robusta*** Gray ex Eames, Mountain Hairy Coreopsis. Mt (GA, NC, SC, VA), Pd (NC), Cp* (NC): rocky slopes, glades, edges of rock outcrops; common (rare in Piedmont and Coastal Plain, rare in VA and WV). July-September. Var. *robusta* is a Southern Appalachian endemic, known from sw. VA, w. NC, nw. SC, n. GA, e. TN, and c. AL. [= F, GW, K, Y, Z; < *C. pubescens* – RAB, C, FNA, G, S, SE, W, WV]

Coreopsis rosea Nuttall. Cp (DE, GA, SC): upland depression ponds in the Inner Coastal Plain, drawdown zones on banks of blackwater rivers in the Outer Coastal Plain; rare. July-September. Coastal Plain of s. NS, MA, RI, NY (Long Island), NJ, DE, MD, e. SC, and e. GA, where it occurs on shores with fluctuating water levels, primarily on Coastal Plain pond shores, but also on river banks. It occurs in Horry County, SC, in the drawdown zone on the banks of the Waccamaw River; it should be sought in NC. It is immediately distinguishable from all our species by its pink to white ray flowers; another pink-rayed species, *C. nudata* Nuttall, ranges in the Coastal Plain from GA west to e. LA and has linear, terete, "juncoid" leaves. [= FNA, GW, K, S, SE, Y, Z]

Coreopsis species 1. Cp (NC): calcareously influenced acid savannas; rare. September-October. Known from a single site on the Onslow-Pender county line, where growing with *Thalictrum cooleyi*, *Allium species 1*, and *Scleria species 1*.

* ***Coreopsis tinctoria*** Nuttall *var.* ***tinctoria***, Calliopsis, Plains Coreopsis. Pd (DE, GA, NC, SC, VA), Mt (GA, NC, SC, VA, WV), Cp (DE, FL, GA, NC, SC, VA): roadsides and other disturbed places; uncommon (rare in VA and WV Mountains), probably introduced from farther west. Var. *tinctoria* was apparently widespread in the Great Plains, now distributed nearly throughout North America. Var. *similis* (Boynton) H.M. Parker ex E.B. Smith is endemic to s. TX and adjacent Tamaulipas and Nuevo León. [= C, K, Z; < *C. tinctoria* – FNA, G, GW, SE, W, WH, WV; > *C. tinctoria* – RAB, S; > *C. cardaminefolia* (A.P. de Candolle) Torrey & A. Gray – RAB, S, Y; > *C. tinctoria* var. *tinctoria* – Y; > *C. stenophylla* Boynton – Y]

Coreopsis tripteris Linnaeus, Tall Coreopsis. Pd (GA, NC, SC, VA), Mt (GA, NC, SC, VA, WV), Cp (FL, GA, NC, VA): rich, moist woodlands and woodland borders, primarily over calcareous or mafic rocks or on nutrient-rich alluvium; common (uncommon in FL, GA, NC, SC, and VA). July-early September. MA, s. ON, and WI south to Panhandle FL and TX. [= RAB, C, FNA, G, GW, K, S, SE, W, WH, WV, Z; > *C. tripteris* var. *deamii* Standley – F; > *C. tripteris* var. *smithii* Sherff – F, Y; > *C. tripteris* var. *tripteris* – F, Y]

Coreopsis verticillata Linnaeus, Threadleaf Coreopsis. Pd (NC, SC, VA), Cp (NC, SC, VA), Mt (NC, SC, VA, WV): dry sandy, rocky, or clayey woodlands and woodland borders; common (uncommon in Coastal Plain and Mountains, rare in WV Mountains). May-July. Smith (1976) indicates that the species consists of two chromosome races, a diploid, ranging in the Piedmont and Mountains from c. SC and NC north to ne. WV, and s. MD, and an allotetraploid, limited to the Coastal Plain of ne. NC and se. VA. The finely-divided leaves are attractive and the plant is cultivated horticulturally; scattered occurrences outside the ranges indicated above are escapes from cultivation. [= RAB, C, F, FNA, G, K, S, SE, W, WV, Y, Z]

Coreopsis grandiflora Hogg ex Sweet var. *inclinata* J. Allison, Ketona Tickseed, Ketona Coreopsis, is endemic to dolomitic Ketona glades of c. AL (Allison & Stevens 2001). [< *C. grandiflora* – FNA]

Coreopsis leavenworthii Torrey & Gray. AL and FL. [= FNA, K; > *C. leavenworthii* vars. – Y] {not yet keyed; synonymy incomplete}

Coreopsis pubescens Elliott *var.* ***debilis*** (Sherff) E.B. Smith. Cp (FL): {habitat}; rare. C. TN south through AL and ne. MS to w. FL, s. AL, s. MS, and se. LA; it has very narrow leaf blades or terminal leaflets. [= GW, K, Z; < *C. pubescens* – FNA, S, SE; > *C. corninsularis* Sherff – Y; > *C. debilis* Sherff – Y] {not yet keyed}

Coreopsis pulchra F.E. Boynton, Lookout Mountain Coreopsis. Nw. GA and ne. AL. [= FNA, K, S, SE, Y, Z] {not yet keyed}

Coreopsis tinctoria Nuttall *var.* ***atkinsoniana*** (Douglas ex Lindley) H.M. Parker ex E.B. Smith. Mt (GA): roadsides; rare, apparently introduced eastward in nw. GA from a distribution in the w. North America. [= K; < *C. tinctoria* – FNA, SE; = *C. atkinsoniana* Douglas ex Lindley – Y] {not yet keyed; synonymy incomplete]

Cosmos Cavanilles 1791 (Cosmos)

A genus of about 26 species, of tropical, subtropical, and warm temperate America. References: Kiger in FNA (2006c); Cronquist (1980)=SE; Sherff & Alexander (1955)=Z.

1 Rays pink or white; ultimate leaf segments mostly ca. 1 mm wide or less ..... ***C. bipinnatus***
1 Rays orange, yellow, or red; ultimate leaf segments mostly > 2 mm wide ..... ***C. sulphureus***

* ***Cosmos bipinnatus*** Cavanilles, Common Cosmos. Cp (DE, NC, SC, VA), Pd (DE, NC, SC, VA), Mt (NC, WV): garden edges, roadsides, disturbed areas, commonly cultivated, sometimes escaped; uncommon (rare in NC, SC, VA, and WV), native of Mexico. August-November. [= RAB, C, F, FNA, G, K, S, SE, WV; > *C. bipinnatus* var. *bipinnatus* – Z]

* ***Cosmos sulphureus*** Cavanilles, Orange Cosmos. Cp (GA, NC, SC, VA), Mt (WV): garden edges, roadsides, disturbed areas; commonly cultivated, rarely escaped, native of tropical America. August-November. [= C, F, FNA, G, K, S, SE; > *C. sulphureus* var. *sulphureus* – Z]

Cota J. Gay ex Gussone 1845 (Golden Marguerite)

A genus of ca. 40 species, herbs, of Europe, sw. Asia , and Africa. References: Watson in FNA (2006a).

* ***Cota tinctoria*** (Linnaeus) J. Gay ex Gussone, Yellow Chamomile, Golden Marguerite. Cp (VA), Mt (WV): disturbed areas, roadsides; rare, native of Europe. June-September. [= FNA; = *Anthemis tinctoria* Linnaeus – C, F, G, K, WV, Z]

Cotula Linnaeus 1753 (Brassbuttons)

A genus of about 55 species, annual and perennial herbs, of the Old World, mainly southern hemisphere. References: Watson in FNA (2006a).

1 Stems hairy; leaf blades 2-3× pinnately lobed; annual ..... ***C. australis***
1 Stems glabrous; leaf blades entire or with a few teeth or lobes; perennial ..... ***C. coronopifolia***

* ***Cotula australis*** (Sieber) Hooker f. Cp (SC): waste area around wool-combing mill; rare, native of Australia and New Zealand. Reported for SC by Nesom (2004d). [= FNA, K]
* *Cotula coronopifolia* Linnaeus, Brass-buttons. MD. Native of Old World. [= FNA]

Crepis Linnaeus 1753 (Hawksbeard)

A genus of about 200 species, herbs, of the Northern Hemisphere, South America, and southern Africa. References: Bogler in FNA (2006a); Cronquist (1980)=SE. Key adapted from C and SE. [also see *Youngia*]

1 Cypselas (at least the inner in the head) with a distinct narrow beak
  2 Cypselas dimorphic, the inner beaked ..... ***C. foetida***
  2 Cypselas monomorphic, all beaked.
    3 Stems coarsely setose, the setae yellowish; bractlets subtending the phyllaries 10-14, not reflexed ..... ***[C. setosa]***
    3 Stems glabrate, hispid, or tometose, if sparsely setose the setae blackish; bractlets subtending the phyllaries 5-12, reflexed ..... ***C. vesicaria*** *ssp.* ***taraxacifolia***
1 Cypselas narrowed toward the summit, but not distinctly beaked.
  4 Stems (at least towards the base) hispid and viscid with stipitate glands; phyllaries glabrous on both the inner and outer surfaces; cypselas 4-6 mm long ..... ***C. pulchra***
  4 Stems variously pubescent, but not viscid with stipitate glands; phyllaries variously pubescent on one or both surfaces; cypselas 1.5-7 mm long.
    5 Inner surface of the inner phyllaries glabrous; outer surface stipitate-glandular and with 2 rows of black setae; cypselas 1.5-2.5 mm long ..... ***C. capillaris***
    5 Inner surface of the inner phyllaries pubescent with appressed, shining, white hairs 0.1-0.2 mm long; outer surface of phyllaries tomentose, hispidulous, or canescent, but the hairs not glandular and without setae; cypselas 3-7 mm long.
      6 Cypselas 4-7 mm long, yellowish- or reddish-brown, with 13-20 ribs; pappus 5-7 mm long; biennial ..... ***C. biennis***
      6 Cypselas 3-4 mm long, reddish- or purplish-brown, with 10 ribs; pappus 4-5 mm long; annual ..... ***C. tectorum***

* ***Crepis capillaris*** (Linnaeus) Wallroth, Smooth Hawksbeard. Mt (NC, VA, WV), Pd (DE, NC, VA), Cp (DE): pastures, roadsides, disturbed areas; common (rare in Piedmont and Coastal Plain), native of Eurasia. May-November. [= RAB, C, F, FNA, G, K, SE, W, WV]
* ***Crepis pulchra*** Linnaeus, Smallflower Hawksbeard. Pd (GA, NC, SC, VA), Mt (NC, SC, VA, WV), Cp (FL, NC, SC, VA): roadsides, fields, disturbed areas; common in Piedmont (rare in Mountains and Coastal Plain), native of Eurasia. Late April-July. [= RAB, C, F, FNA, G, K, SE, W, WH, WV]
* ***Crepis tectorum*** Linnaeus. Mt (NC), Cp (VA): disturbed areas; rare, perhaps not established, native of Europe. June-July. [= C, F, FNA, G, K, S]
* ***Crepis vesicaria*** Linnaeus *ssp.* ***taraxacifolia*** (Thuillier) Thellung. Mt (NC): lawns; rare, native of Mediterranean and w. Europe. Late May-July. [= RAB, C, FNA, K, SE; *? Crepis vesicaria* Linnaeus ssp. *haenseleri* (Boiss. ex A.P. de Candolle) P.D. Sell]

* ***Crepis biennis*** Linnaeus, Rough Hawkbeard. {VA} native of Europe. June-August. [= FNA, K]
* ***Crepis foetida*** Linnaeus, Stinking Hawksbeard. {NC} native of Eurasia. April-September. [= FNA, K]
* *Crepis setosa* Haller f., Bristly Hawksbeard. Reported for Polk County, TN by Chester, Wofford, & Kral (1997) and from s. PA by Rhoads & Klein (1993). [= C, FNA, K] {not yet keyed}

Croptilon Rafinesque 1837 (Scratch-daisy)

A genus of 3 species, herbs, of s. North America. References: Smith (1981); Correll & Johnston (1970); Cronquist (1980)=SE; Nesom (2000b).

Croptilon divaricatum (Nuttall) Rafinesque, Scratch-daisy. Cp (FL, GA, NC, SC, VA), Pd (GA, NC, SC, VA), Mt (GA, NC, SC, VA): sandy soils of fields, roadsides, and sandhill woodlands; common (rare in VA). August-November. Se. VA south to c. peninsular FL and west to c. TX, inland to se. OK and s. AR. [= FNA, K; = *Haplopappus divaricatus* (Nuttall) A. Gray – RAB, C, F, G, SE, W; = *Isopappus divaricatus* (Nuttall) Torrey & Gray – S]

Cyclachaena Fresenius 1838

A monotypic genus, a perennial herb, of North America. References: Strother in FNA (2006c).

* ***Cyclachaena xanthiifolia*** (Nuttall) Fresenius, Big Marsh-elder. Mt (VA), Pd (VA), Cp (SC): disturbed areas, waste areas near wool-combing mills; rare, native of w. North America. August-October. See Nesom (2004d). [= FNA; = *Iva xanthifolia* Nuttall – C, F, G, K, SE, orthographic variant; = *I. xanthiifolia* Nuttall]

Diaperia Nuttall 1840 (Dwarf Cudweed)

A genus of 3 species, annual herbs, of c. United States and n. Mexico. References: Morefield in FNA (2006a); Arriagada (1998)=Z; Cronquist (1980)=SE; Anderberg (1991)=Y. Key based closely on FNA.

1 Heads ellipsoid to cylindrical, 3.5-4.5 mm high, 2-3× as high as wide; capitular leaves visible between and surpassing the heads; cypselas 0.9-1.2 mm long ..... ***D. prolifera*** *var.* ***prolifera***
1 Heads campanulate to spherical, 2-3.3 mm high, about 1× as high as wide; capitular leaves more-or-less hidden between and surpassed by the heads; cypselas 0.7-0.9 mm long.
2 Pistillate paleas individually visible through thin, silky pubescence; heads spherical, the largest 2.5-3.3 mm high ..... ***[D. verna*** *var.* ***drummondii]***
2 Pistillate paleas collectively hidden by dense woolly pubescence; heads campanulate the largest 2.0-2.5 mm long ..... ***D. verna*** *var.* ***verna***

Diaperia prolifera (Nuttall ex de Candolle) Nuttall *var.* ***prolifera***, Cotton-rose, Bighead Pygmy-cudweed. Cp (*SC): disturbed areas, waste areas around wool-combing mill; rare, introduced from farther south and west (Nesom 2004d). May-June. MO west to MT, south to LA and TX; disjunct eastwards in the Black Belt prairies of AL and MS. [= FNA; < *Filago prolifera* (Nuttall ex A.P. de Candolle) Britton – Y, Z; < *Evax prolifera* Nuttall ex A.P. de Candolle – K, SE]

* ***Diaperia verna*** (Rafinesque) Morefield *var.* ***verna***, Cotton-rose, Poverty-weed. Pd (GA), Cp (SC): disturbed areas, waste areas around wool-combing mill; rare, introduced from farther south and west (Nesom 2004d). Early March-late June. [= FNA; = *Filago verna* (Rafinesque) Rafinesque – Y, Z; *? Evax verna* Rafinesque var. *verna* – K; *? Filaginopsis nivea* Small – S; *? E. multicaulis* A.P. de Candolle – SE]

Diaperia verna (Rafinesque) Morefield var. *drummondii*, Gulf Coast Rabbit-tobacco. Dunes, beaches, disturbed sandy soils. AL west to TX. Mid February-mid May. [= FNA; = *Evax verna* Rafinesque var. *drummondii* (Torrey & A> Gray) Kartesz & Gandhi – K]

Dittrichia W. Greuter 1973

A genus of 2 species, herbs, of the Mediterranean region. References: Preston in FNA (2006a).

* ***Dittrichia graveolens*** (Linnaeus) W. Greuter. Cp (SC): waste area around wool-combing mill; rare, native of Meditteranean Europe, but quite possibly introduced into SC by wool from Australia (Nesom 2004d). [= FNA, K] {add to synonymy}

* *Dittrichia viscosa* (Linnaeus) Greuter. Cp (FL): disturbed areas, on ballast; rare, native of Mediterranean Europe. Collected as a ballast weed in Pensacola, Escambia County, FL, and elsewhere in eastern North America, in the late 1800s; it does not appear to be naturalized. [= FNA, WH; = *Cupularia viscosa* (Linnaeus) Godron & Grenier – S; = *Inula viscosa* (Linnaeus) Aiton – SE] {not keyed}

Doellingeria Nees 1832 (Flat-topped Aster)

A genus of about 7 species, herbs, of e. North America and e. Asia. This group of species has long been recognized as distinctive, sometimes given status as the genus *Doellingeria* (first by Nees in 1832), or as subgenus *Doellingeria* of *Aster*. Nesom (1993d) argues that *Doellingeria* should be separated from *Aster*, as its affinities seem to be at least as strongly to *Solidago* and its relatives, an assertion supported by molecular evidence (Noyes & Rieseberg 1999). References: Semple & Chmielewski in FNA (2006b); Nesom (1993d)=Z; Cronquist (1980)=SE; Nesom (2000b).

1 Disk flowers 4-14 per head; ray flowers 2-7 per head; leaves mostly 1.5-4× as long as wide; [of sandhill ecotones and streamhead pocosins of the Coastal Plain (primarily fall-line sandhills) from sc. NC southward] ..... ***D. sericocarpoides***
1 Disk flowers 16-40 per head; ray flowers 5-14 per head; leaves 2-6× as long as wide; [collectively widespread in our area].
2 Plants with stems solitary or several from a crown, to 11 dm tall; leaves mostly 2-4 (-5)× as long as wide ..... ***D. infirma***
2 Plants with stems scattered from creeping rhizomes (forming clonal patches), to 20 dm tall; leaves mostly 4-6× as long as wide..... ***D. umbellata***

Doellingeria infirma (Michaux) E. Greene, Appalachian Flat-topped White Aster. Mt (GA, NC, SC, VA, WV), Pd (DE, GA, NC, SC, VA), Cp (DE, FL, NC, VA): woodland borders, dry or dry-mesic woodlands, glades; common (rare in DE and FL). Late June-September. MA west to KY, south to SC, GA, Panhandle FL (Gadsden County), AL, and wc. TN. [= FNA, K, WH, Z; = *Aster infirmus* Michaux – RAB, C, G, SE, W, WH; > *Doellingeria infirma* – S; >< *Doellingeria humilis* (Willdenow) Britton – S, in part]

Doellingeria sericocarpoides Small, Pocosin Flat-topped Aster. Cp (FL, GA, NC, SC): sandhill ecotones and streamhead pocosins; uncommon. Late July-October. Sc. NC south to ne. FL and Panhandle FL, west to AL; also in AR, OK, and TX. [= FNA, K, S, WH, Z; = *Aster sericocarpoides* (Small) K. Schumann – SE; = *A. umbellatus* P. Miller var. *brevisquamus* Fernald – RAB, misapplied; = *A. umbellatus* var. *latifolius* A. Gray – GW; >< *Doellingeria humilis* (Willdenow) Britton – S, in part, misapplied]

Doellingeria umbellata (P. Miller) Nees, Tall Flat-topped White Aster. Mt (GA, NC, SC, VA, WV), Pd (DE, GA, NC, VA), Cp (DE, VA): wet meadows, pastures, bogs, marshes, stream floodplains, roadbanks, to at least 1900 m; common (uncommon in DE, rare in Coastal Plain south of DE). August-September. NL (Newfoundland) west to MN, south to e. VA, w. NC, nw. SC (P. McMillan pers.comm. 2002), n. GA, ne. AL, TN, and KY. [= S, Z; = *Aster umbellatus* P. Miller – C, G, SE, W, WH; = *A. umbellatus* var. *umbellatus* – RAB, GW; > *Doellingeria umbellata* var. *umbellata* – FNA, K]

Dracopis Cassini 1825 (Coneflower)

A monotypic genus, an annual herb, of sc. and se. North America, perhaps better included in *Rudbeckia*. References: Urbatsch & Cox in FNA (2006c).

Dracopis amplexicaulis (Vahl) Cassini. Cp (FL, SC*), Pd* (GA*): prairies, calcareous bttomlands, dry open areas, disturbed areas, waste areas near wool-combing mill; rare, introduced at least in part in our area. Native to prairie-like areas and calcareous bottomlands from GA (?) and AL west to KS and TX; reported for nc. GA (Jones & Coile 1988) and introduced in SC (Nesom 2004d). [= K, SE, WH; = *Rudbeckia amplexicaulis* Vahl – F, FNA]

Dyssodia Cavanilles 1802

A genus of 4 species, herbs, of North America south to Central America. References: Strother in FNA (2006c).

* ***Dyssodia papposa*** (Ventenat) A.S. Hitchcock, Dogweed. Cp (SC), Mt (WV): waste areas near wool-combing mill, other disturbed areas; rare, native of c. and sw. North America. Reported for SC by Nesom (2004d). [= FNA, K, SE; = *Boebera papposa* (Ventenat) Rydberg – S]

Echinacea Moench 1794 (Purple Coneflower)

A genus of 4-9 species, herbs, endemic to e. and c. North America. There has been considerable medicinal use of extracts from many of the species, and collection of plants from the wild to meet the demand of the herbal trade has extirpated many populations, particularly in c. United States. Foster (1991) presents a lengthy and detailed discussion of medicinal uses of *Echinacea*, along with considerable information on the biology, conservation needs, taxonomy, and nomenclatural history of the genus. Binns, Baum, & Arnason (2002) provide no rationale for their approach of recognizing the same number of taxa as McGregor, but treating them as 4 species and 10 varieties; the entities seem to be distinct at the specific level. References: Urbatsch, Neubig, and Cox in FNA (2006c); Baskin, Snyder, & Baskin (1993)=Z; Foster (1991)=Y; Cronquist (1980)=SE; Binns, Baum, and Arnason (2002)=X; McKeown (1999); Gaddy (1991); McGregor (1968).

1 Leaves lanceolate to ovate, the larger > 5 cm wide, the stem leaves well-developed, though smaller than the basal.
  2 Leaves glabrous on both sides, or scabrous above; chaffy bracts (pales) ca. 9 mm long, the awns about a fourth as long as the body of the pales and with incurved tips; rays 3.5-8 cm long, strongly drooping ..... ***E. laevigata***
  2 Leaves pubescent or scabrous on both sides; chaffy bracts (pales) 10-13 mm long, the awns about half as long as the body of the pales and with straight tips; rays 2.5-5.5 cm long, horizontal to slightly drooping ..... ***E. purpurea***
1 Leaves lanceolate to linear, the larger < 5 cm wide, stem leaves few and poorly developed, the basal leaves predominant.
  3 Rays curved upward, medium pink, 2.5-3.2 cm long; [endemic to calcareous glades in c. TN] ..... ***[E. tennesseensis]***
  3 Rays horizontal to drooping, pale pink, 4-9 cm long; [widely scattered in our area].
    4 Fresh pollen white ..... ***E. pallida***
    4 Fresh pollen pale to bright yellow ..... ***E. simulata***

Echinacea laevigata (C.L. Boynton & Beadle) S.F. Blake, Smooth Purple Coneflower. Pd (NC, VA), Mt (GA, SC, VA), Cp (SC): open woodlands and glades over mafic or calcareous rocks, such as diabase, limestone, and dolostone, rarely in oak-pine savannas of the upper Coastal Plain over circumneutral clay sediments; rare. Late May-July. The species is an eastern sibling of *E. purpurea*. In NC, this attractive, medicinal plant is now limited to a few populations in Durham, Granville, and Rockingham counties. Extensive populations occur over Elbrook Dolomite in Montgomery, VA. Populations of this species in sandy soils of the Coastal Plain of SC have been variously interpreted as native or introduced (Nelson & Kelly 1997). [= RAB, C, F, FNA, K, S, SE, W, X, Y; = *E. purpurea* var. *laevigata* (C.L. Boynton & Beadle) Cronquist – G]

*? ***Echinacea pallida*** (Nuttall) Nuttall, Pale Purple Coneflower. Pd (GA, NC?, VA), Mt (VA), Cp (GA): roadsides; rare, perhaps introduced in part from c. US (GA Special Concern, NC Watch List). June-July. ON west to MI, WI, and NE, south to IN, LA, and TX; disjunct eastwards in TN, AL, GA, SC, NC, and VA, where probably but uncertainly native). Some at least of the eastern populations considered to be *E. pallida* are actually the closely related *E. simulata*; additional work is needed to disentangle the relative distributions of these two species in our area. [= RAB, FNA, K, Y, Z; < *E. pallida* var. *pallida* – C, SE; < *E. pallida* – F, G, W; = *E. pallida* var. *pallida* – X]

Echinacea purpurea (Linnaeus) Moench, Eastern Purple Coneflower. Mt (NC, VA*, WV*), Pd (NC, VA*), Cp (FL): open woodlands, roadsides, some of the occurrences persistent or spread from cultivation; rare. OH, WI, and IA south to FL and TX; introduced more broadly as in ne. United States and ON, the exact limits of the native distribution unclear. [= RAB, C, F, FNA, K, SE, W, WH, X, Y; = *E. purpurea* var. *purpurea* – G]

Echinacea simulata R.L. McGregor, Prairie Purple Coneflower. Mt (GA!, VA*?), Pd (NC!, VA*?), Cp (NC!): prairies, roadsides; rare. June-July. IN, IL, and MO south to KY and TN; some of the more eastern disjunct populations previously considered to be *E. pallida* are actually *E. simulata*; additional work is needed to disentangle the relative distributions of these two species in our area. GA native populations (Floyd Co.) are *E. simulata*. [= FNA, K, Y, Z; < *E. pallida* var. *pallida* – C, SE; < *E. pallida* – F, G, W; = *E. pallida* (Nuttall) Nuttall var. *simulata* (McGregor) Binns, B.R. Baum, & Arnason – X]

Echinacea tennesseensis (Beadle) Small, Tennessee Purple Coneflower. Ip (TN): calcareous glades; rare. Endemic to the Nashville Basin of c. TN (Davidson, Rutherford, & Wilson counties) (Chester, Wofford, & Kral 1997). [= FNA, K, S, Y, Z; < *E. pallida* (Nuttall) Nuttall var. *angustifolia* (A.P. de Candolle) Cronquist – SE; = *E. pallida* (Nuttall) Nuttall var. *tenneseensis* (Beadle) Binns, B.R. Baum, & Arnason – X; = *E. angustifolia* A.P. de Candolle var. *tennesseensis* (Beadle) S.F. Blake]

Echinops Linnaeus (Globe-thistle)

A genus of about 120 species, herbs, of temperate and subtropical Europe, Asia, and Africa. References: Keil in FNA (2006a).

* ***Echinops sphaerocephalus*** Linnaeus, Globe-thistle. Mt (VA, WV): roadsides, edges of railroad tracks, disturbed areas; rare, native of Europe and w. Asia. July-October. Reported as introduced as far south as se. PA (Rhoads & Klein 1993) and VA (Fernald 1950; Keil in FNA 2006a). Its occurrence in VA has recently been verified (C.N. Horn, pers. comm. 2006). [= C, F, FNA, G, K, WV]

Eclipta Linnaeus 1753

A genus of 4 species, herbs, of temperate, subtropical, and tropical regions. References: Strother in FNA (2006c); Cronquist (1980)=SE.

Eclipta prostrata (Linnaeus) Linnaeus, Yerba-de-tajo. Cp (DE, FL, GA, NC, SC, VA), Pd (DE, GA, NC, SC, VA), Mt (GA, NC, SC, VA, WV): moist or wet disturbed areas, ditches, shores, disturbed bottomlands; common (uncommon in Mountains). June-November. MA west to WI, south to s. FL and TX, and southward into the tropics. [= C, FNA, K, WH; = *E. alba* (Linnaeus) Hasskarl – RAB, F, G, GW, SE, W, WV; = *Verbesina alba* Linnaeus – S]

Elephantopus Linnaeus 1753 (Elephant's-foot)

A genus of about 12-30 species, of tropical, subtropical, and warm temperate regions. References: Strother in FNA (2006a); Jones (1982)=Z; Cronquist (1980)=SE.

Identification notes: The acaulescent species are easily and often confused with *Vernonia acaulis*, especially when sterile. *Vernonia* has leaves scabrous above and sparsely pilose to glabrate beneath; *Elephantopus* has leaves sparely pilose above, densely pilose or tomentose below. *Vernonia* leaves tend to have a more acute apex, and the veins above are more strikingly differentiated in their color (white or pink) from the adjacent leaf tissue. When in flower, the presence of subtending foliose bracts below the compound glomerule of heads in *Elephantopus* (versus the absence of foliose bracts below the simple head in *Vernonia*) is diagnostic.

1 Leaves cauline, the stem with well-developed leaves over 10 cm long ..... ***E. carolinianus***
1 Leaves basal, the stem scapose or with a few leaves much smaller than the basal, usually < 8 cm long.
  2 Longest phyllaries 10-13 mm long; pappus 6-8 mm long; basal leaves 5.5-10.5 cm wide, usually at least some on a plant > 7 cm wide; leaves pubescent on the midrib below with spreading or reflexed hairs; [of the Coastal Plain, Piedmont, and rarely the Mountains]..... ..... ***E. tomentosus***
  2 Longest phyllaries 6-9 mm long; pappus 3-4.5 mm long; basal leaves 1.5-7.5 cm wide, rarely any on a plant > 7 cm wide; leaves pubescent on the midrib below with appressed or spreading hairs; [of the Coastal Plain, and rarely the lower Piedmont].
    3 Phyllaries densely villous with white hairs (0.3-) 0.5-1.0 mm long, the punctate glands obscured; cypselas 3-3.5 mm long; [of e. SC southward] ..... ***E. elatus***
    3 Phyllaries punctate-glandular, also sparsely pubescent with hairs 0.05-0.3 (-0.5) mm long; cypselas 2.5-3.0 mm long; [widespread in our area]..... ***E. nudatus***

Elephantopus carolinianus Räuschel, Leafy Elephant's-foot. Cp (DE, FL, GA, NC, SC, VA), Pd (DE, GA, NC, SC, VA), Mt (GA, NC, SC, VA, WV): mesic to dry forests and woodlands; common (uncommon in VA Mountains, rare in DE Coastal Plain). August-November. NJ west to KS, south to s. FL and e. TX; West Indies. [= RAB, C, F, FNA, G, GW, K, S, SE, WH, WV, Z]

Elephantopus elatus Bertoloni, Southern Elephant's-foot. Cp (FL, GA, SC): pine barrens; common (rare in GA and SC). Late August-September. E. SC south to s. FL, west to se. LA, on the Coastal Plain. [= RAB, FNA, K, S, SE, WH, Z]

Elephantopus nudatus A. Gray, Coastal Plain Elephant's-foot. Cp (DE, FL, GA, NC, SC, VA), Pd (NC, SC, VA): woodlands and woodland borders, usually fairly dry; common (rare in Piedmont, rare in DE). Late July-September. DE south to n. peninsular FL, west to e. TX and AR, primarily on the Coastal Plain; south into n. South America. [= RAB, C, F, FNA, G, GW, K, S, SE, WH, Z]

Elephantopus tomentosus Linnaeus, Common Elephant's-foot. Cp (FL, GA, NC, SC, VA), Pd (GA, NC, SC, VA), Mt (GA, NC, SC, VA): woodlands and woodland borders, usually fairly dry; common (rare in Mountains). August-November. MD south to Panhandle FL, west to e. TX, north in the interior to w. NC, KY, and south to Chiapas, Mexico. [= RAB, C, F, FNA, G, K, S, SE, WH, Z]

Emilia Cassini 1817 (Tasselflower)

A genus of 50-100 species, of the Old World. References: Barkley in FNA (2006b); Cronquist (1980)=SE.

1 Leaves well-distributed along the stem, with at most few and shallow lobes; corollas salmon or red-orange; involucre 1-2 (-3)× as high as wide ..... ***E. fosbergii***
1 Leaves mostly on the lower portion of the stem, the larger lyrate-pinnatifid; corollas lilac; involucre 3-4× as high as wide..... ***E. sonchifolia*** *var.* ***sonchifolia***

* ***Emilia fosbergii*** Nicolson, Salmon Tasselflower. Cp (FL, GA): disturbed areas; rare, native of Old World tropics. Scattered as an introduction in FL, including the Panhandle; reported for Lowndes County, GA (Carter, Baker, & Morris 2009). [= FNA, K, SE, WH]

* ***Emilia sonchifolia*** (Linnaeus) A.P. de Candolle *var.* ***sonchifolia***, Lilac Tasselflower. Cp (FL, SC), Pd (GA): disturbed areas, native of the Old World tropics. The occurrence of this species in SC was first reported by Nelson & Kelly (1997); it is unclear how well established *Emilia* is in the northern part of our area. See Anderson (2007) for FL Panhandle record. [= FNA, K; < *E. sonchifolia* – S, SE, WH]

Erechtites Rafinesque 1817 (Fireweed)

A genus of about 12-15 species, American and Australian. Barkley in FNA (2006a) points out that the genus should be treated as masculine gender. References: Barkley in FNA (2006b); Cronquist (1980)=SE. Key based in part on C and FNA.

1 Denuded receptacle 5-8 mm in diameter; achenes 2-3 mm long, with 10-12 ribs ..... ***E. hieraciifolius***
1 Denuded receptacle 9-12 mm in diameter; achenes 4-5 mm long, with 16-20 ribs ..... ***[E. megalocarpus]***

Erechtites hieraciifolius (Linnaeus) Rafinesque ex de Candolle, Fireweed. Cp (DE, FL, GA, NC, SC, VA), Pd (DE, GA, NC, SC, VA), Mt (GA, NC, SC, VA, WV): in disturbed soil in nearly all habitats except the extremely xeric, present in most parts of the modern (beat-up) landscape at least as seedlings, liable to turn up at the smallest disturbance (such as small tree-fall tip-up mounds or campfires, even in large natural areas), most abundant in areas extensively disturbed or scarified by timber-harvest, bulldozing, or severe fire; common. Late July-November. NL (Newfoundland) west to SK, south to s. FL and e. TX; West Indies; tropical America. Ecologically filling something of the same role in the south as the other (unrelated) "fireweed" in the north, *Epilobium angustifolium*. The only other species in our area as adept at appearing (seemingly from nowhere) at small soil disturbances in forests are *Phytolacca americana* and the moss *Atrichum angustatum* (Brid.) BSG. [= *E. hieracifolia* var. *hieracifolia* – C, G, K, SE; < *E. hieracifolia* – RAB, GW, S, W, WV; > *E. hieracifolia* var. *hieracifolia* – F; > *E. hieracifolia* var. *intermedia* Fernald – F; > *E. hieracifolia* var. *praealta* (Rafinesque) Fernald – F; = *E. hieraciifolius* var. *hieraciifolius* – FNA; < *E. hieraciifolius* – WH]

Erechtites megalocarpus (Fernald) Cronquist. Coastal marshes (brackish or salty) from MA to NJ and should be sought in our area, especially in VA. As the differences between this and *E. hieraciifolius* consist of multiple, non-overlapping morphological characters, the presumption should be to treat the two as specifically distinct. [= *E. hieracifolia* var. *megacarpa* – C, G, K; = *E. megalocarpa* Fernald – F, orthographic variant; = *E. hieraciifolius* var. *megalocarpus* – FNA]

Erigeron Linnaeus 1753 (Daisy Fleabane)

A genus of about 150 species, nearly cosmopolitan. References: Nesom in FNA (2006b); Cronquist (1980)=SE; Allison & Stevens (2001)=Z. Key adapted from those references. [also see *Conyza*]

1 Stem leaves sessile; pappus of the pistillate (ray) flowers consisting only of a few short, slender scales, < 1 mm long (visible at 20× magnification); annual or perennial (rarely biennial).
2 Stem leaves many, mostly toothed, the larger > 1cm wide; pubescence of the mid-stem long and spreading.....***E. annuus***
2 Stem leaves few, mostly entire, the larger usually < 1 cm wide; pubescence of the mid-stem usually short and appressed.
3 Phyllary hairs flattened, 0.5-1.2 mm long; stem hairs appressed to spreading, 0.5-1.0 mm long .....***[E. strigosus** var. **septentrionalis]***
3 Phyllary hairs terete, mostly 0.1-0.5 mm long; stem hairs appressed to spreading, 0.1-0.4 (-0.8) mm long.
4 Plants annual (rarely biennial), lacking rhizomes; [of various, often weedy, habitats]..... ***E. strigosus** var**. strigosus***
4 Plants perennial, rhizomatous; [plants of shallow soil over calcareous rock].
5 Basal leaves oblanceolate to narrowly obovate or spatulate, (3.2-) 3.8-15 (-21) mm wide; cauline leaves glabrous, except along the midvein and the cilate margins; [of limestone glades and barrens of c. TN, nw. GA, and n. AL]..... ***E. strigosus** var. **calcicola***
5 Basal leaves linear-oblanceolate, 1-3.5 (-6) mm wide; cauline leaves sparsely to moderately strigillose; [of dolostone glades of c. AL (Bibb Co.)] .....***[E. strigosus** var. **dolomiticola]***
1 Stem leaves relatively large and clasping, or small and sessile (in *E. vernus*); pappus of the pistillate (ray) flowers of elongate capillary bristles (sometimes also with scales); plants biennial or perennial.
6 Plants trailing or ascending, rooting at the nodes, and with stolons .....***[E. procumbens]***
6 Plants erect (sometimes the shoots curved at the base but ultimately vertical).
7 Stem leaves not clasping; basal leaves fleshy; rays 25-40, white, 0.5-1.3 mm wide; [of moist to wet habitats of the Coastal Plain] ....***E. vernus***
7 Stem leaves clasping; basal leaves herbaceous; rays 50-400, pink, blue, purplish, or white, either 0.3-0.5 mm wide (in *E. philadelphicus* var. *philadelphicus, E. quercifolius,* and *E. tenuis*) or 0.8-1.2 mm wide (in *E. pulchellus* var. *pulchellus*); [of more general distribution and habitat].
8 Disk corollas 4-6 mm long; rays 50-100, 0.8-1.2 mm wide.
9 Stems and leaves glabrous .....***E. pulchellus** var. **brauniae***
9 Stems and leaves densely pubescent with long hairs.....***E. pulchellus** var**. pulchellus***
8 Disk corollas 2.0-3.2 mm long; rays 60-400, 0.3-0.5 mm wide.
10 Involucre 4-6 mm high; rays 150-400, white to deep pink, 5-10 mm long.....***E. philadelphicus** var**. philadelphicus***
10 Involucre 2.5-4 mm high; rays 60-250, blue-lavender (rarely white to pink), 2.5-5 (-6) mm long.
11 Pappus simple; stem spreading pubescent throughout (or appressed pubescent in the upper third only); rays 100-250 ....***E. quercifolius***
11 Pappus double, with short outer setae in addition to the long slender bristles; stem appressed pubescent in at least the upper half; rays 60-120 ..... ***E. tenuis***

Erigeron annuus (Linnaeus) Persoon, Annual Fleabane. Mt (GA, NC, SC, VA, WV), Pd (DE, GA, NC, SC, VA), Cp (DE, FL, NC, SC, VA): roadsides, disturbed areas; common (uncommon in FL, rare in Coastal Plain of SC). May-October. NL (Newfoundland) west to MB, south to Panhandle FL and TX (and beyond). [= RAB, C, F, FNA, S, SE, W, WH, WV; > *E. annuus* var. *annuus* – G]

Erigeron philadelphicus Linnaeus *var.* ***philadelphicus***, Philadelphia-daisy. Mt (GA, NC, SC, VA, WV), Pd (DE, GA, NC, SC, VA), Cp (DE, FL, GA, NC, SC, VA): roadsides, meadows, disturbed areas; common (uncommon in FL, NC, SC, and VA Coastal Plain). April-August. NL (Newfoundland) west to BC, south to n. FL and TX. Var. *scaturicola* Fernald, of bluffs along the James River in VA, seems to be merely an extreme form. Other varieties [var. *glaber* Henry and var. *provancheri* (Victorin & Rouss.) Boivin] may have more merit. [= FNA, K; < *E. philadelphicus* – RAB, C, G, GW, S, SE, W, WH, WV; > *E. philadelphicus* var. *philadelphicus* – F; > *E. philadelphicus* var. *scaturicola* Fernald – F]

Erigeron pulchellus Michaux *var.* ***brauniae*** Fernald. Mt (WV): sandy woodlands and forests, riverbanks; uncommon. April-June. MD, WV, and s. OH south to KY. [= C, F, FNA, G, K, WV]

Erigeron pulchellus Michaux *var.* ***pulchellus***, Robin's-plantain. Mt (DE, GA, NC, SC, VA, WV), Pd (GA, NC, SC, VA), Cp (FL, GA, NC, SC, VA): moist slopes, coves, limestone bluffs, trail margins, roadbanks; common (uncommon in Coastal Plain, rare in FL). April-early June. ME west to MN, south to Panhandle FL (Jackson County), GA, and TX. In addition to the widespread var. *pulchellus*, and the Alleghenian var. *brauniae*, *E. pulchellus* has an additional local variety, var. *tolsteadii* Cronquist, of se. MN. [= C, F, FNA, G, K, SE, WV; < *E. pulchellus* – RAB, GW, S, W, WH]

Erigeron quercifolius Lamarck, Oak-leaved Fleabane. Cp (FL, GA, NC, SC, VA): sandy roadsides, disturbed areas; common, rare in VA. April-June. Se. VA south to s. FL, west to TX, north in the interior to TN; Bahamas. [= RAB, C, F, FNA, G, K, S, SE, WH]

Erigeron strigosus Muhlenberg ex Willdenow *var.* ***calcicola*** J. Allison, Cedar Glade Daisy Fleabane. Mt (GA): limestone glades; rare. (April-) May-October. Central basin of TN (Allison & Stevens 2001), nw. GA (GANHP) and n. AL. [= FNA, Z]

Erigeron strigosus Muhlenberg ex Willdenow *var.* ***strigosus***, Common Rough Fleabane. Mt (GA, NC, SC, VA, WV), Pd (DE, GA, NC, SC, VA), Cp (DE, FL, GA, NC, SC, VA): roadsides, disturbed areas; open woodlands; common. Late April-October. NS west to WA, south to c. peninsular FL and TX. [= FNA; < *E. strigosus* – RAB, W, WH, WV; > *E. strigosus* var. *strigosus* – C, F, G, K, SE, Z; > *E. strigosus* var. *beyrichii* – C, F, G, K, SE, Z; < *E. ramosus* (Walter) Britton, Sterns, & Poggenburg – S]

Erigeron tenuis Torrey & A. Gray, Midwestern Fleabane. Cp (FL): disturbed areas; rare. FL Panhandle (Okaloosa County) and AL west to KS, OK, and TX. Reported for w. NC (Nesom 1980); but later discounted (Nesom in FNA 2006b). Mid March-May (sporadically later). [= FNA, K, SE, WH]

Erigeron vernus (Linnaeus) Torrey & A. Gray, Whitetop Fleabane. Cp (FL, GA, NC, SC, VA): wet savannas, seepages, interdunal swales; common (rare in VA). Late March-June. E. VA south to s. FL, west to LA. [= RAB, C, F, FNA, G, GW, K, S, SE, WH]

Erigeron procumbens (Houstoun ex Miller) Nesom, Corpus Christi Fleabane. Moist to dry coastal areas, including marsh edges. S. MS (?), LA, TX, Tamaulipas, Veracruz. [= FNA, K; = *E. myrionactis* Small –S, SE]

Erigeron strigosus Muhlenberg ex Willdenow var. *dolomiticola* J. Allison, Cahaba Daisy Fleabane. Mt (AL): calcareous Ketona glades; rare. Endemic to Bibb County, AL (Allison & Stevens 2001). Late May-October. [= FNA, Z]

Erigeron strigosus Muhlenberg ex Willdenow var. *septentrionalis* (Fernald & Wiegand) Fernald. Scattered in n. North America, south to NY, TN (FNA), AR, OK, WY, CA. [= C, FNA, F, G, K]

Eupatorium Linnaeus 1753 (Eupatorium, Thoroughwort, Dog-fennel)

A genus of about 40 species, herbs, of e. North America and Eurasia (after the exclusion of *Ageratina, Chromolaena, Conoclinium, Eutrochium, Fleischmannia*, and other genera). I have differed considerably from Cronquist's treatments, as for instance in SE, regarding the rank at which to recognize taxonomic entities in *Eupatorium*. In the Southeastern United States, *Eupatorium* is a reticulately evolved complex, including diploids, triploids, and tetraploids; derivatives of hybridization produce sterile pollen but in some cases reproduce vigorously via agamospermous production of seeds. In some cases, these entities form separate populations from their presumed parental species, with distinctive ranges and habitats and more-or-less distinctive morphology. Cronquist treats morphologically highly distinctive entities, such as *E. pinnatifidum*, as full species, while stating that they are "not long-persistent." He treats morphologically more subtle entities as varieties of one of the two presumed parental species, such as *E. album* var. *vaseyi* ("very probably derived by hybridization of *E. album* var. *album* and *E. sessilifolium*"). Other entities, difficult to distinguish morphologically from another species, he does not recognize, as for instance *E. saltuense*, included as a synonym under *E. altissimum* ("*E. saltuense* may reflect hybridization between *E. altissimum* and some other species such as *E. album*, or possibly between *E. hyssopifolium* and *E. album*"].

A species concept that stresses ecological, biological, and distributional independence seems preferable. When plants of a putative hybrid occur in substantial populations, reproducing independently of one or both alleged parents, and in geographically and/or ecologically distinctive situations they should be treated as a separate species. Only field observations and studies can provide the necessary information. I have seen no evidence that *E. ×pinnatifidum* (though morphologically strikingly distinctive) occurs independent of its parents; thus I treat it as a hybrid (see below). *E. vaseyi* regularly occurs without one or both of its presumed parents, forms fertile achenes, occurs in large populations, and (in NC) is distributionally more limited than its presumed parents (Sullivan 1978). Biologically, it is best treated as an allopolyploid species; its treatment as a variety leads to conceptual and nomenclatural problems (reflected in the synonymy above): of which species should it be a variety? Sullivan (1978) considered that *E. saltuense* was derived from hybridization of *E. album* and *E. lecheifolium* (= *hyssopifolium*), but found it to be a triploid, growing in association with triploid (and pollen-sterile) *E. lecheifolium*. She concluded that "the origin of *E. saltuense* through hybridization could have occurred in the ancient past when diploids of *E. lecheifolium* were more prevalent." In addition to its postulated "ancient origin," *E. saltuense* appears to occur in NC in habitats different from any of its variously alleged parents; for these reasons it seems best to treat *E. saltuense* as an allopolyploid species as well. Species in our flora believed to be of allopolyploid derivation include *E. anomalum*, *E. cordigerum*, *E. godfreyanum*, *E. linearifolium*, *E. mohrii*, *E. pubescens*, *E. saltuense*, *E. torreyanum*, and *E. vaseyi*. References: Siripun & Schilling in FNA (2006c); Cronquist (1980)=SE; Godfrey (1949). The key adapted from those references. (also see *Ageratina, Chromolaena, Conoclinium, Eutrochium, Fleischmannia*)

1 Leaves generally in whorls of 3-7 (very rarely all of them opposite), most of them > 2 cm wide; involucre 6.5-9 mm high, the flowers pale pink to purple.....*[see **Eutrochium**]*
1 Leaves generally opposite, sometimes in whorls of 3-4 (if so the leaves usually < 2 cm wide), or some of them alternate; involucre mostly 2-6 mm high, the flowers mostly white, rarely blue (rarely the involucre 6-11 mm high, then the flowers white).
2 Leaves pinnate or pinnatifid, divided into linear or capillary segments, 0-5 mm wide..... **Key A**
2 Leaves simple or palmately 3 (-5)-lobed, the leaves or lobes generally over 5 mm wide.
3 Leaves palmately 3 (-5)-lobed ..... ***E. cannabinum***
3 Leaves simple.
4 Leaves long-petiolate, the petioles of larger leaves > 10 mm long.
5 Leaf blades deltate or rhombic, held vertically; [of FL]..... ***E. mikanioides***
5 Leaf blades lanceolate, held horizontally; [widespread] ..... ***E. serotinum***
4 Leaves sessile or short-petiolate, the petioles < 9 mm long.
6 Florets (3-) 5 (-7) per head..... **Key B**
6 Florets 7-14 per head.
7 Leaf bases fused..... ***E. perfoliatum***
7 Leaf bases tapering to a cuneate base..... ***E. resinosum***

Key A – leaves pinnatifid or pinnate into linear or capillary segments (Dog-fennels)

1 Stem glabrous throughout, or short-pubescent in the lower portion only; inflorescence paniculate, the panicle branches recurved, the heads secundly arranged..... ***E. leptophyllum***
1 Stem pubescent throughout, generally conspicuously so; inflorescence paniculate, the branches not recurved, the heads not secund.
2 Leaves bright green, glabrous, sparsely glandular-punctate, segments of the **basal** leaves 1-1.5 mm wide, segments of the **upper** leaves 0.2-0.5 mm wide ..... ***E. capillifolium***
2 Leaves grayish-green, pubescent, densely glandular-punctate, segments of the **basal** leaves 2-5 mm wide, segments of the **upper** leaves 1-2.5 mm wide..... ***E. compositifolium***

Key B – leaves simple, flowers usually 5 per head

1 Phyllaries acuminate to attenuate.
2 Larger leaves 0.2-1.3 cm wide; stems puberulent; involucre 3.5-7 mm high.
3 Rhizome absent to < 2 cm long; leaves usually reflexed-spreading to spreading-ascending, the larger (5-) 6-13 mm wide; leaf margins and surfaces moderately to densely strigose; involucre 5-8 mm long; pappus (3.3-) 3.9-5.0 mm long; corolla:pappus length ratio 0.63-0.89; mature achene 2.2-3.5 mm long ..... ***E. leucolepis***
3 Rhizome 2-20 cm long; leaves usually ascending to erect-recurved, the larger 2-4.5 mm wide; leaf margins and adaxial surface glabrous to sparsely strigose; involucre 3.5-5.5 mm long; pappus 2.7-4.1 mm long; corolla:pappus length ratio 0.83-1.00; mature achene 1.6-2.3 mm long ..... ***E. paludicola***
2 Larger leaves 1.5-3 (-4) cm wide; stems villous to puberulent; involucre 8-11 mm high.
4 Leaves with few or no resin-glands; phyllaries glabrous, lacking resin-glands; [of the Coastal Plain of GA, Panhandle FL, AL, and MS] ..... ***E. petaloideum***
4 Leaves with resin-glands; phyllaries puberulent to villous (at least towards the base and on the midrib); [collectively widespread]
5 Leaves 3-nerved from the base; leaves 4-7 cm long, 10-20 mm wide; [of DC, DE, NJ, and NY] ..... ***[E. album*** *var.* ***subvenosum]***
5 Leaves 3-nerved from above the base; leaves 5-11 cm long, 10-40 mm wide; [collectively widespread].
6 Leaves pubescent, the pubescence short to long; phyllaries generally attenuate (rarely acuminate); leaves (2.5-) 3-6× as long as wide; leaf apices obtuse; teeth obtuse or rounded ..... ***E. album*** *var.* ***album***
6 Leaves sparsely pubescent to nearly glabrous, the pubescence generally short; phyllaries generally acuminate, sometimes abruptly so; leaves 2-4× as long as wide; leaf apices acute to acuminate; teeth sharp ..... ***E. vaseyi***
1 Phyllaries acute to obtuse.
7 Leaf bases broadly cuneate, truncate, or subcordate, the leaves generally distinctly broadest near the base.
8 Leaves (2.5-) 3-6 (-7)× as long as wide; plants glabrous below the inflorescence.
9 Leaves subcoriaceous, the larger ones 8-18 cm long, 3-6 cm wide, averaging about 3× as long as wide ..... ***E. sessilifolium*** *var.* ***brittonianum***
9 Leaves membranaceous, the larger ones 9-18 cm long, 2-4 cm wide, averaging about 5× as long as wide ..... ***E. sessilifolium*** *var.* ***sessilifolium***
8 Leaves 1-3 (-3.5)× as long as wide; plants pubescent below the inflorescence.
10 Leaves pinnately veined ..... ***E. godfreyanum***
10 Leaves 3-veined from the base or just above it.
11 Leaves averaging (1.5) 2-2.5× as long as wide, usually with a purple border; upper leaves and main inflorescence branches often alternate ..... ***E. pilosum***
11 Leaves averaging 1-2× as long as wide, usually lacking a purple border; upper leaves and main inflorescence branches usually all opposite.
12 Leaf base broadly rounded, cordate-clasping; leaves very densely pubescent, the pubescence often harsh; larger leaves usually 4-10 cm long; principal pair of lateral veins diverging from the midrib 2-10 mm above the base of the leaf; toothing of leaf often irregular and coarse ..... ***E. cordigerum***
12 Leaf base cuneate, broadly cuneate, rounded, or cordate (but not clasping); leaves densely to sparsely pubescent; larger leaves usually 2-6 cm long; principal pair of lateral veins diverging at the base or 2-10 mm above the base of the leaf; toothing of leaf regular and relatively fine.
13 Leaves mostly 1-1.5 (-1.7)× as long as wide, tending to be obtuse (the apex usually 90º or more), the teeth generally rounded (the 2 sides of each tooth usually distinctly convex-curved, the end of the tooth therefore rounded), the principal pair of lateral veins diverging directly from the base of the midrib ..... ***E. rotundifolium***
13 Leaves mostly (1.2-) 1.5-2× as long as wide, tending to be acute (the apex usually 90º or less), the teeth generally rather sharp (the 2 sides of each tooth straight to gently curved, the end of the tooth therefore triangular), the principal pair of lateral veins diverging 2-10 mm above the base of the midrib.
14 Leaves broadly cuneate to broadly rounded, thin in texture, the pubescence rather soft and long (and also often sparse), the leaf blade not twisted at base, not borne in a vertical plane, up to 10 cm long and 6.5 cm wide ..... ***E. pubescens***
14 Leaves distinctly cuneate, firm in texture, the pubescence rather harsh and short, the leaf blade twisted at the base, thus borne in a vertical plane, up to 5.5 cm long and 3 cm wide ..... ***E. scabridum***
7 Leaf bases narrowly cuneate, the leaves generally broadest near the middle or toward the tip.
15 Plants from conspicuously tuberous-thickened (ca. 1 cm in diameter) horizontal rhizomes; leaves deflexed, spreading, or ascending.
16 Leaves 15-30 mm wide, spreading or ascending ..... ***E. anomalum***
16 Leaves 2-12 mm wide, deflexed to erect-ascending.
17 Leaves erect-ascending, 2-5.5 mm wide; pappus 4.0-5.4 mm long ..... ***E. mohrii × paludicola***
17 Leaves deflexed to spreading, 3-12 mm wide; pappus 2.5-3 mm long.
18 Stems 3-6 (-7) dm tall, often erectly branching from near the base; involucres 3-4 mm high, the bracts with rounded apices ..... ***E. recurvans***
18 Stems (6-) 10-15 dm tall, not branching near the base; involucres 5-7 mm high, at least some of the inner bracts with acute apices ..... ***E. mohrii***
15 Plants from crowns or caudices; leaves usually spreading or ascending (not deflexed).
19 Plants generally with numerous branches from at or near the base, the axillary shoots of the lower internodes elongating; leaves 2-5 cm long, oblanceolate.
20 Leaves broadly oblanceolate, 5-15 mm wide, crenate or serrate in the upper half ..... ***E. glaucescens***
20 Leaves narrowly oblanceolate, 3-8 mm wide, entire or remotely serrate apically ..... ***E. linearifolium***
19 Plants generally simple below the middle, the axillary shoots of the lower nodes not elongating (except in response to injury of the main stem); leaves 3-12 cm long, lanceolate or linear.
21 Leaves mostly 6-40× as long as wide, the larger ones usually < 10 mm wide, ranging from 1-12 mm wide, whorled or opposite (rarely alternate above).

22 Leaves linear to narrowly lanceolate, the principal leaves 2-7 cm long, 1-5 mm wide, 10-40× as long as wide, entire to obscurely toothed, the leaves mostly in whorls of 3 or 4 ..... ***E. hyssopifolium***
22 Leaves lanceolate, the principal leaves 5-12 cm long, 5-10 (-12) mm wide, 6-15× as long as wide, conspicuously and divergently toothed, the leaves mostly opposite or in whorls of 3 ..... ***E. torreyanum***
21 Leaves mostly 2.5-7× as long as wide, the larger ones > 10 mm wide, ranging from 8-30 mm wide, opposite, alternate, or whorled.
23 Involucre 2.5-4 mm high; leaves obtuse to acute, elliptic to elliptic-oblanceolate, the 2 main lateral veins separating from the midrib about 1 cm above the base; leaves commonly 3 per node ..... ***E. semiserratum***
23 Involucre 4.5-7 mm high; leaves acute to attenuate-acuminate, lanceolate, the 2 main lateral veins separating from the midvein at the base; leaves rarely 3 per node.
24 Leaves 3-5 cm long, 5-13 mm wide; leaf surfaces generally glabrous; [of AL westward] ..... ***[E. lancifolium]***
24 Leaves 5-12 cm long, 5-20 mm wide; leaf surfaces short or long puberulent; [widespread].
25 Leaf surfaces glandular-punctate, densely puberulent on the surfaces and veins, the hairs fairly long and curling or twisted (as seen with at least 10× magnification); stem densely puberulent; leaves entire to serrate, the teeth varying from obscure to sharp, generally about 1 mm long (measured on the side toward the leaf apex), rarely to 3 mm long, generally forward-pointing; leaves acuminate to acute, the terminal portion not strongly attenuated, and about as likely to have teeth as the rest of the margin ..... ***E. altissimum***
25 Leaf surfaces densely glandular-punctate, sparsely puberulent (mainly on the veins), the hairs short; stem sparsely puberulent; leaves serrate to pinnatifid, the teeth often 1-5 mm long (measured on the side toward the leaf apex), often salient or divergent; leaves attenuate-acuminate, the terminal 1/3 extended and generally entire ..... ***E. saltuense***

Eupatorium album Linnaeus *var.* ***album***, White-bracted Thoroughwort. Cp (DE, FL, GA, NC, SC, VA), Pd (GA, NC, SC, VA), Mt (GA, NC, SC, VA, WV): dry woodlands; common (rare in Mountains, uncommon in Piedmont). Late June-September. CT, NY, OH, and TN, south to FL and LA. Var. *glandulosum* is alleged to differ from var. *album* in having the involucre with copious dark glands (vs. glandless or nearly so). The distinction is dubious; variation seems essentially continuous in our area, with frequent intermediates, and there seems to be little correlation between morphology and habitat/range. [= FNA; < *E. album* – RAB, S, WH; < *E. album* var. *album* – C, K, SE, W (also see *E. petaloideum*); > *E. album* var. *album* – F, G, WV; > *E. album* var. *glandulosum* (Michaux) A.P. de Candolle – F, G, WV]

Eupatorium altissimum Linnaeus, Tall Thoroughwort. Pd (GA, NC, VA), Mt (GA, VA, WV), Cp (FL): woodlands, old fields, woodland borders, and openings over mafic rocks (such as diabase) or calcareous rocks (such as limestone and calcareous sandstone); common (uncommon in WV, rare south of VA, rare in Coastal Plain). Late August-October. CT, NY, QC, MN, and NE, south to Panhandle FL and TX, primarily in the midwest, especially on limestone substrates, and uncommon east of the mountains. [= RAB, F, G, S, W, WV; < *E. altissimum* – C, FNA, K, SE, WH (also see *E. saltuense*)]

Eupatorium anomalum Nash, Anomalous Eupatorium. Cp (FL, GA, NC, VA): moist savannas, moist interdune swales; rare. August-October. *E. anomalum* is believed to be a triploid and tetraploid, apomictic derivative of the hybrid *E. mohrii* × *serotinum*. Se. VA south to c. peninsular FL and west to s. AL. Inasmuch as it is now a separate lineage (as evidenced by a distinct distribution, more-or-less recognizable morphology, and phenologic separation), treatment as a separate taxon seems warranted. [= FNA, GW, K, SE; < *E. recurvans* – RAB; < *E. anomalum* – S (also see *E. mohrii*); = *E.* ×*anomalum* – WH]

* ***Eupatorium cannabinum*** Linnaeus, Hemp-agrimony. Cp, Pd (VA): disturbed areas; rare, perhaps merely a waif or garden remnant, native of Europe. July-September. The documentation for VA is an 1899 specimen from Fairfax County and a record from Westmoreland County. [= FNA, K]

Eupatorium capillifolium (Lamarck) Small, Common Dog-fennel, Yankeeweed. Cp (DE, FL, GA, NC, SC, VA), Pd (DE, GA, NC, SC, VA), Mt (GA, NC, SC, WV): disturbed soils; common (uncommon in GA, NC, and SC Mountains, uncommon in VA Piedmont, rare in WV Mountains). September-November. CT, PA, KY, MO, and OK south to s. FL and TX. This species, like *E. compositifolium*, is an excellent indicator of soil disturbance. [= C, F, FNA, G, GW, K, S, SE, W, WH, WV; = *E. capillifolium* var. *capillifolium* – RAB]

Eupatorium compositifolium Walter, Coastal Dog-fennel, Yankeeweed. Cp (FL, GA, NC, SC, VA), Pd (GA, NC, SC, VA): sandy disturbed areas; common. September-December. S. VA, KY, and OK south to s. FL and TX. This species, like *E. capillifolium*, is an excellent indicator of soil disturbance. At its northern limit, in se. VA, this species occurs on riverbanks, in the seasonally exposed drawdown zone (Fleming & Ludwig 1996). [= RAB, FNA, GW, K, S, SE, W]

Eupatorium cordigerum (Fernald) Fernald, Clasping Roundleaf Eupatorium. Cp (NC, SC, VA): woodlands; rare. July-August. VA, NC, and SC west to AR and MS. This taxon is an apomictic, polyploid derivative of the hybrid *E. perfoliatum* × *rotundifolium*. [= F; > *E. rotundifolium* var. *ovatum* – RAB, G (also see *E. pubescens*); = *E. rotundifolium* var. *cordigerum* Fernald – C, K, SE; = *E.* ×*cordigerum* (Fernald) Fernald – FNA; < *E. rotundifolium* – GW; < *E. pubescens* – S]

Eupatorium glaucescens Elliott, Wedgeleaf Eupatorium, Broadleaf Bushy Eupatorium. Cp (GA, NC, SC, VA): sandhills, dry sandy woodlands; common (rare in VA). Late July-October. Widespread in the Southeastern Coastal Plain, ranging from se. VA south to FL and west to MS. The name *E. cuneifolium* must be rejected on nomenclatural grounds (Gandhi & Thomas 1991). [= K; < *E. cuneifolium* Willdenow – RAB, C, G, SE (also see *E. linearifolium*); ? *E. cuneifolium* var. *cuneifolium* – F; = *E. cuneifolium* – S; < *E. linearifolium* Walter – FNA, WH]

Eupatorium godfreyanum Cronquist, Godfrey's Eupatorium. Pd (GA, NC, VA), Mt (NC, VA, WV), Cp (VA): dry woodlands; common (uncommon in VA Coastal Plain, uncommon in WV Mountains, rare in GA and NC). July-September; August-October. NJ, MD, and WV south through VA to nc. NC and TN, reaching its greatest abundance in wc. VA. See Cronquist (1985) for additional information and illustrations. Siripun & Schilling (2006) confirmed that this species is of hybrid origin from *E. rotundifolium* and *E. sessilifolium*. [= C, FNA, K; < *E. sessilifolium* var. *vaseyi* (Porter) Fernald & Griscom – RAB; < *E. sessilifolium* var. *vaseyi* (Porter) Fernald & Griscom – F; < *E. vaseyi* Porter – G; < *E. sessilifolium* – SE]

Eupatorium hyssopifolium Linnaeus, Hyssopleaf Eupatorium. Cp (DE, GA, NC, SC, VA), Pd (DE, GA, NC, SC, VA), Mt (GA, NC, SC, VA, WV): roadbanks, pastures, fields, disturbed areas, dry woodlands; common (rare in Mountains). Late July-

October. MA south to GA and west to TN and LA. [= *E. hyssopifolium* var. *hyssopifolium* – C, FNA, G, SE, W; < *E. hyssopifolium* – RAB, WV (rejected) (also see *E. torreyanum*); > *E. hyssopifolium* var. *hyssopifolium* – F, K; > *E. hyssopifolium* var. *calcaratum* Fernald & Schubert – F, K; > *E. sessilifolium* – S; > *E. lecheifolium* Greene – S]

Eupatorium leptophyllum A.P. de Candolle, Limesink Dog-fennel. Cp (FL, GA, NC, SC): limesink depression ponds (dolines) in the outer Coastal Plain and clay-based Carolina bays in the inner Coastal Plain; common (rare in GA, NC, SC). September-November. A Southeastern Coastal Plain endemic, ranging from se. NC south to FL and west to s. GA and s. AL; also in the Bahamas and Cuba. [= FNA, GW, K, S, SE, WH; = *E. capillifolium* var. *leptophyllum* (A.P. de Candolle) Ahles – RAB]

Eupatorium leucolepis (A.P. de Candolle) Torrey & Gray, Savanna Eupatorium. Cp (DE, FL, GA, NC, SC, VA), Pd (VA), Mt (VA, WV): savannas, seepage bogs, depression ponds; common (uncommon in DE and VA, rare in Piedmont and Mountains). August-October. Primarily of the Southeastern Coastal Plain, ranging from NY south to n. peninsular FL, Panhandle FL, and west to LA; disjunct in Coffee County, TN (Chester, Wofford, & Kral 1997). This species is often confused with members of the *E. recurvans-mohrii-anomalum* complex. The following differences are useful: *E. leucolepis* has phyllaries acuminate to attenuate (vs. acute to obtuse), leaves of the uppermost nodes below the inflorescence opposite, or rarely the uppermost 1-2 nodes subopposite (vs. leaves of the uppermost 2-15 nodes below the inflorescence alternate), and leaves generally longitudinally folded (vs. generally planar). The plants formerly called *E. leucolepis* var. *novae-angliae* Fernald and endemic to freshwater pondshores in MA and RI apparently represent a distinct allopolyploid species, *E. novae-angliae* (Fernald) V.I. Sullivan ex A. Haines & Sorrie, and should not be treated as a variety of *E. leucolepis*. [= W; = *E. leucolepis* var. *leucolepis* – C, F, G; < *E. leucolepis* – RAB, GW, S, SE, WH; < *E. leucolepis* var. *leucolepis* – FNA, K]

Eupatorium linearifolium Walter, Narrowleaf Bushy Eupatorium. Cp (FL, GA, NC, SC, VA): sandhills; uncommon. Late July-October. Se. VA south to FL and west to LA. The appropriate treatment of this taxon is unclear; it may be a derivative of the hybrid *E. cuneifolium* × *hyssopifolium*. [= F; < *E. cuneifolium* – RAB, C, G, SE; = *E. hyssopifolium* var. *linearifolium* (Walter) Fernald – K; = *E. tortifolium* Chapman – S; < *E. linearifolium* – FNA, WH]

Eupatorium mikanioides Chapman, Semaphore Thoroughwort. Cp (FL): saline and brackish flats, seasonally ponded freshwater wetlands, wet flatwoods; rare. Endemic to FL, primarily in the peninsula, but also along the coast of the eastern Panhandle (Bay, Franklin, Gulf, Taylor, and Wakulla counties). July-September. [= FNA, GW, K, S, SE, WH]

Eupatorium mohrii Greene, Mohr's Eupatorium. Cp (FL, GA, NC, SC, VA): moist savannas, other wet habitats; common (uncommon in VA). August-October. Se. VA south to s. FL and west to TX. This is by far the most abundant of the *E. recurvans-anomalum-mohrii* complex in our area. Like *E. anomalum*, *E. mohrii* is believed to be a triploid and tetraploid, apomictic derivative of the hybrid *E. recurvans* × *rotundifolium*; it is more widespread than *E. recurvans* sensu stricto. Inasmuch as it is now a separate lineage (as evidenced by a distinct distribution, more-or-less recognizable morphology, and phenologic separation), treatment as a separate taxon seems warranted. [= GW; < *E. recurvans* – RAB, F, G (also see *E. anomalum* and *E. recurvans*); < *E. mohrii* – C, FNA, K, SE, W, WH (also see *E. recurvans*); < *E. anomalum* – S (also see *E. anomalum*)]

Eupatorium paludicola E.E. Schilling & LeBlond. Cp (NC, SC): cypress savannas, clay-based bays, and small depressions ponds; rare. A Cape Fear Arch endemic, ranging from the se. Coastal Plain and Sandhills of NC, to ne. Coastal Plain of SC. See LeBlond et al. (2007) and Schilling et al. (2007). [< *E. leucolepis* – RAB, GW, S, SE; < *E. leucolepis* var. *leucolepis* – FNA, K]

Eupatorium perfoliatum Linnaeus, Boneset. Mt (GA, NC, SC, VA, WV), Pd (DE, GA, NC, SC, VA), Cp (DE, FL, GA, NC, SC, VA): marshes, swamps, bogs, wet pastures, and other wet habitats; common (uncommon in FL). August-October. NS west to MB, south to n. peninsular FL and TX. [= RAB, FNA, GW, W, WH, WV; = *E. perfoliatum* var. *perfoliatum* –C, F, G, K, S, SE; *?* *E. cuneatum* Engelmann – S (actually a hybrid)]

Eupatorium petaloideum Britton, Showy White Thoroughwort. Cp (FL, GA): sandhills, scrub, dryish pinelands; uncommon? GA south to FL, west to s. MS. [= FNA, S; < *E. album* Linnaeus var. *album* – K, SE; < *E. album* – WH; = *E. album* var. *petaloideum* (Britton) Godfrey ex D.B. Ward]

Eupatorium pilosum Walter, Ragged Eupatorium. Cp (DE, FL, GA, NC, SC, VA), Pd (GA, NC, SC, VA), Mt (GA, NC, SC, VA, WV): savannas, bogs, other moist areas; common (uncommon in Piedmont, rare in Mountains). August-October. MA south to c. peninsular FL, west to KY, c. TN, and MS. This species is clearly distinct; it should not be treated as a variety of *E. rotundifolium*. [= RAB, C, F, FNA, GW, K, WH, WV; = *E. verbenaefolium* Reichard – S; = *E. rotundifolium* var. *saundersii* (T.C. Porter) Cronquist – G, SE, W]

Eupatorium pubescens Muhlenberg ex Willdenow, Inland Roundleaf Eupatorium. Mt (GA, NC, SC, VA, WV), Pd (DE, NC, SC, VA), Cp (DE, NC, SC, VA): forests and woodlands, woodland edges, roadbanks; common (uncommon in Mountains, uncommon in Coastal Plain south of DE). July-September. The distribution, abundance, and phenology of *E. pubescens* in our area need additional study. Where growing together, *E. pubescens* apparently flowers about a month earlier than *E. rotundifolium*. Primarily in the Appalachians and adjacent provinces, ranging from ME south to n. GA and n. AL. This taxon appears to be a stabilized polyploid complex originating from hybridization of *E. rotundifolium* and (perhaps) *E. sessilifolium*; in that it now functions as a more-or-less independent evolutionary lineage, with distinctive morphology, habitat, and distribution, it is here treated as a species. [= F, WV; < *E. rotundifolium* var. *ovatum* (Bigelow) Torrey – RAB (also see *E. cordigerum*); = *E. rotundifolium* var. *ovatum* (Bigelow) Torrey – C, FNA, G, K, SE, W; < *E. rotundifolium* – GW; < *E. pubescens* – S (also see *E. cordigerum*); = *E. rotundifolium* Linnaeus ssp. *ovatum* (Bigelow) Montgomery & Fairbrothers]

Eupatorium recurvans Small, Recurved Eupatorium. Cp (FL, GA, NC, SC): moist savannas; rare (NC Watch List). August-October. Se. NC south to GA and s. FL. The diploid sexual *E. recurvans* (sensu stricto) is rare in our area; GW gives its range as se. and sc. GA and FL. *E. mohrii* is believed to be a triploid and tetraploid, apomictic derivative of the hybrid *E. recurvans* × *rotundifolium*; it is more widespread. [= GW, S; < *E. recurvans* – RAB, WH (also see *E. anomalum* and *E. mohrii*); < *E. mohrii* – C, FNA, K, SE]

Eupatorium resinosum Torrey ex A.P. de Candolle, Resinous Boneset, Pinebarren Eupatorium. Cp (DE, NC, SC): seepage bogs, beaver ponds, frequently burned streamhead pocosins, in the Sandhills and inner Coastal Plain of sc. NC; rare. August-

October. A "bimodal endemic," known from the NJ, DE (formerly), and (formerly) NY, thence disjunct to the Sandhills and upper Coastal Plain of NC and SC. [= RAB, C, FNA, G, GW, K, SE; > *E. resinosum* var. *resinosum* – F]

Eupatorium rotundifolium Linnaeus, Common Roundleaf Eupatorium. Cp (DE, FL, GA, NC, SC, VA), Pd (DE, GA, NC, SC, VA), Mt (GA, NC, SC, VA): savannas, seepage bogs, woodlands; common (uncommon in Piedmont north of VA, rare in Mountains). August-October. MA, NY, IN, and OK south to s. FL and TX. [= F, S; = *E. rotundifolium* var. *rotundifolium* – RAB, C, FNA, G, K, SE, W; < *E. rotundifolium* – GW, WH (also see *E. pubescens* and *E. cordigerum*); *E. rotundifolium* Linnaeus ssp. *rotundifolium*]

Eupatorium saltuense Fernald, Tall Boneset, Pasture Eupatorium. Pd (NC, VA), Cp (VA): upland forests, woodland borders, marsh edges; uncommon (rare in NC). August-October. Known from e. and c. VA and NC. Considered by some to be a hybrid of *E. album* and *E. altissimum*. Reported for nc. WV by Harmon, Ford-Werntz, & Grafton (2006). [= RAB, F, G; < *E. altissimum* – C, FNA, K]

Eupatorium scabridum Elliott, Roughleaf Eupatorium. Cp (FL, GA, SC): savannas, wet pinelands; uncommon. Late July-October. SC south to n. FL, west to AR, LA, and OK. This plant is believed to be an allopolyploid derivative of the hybrid *E. rotundifolium* × *semiserratum.* In some areas it apparently consists only of short-lived diploids, but in others (according to GW especially in SC, AR and LA) to occur as populations of polyploid apomicts. It resembles *E. rotundifolium*, but has cuneate leaves with a less prominent pair of lateral veins, narrower leaves, and is more likely to have 3-whorled leaves (as *E. semiserratum* often does). [= GW, S; = *E. rotundifolium* var. *scabridum* (Elliott) A. Gray – FNA, K, SE; < *E. rotundifolium* – WH]

Eupatorium semiserratum A.P. de Candolle. Cp (FL, GA, NC, SC, VA): swamp forests, seepage bogs, savannas, clay-based Carolina bays, other wetlands; uncommon. Late July-October. Se. VA south to ne. FL, Panhandle FL, west to TX and AR; disjunct in sc. TN. This species often has 3 leaves per node; most similar species rarely or never have whorled leaves. [= RAB, C, FNA, G, GW, K, S, SE, WH; = *E. cuneifolium* var. *semiserratum* (A.P. de Candolle) Fernald & Griscom – F]

Eupatorium serotinum Michaux, Late Eupatorium. Cp (DE, FL, GA, NC, SC, VA), Pd (GA, NC, SC, VA), Mt (GA, NC, SC, VA, WV): interdune swales, fields, open forests, powerline rights-of-way, tidal marshes, disturbed areas; common (uncommon in DE). Late August-October. MA, NY, MI, WI, MN, and NE south to s. FL, LA, and TX. This species was apparently largely or strictly coastal in our area, but has spread inland rapidly along corridors of disturbance, somewhat similarly to *Baccharis halimifolia*. [= RAB, C, F, FNA, G, GW, K, S, SE, W, WH, WV]

Eupatorium sessilifolium Linnaeus *var.* ***brittonianum*** Porter, Britton's Eupatorium. Mt (NC, WV): circumneutral soils of woodlands at moderate elevations; rare. August; September. NH and MN, south to NJ, PA, MD, w. NC, KY, and MO. The only collection from NC known to me is from Cedar Cliff, Buncombe County, in 1897. I disagree with Cronquist's equation of this taxon with *E. godfreyanum*. [= F, K, WV; < *E. sessilifolium* var. *sessilifolium* – RAB; < *E. sessilifolium* – C, FNA, G, S, SE, W]

Eupatorium sessilifolium Linnaeus *var.* ***sessilifolium***, Sessile-leaf Eupatorium. Pd (DE, GA, NC, VA), Mt (GA, NC, VA, WV), Cp (DE, VA): open upland woodlands and woodland borders, especially calcareous or mafic; common (uncommon in VA Piedmont, rare in VA Coastal Plain, rare in DE). July-October. S. NH west to se. MN, south to n. GA, n. AL, n. MS, n. AR, and e. KS. Grubbs, Small, & Schilling (2009) discuss the genetics of *E. sessilifolium*; most of the species' distribution consists of agamospermous triploids, with sexual diploids only known from two disjunct areas of the southern Appalachians (w. VA, and w.NC-e. TN). There may be merit to the taxonomic recognition of the diploids and the triploids. [= F, K, WV; < *E. sessilifolium* var. *sessilifolium* – RAB (also see var. *brittonianum*); < *E. sessilifolium* – C, FNA, G, S, SE, W]

Eupatorium torreyanum Short & Peter, Torrey's Eupatorium. Pd (GA, NC, SC, VA), Cp (DE, FL, GA, NC, SC, VA), Mt (GA, NC, SC, WV): dry woodlands, marshes; common (rare in DE and FL, rare in Mountains). Late July-October. NY south to n. peninsular FL, Panhandle FL, and west to OH, TN, and LA. SE considers this taxon a "well-marked variety," "probably originated through hybridization between *E. hyssopifolium* and some other species, but now a stable entity." The other parent is postulated by Sullivan (1978) to be *E. semiserratum*. For reasons stated in the comments before the species accounts, the taxon is here treated as a species. [= S; = *E. hyssopifolium* var. *laciniatum* Gray – C, F, FNA, G, K, SE, W, WH; < *E. hyssopifolium* – RAB, WV (rejected)]

Eupatorium vaseyi T.C. Porter, Vasey's Eupatorium. Mt (GA, NC, VA, WV), Pd (NC, VA), Cp (DE): moist to dry woodlands and openings; uncommon (rare in upper Piedmont). July-October. MD, DE, and VA south to se. TN (Chester, Wofford, & Kral 1997), n. GA, and n. AL. This species is apparently a tetraploid derivative of *E. album* × *sessilifolium*. It is sometimes treated as a variety of *E. album*, but seems better regarded as a species of hybrid origin. [< *E. album* var. *vaseyi* – RAB, W (also see *E. godfreyanum*); = *E. album* var. *vaseyi* (T.C. Porter) Cronquist – C, FNA, SE; = *E. album* var. *monardifolium* (Fernald) – F; < *E. vaseyi* – G; = *E. sessilifolium* var. *vaseyi* (Porter) Fernald & Griscomb – K, WV; ? *E. fernaldii* Godfrey]

Eupatorium album Linnaeus *var.* ***subvenosum*** A. Gray. Cp (DE): pine barrens, open woodlands; rare. DC, DE, NJ, NY. July-September. [= C, F, FNA, K, SE] {add to synonymy}

Eupatorium lancifolium (Torrey & A. Gray) Small. Prairies, open woodlands. AL west to s. AR and TX. [= FNA, GW, K, S, SE; = *E. semiserratum* A.P. de Candolle var. *lancifolium* Torrey & A. Gray]

Eupatorium ×*pinnatifidum* Elliott. E. VA south to Panhandle FL. It is variously considered a species (as by S), a species of hybrid origin (as by SE), or a hybrid (as by GW and K). The parents are variously listed as *E. capillifolium* × *perfoliatum* (as by K) or *E. capillifolium* or *compositifolium* × *perfoliatum* (as by GW and SE). I have seen the plant in Pender County, NC, where it appears to be a first-generation hybrid, growing with *E. capillifolium* and *E. perfoliatum*. Until and unless additional evidence appears that it reproduces itself and exists in independent populations I am inclined to treat it as a hybrid rather than a species of hybrid origin. It is recognizable by its pinnatifid or bipinnatifid leaves (the segments broader than in the dog-fennels) and its corymbose-paniculate inflorescence. [= FNA, K, WH; = *E. pinnatifidum* Elliott – GW, S, SE] {not keyed}

Eurybia (Cassini) Cassini 1820 (Wood-aster)

A genus of about 23 species, perennial herbs, of North America and n. Eurasia. References: Brouillet in FNA (2006b); Nesom (1994b)=X; Lamboy (1987)=Y; Lamboy (1992, 1988). Key based in part on SE and FNA.

1 Basal and lower cauline leaves both distinctly petioled and with a cordate or subcordate blade; [subgenus *Eurybia*, section *Eurybia*].
  2 Outer phyllaries squarrose-reflexed; rhizomes short or absent, the plants not forming extensive clonal colonies; [of rich slopes an bottomlands of the lower Piedmont of NC, SC, GA, and AL].
    3 Involucre (10-) 11-13 mm tall; phyllaries 36-50, ovate, elliptic, or lanceolate, acute to acuminate at the apex, squarrose in life, often only the innermost squarrose in dried specimens, the reflexed portion with a distinct hyaline margin; ray florets 7-15, blue or violet; [of the lower Piedmont of GA and AL] ..... ***E. jonesiae***
    3 Involucre 7-10 (-12) mm high; phyllaries 46-75 (-90), oblong-lanceolate, acute, obtuse, or rounded at the apex, squarrose in life, generally remaining so in dried specimens, the reflexed portion herbaceous with a narrow hyaline margin or none at all; ray florets (7-) 16-20 (-30), white or lavender; [of the lower Piedmont of s. NC and SC] ..... ***E. mirabilis***
  2 Outer phyllaries appressed (or slightly and irregularly spreading); rhizomes long, the plants forming extensive clonal colonies; [of various habitats and distribution].
    4 Ray flowers purplish or bluish; branches of the inflorescence glandular-pubescent ..... ***E. macrophylla***
    4 Ray flowers white; branches of the inflorescence not glandular-pubescent.
      5 Plants with basal leaves on well-developed shoots separate from the flowering shoots; larger leaves with 15-30 teeth per side ..... ***E. schreberi***
      5 Plants without basal leaves on well-developed shoots separate from the flowering shoots; larger leaves with 5-20 teeth per side.
        6 Longest peduncle in inflorescence > 1.5 cm long; involucre 6.5-9 (-10) mm tall; ray florets (8-) 12-16 (-20), the ray portion (10-) 17-18 (-20) mm long; disc florets (12-) 17-26; [mostly of high mountain forests, primarily over 1200 m in elevation] ..... ***E. chlorolepis***
        6 Longest peduncle in inflorescence < 1.5 cm long; involucre (3.5-) 4.2-6 (-7.5) mm tall; ray florets 5-10 (-12), the ray portion (5-) 10-15 mm long; disc florets 12-19 (-25); [mostly of lower elevation forests, primarily below 1200 m in elevation] ..... ***E. divaricata***
1 Basal and lower cauline leaves not as above.
  7 Leaves linear, up to about 10 mm wide; leaves strongly basally disposed.
    8 Inflorescence flat-topped (corymbiform); [subgenus *Heleastrum*, section *Heleastrum*].
      9 Pappus fine, the bristles not thickened above; ray florets 8-15 (-25); [of the Piedmont and low Mountains of GA, SC, and possibly sw. NC] ..... ***E. avita***
      9 Pappus coarse, the larger bristles thickened above (clavellate-flattened); ray flowers 15-35; [of the Coastal Plain, of ne. NC south to ne. FL] ..... ***E. paludosa***
    8 Inflorescence elongate (spike-like or raceme-like).
      10 Stem spreading-hairy throughout; ray florets 25-60, white or pinkish; disc florets; [endemic of FL Panhandle and adjacent sw. GA]; [subgenus *Heleastrum*, section *Eryngiifolii*] ..... ***E. eryngiifolia***
      10 Lower stem glabrous, upper stem variously hairy; ray florets 8-30, deep lavender or purple; [collectively widespread]
        11 Upper stem strigillose; phyllaries 48-64; ray florets 15-30; disc florets (40-) 52-80+; [widespread]; [subgenus *Heleastrum*, section *Heleastrum*] ..... ***E. hemisphaerica***
        11 Upper stem villous to glabrescent; phyllaries 20-40; ray florets 8-17; disc florets 18-30; [endemic of FL Panhandle]; [subgenus *Heleastrum*, section *Eryngiifolii*] ..... ***E. spinulosa***
  7 Leaves broader, the largest on a plant over 15 m wide; leaves somewhat basally disposed, the lowermost sometimes withering before flowering.
    12 Leaves obviously veined beneath, usually toothed, hairy on the undersurface; [subgenus *Eurybia*, section *Radulini*].
      13 Larger leaves < 2.5 (-3.6) cm wide; rays purple; [of w. VA, WV, northward] ..... ***E. radula***
      13 Larger leaves > 4.0 cm wide; rays white to pale purple; [of the Cumberland Plateau of KY and n. TN] ..... ***E. saxicastellii***
    12 Leaves very obscurely veined beneath, entire or nearly so, glabrous on the undersurface; [subgenus *Eurybia*, section *Calliastrum*].
      14 Ray florets 9-14; rays 5-15 mm long ..... ***E. compacta***
      14 Ray florets 15-35; rays 10-25 mm long.
        15 Phyllaries glandular-pubescent on the back and also glandular-ciliate; involucre 8-16 mm high ..... ***E. spectabilis***
        15 Phyllaries slightly or not at all glandular-pubescent on the back (sometimes glandular-ciliate); involucre 7-12 mm high ..... ***E. surculosa***

Eurybia avita (Alexander) Nesom, Alexander's Rock Aster. Pd (GA, SC), Mt (NC?): in shallow soils on granitic flatrocks and granitic domes where moist from seasonal seepage; rare. Upper Piedmont endemic: w. SC (or sw NC?) to wc. GA. A diploid species (2n=18). [= FNA, K, X; = *Aster avitus* Alexander – SE, W]

Eurybia chlorolepis (E.S. Burgess) Nesom, Blue Ridge White Heart-leaved Aster. Mt (GA, NC, SC, VA, WV?): northern hardwood forests, spruce-fir forests; common (rare in VA). August-October. A Southern Appalachian endemic: sw. VA south through w. NC and e. TN to nw. SC and n. GA (Lamboy 1992); also reported for scattered locations in WV (Harmon, Ford-Werntz, & Grafton 2006). Lamboy (1992) has shown that *Eurybia chlorolepis* is a species distinct from *Eurybia divaricata*. *E. chlorolepis* is tetraploid (2n=36) and hexaploid (2n=54); *E. divaricatus* is diploid (2n=18). [= FNA, K, X; = *Aster chlorolepis* E.S. Burgess – G, S, Y; = *A. divaricatus* Linnaeus var. *chlorolepis* (E.S. Burgess) Ahles – RAB, C, SE, W; < *A. divaricatus* – F, WV]

Eurybia compacta Nesom, Slender Aster. Cp (DE, GA, NC, SC, VA): pine savannas; uncommon (rare in GA). Late July-October. An Atlantic Coastal Plain endemic: NJ to e. GA. A diploid species (2n=18). [= FNA, K, X; = *Aster gracilis* Nuttall – RAB, C, F, G, S, SE]

Eurybia divaricata (Linnaeus) Nesom, Common White Heart-leaved Aster. Mt (GA, NC, SC, VA, WV), Pd (DE, GA, NC, SC, VA), Cp (DE, NC, VA): moist to fairly dry forests and woodlands; common (uncommon in VA Coastal Plain, rare in DE Coastal Plain). August-October. N. NH west to s. ON, sw. QC, and n. OH, south to e. NC, c. SC, n. GA, and c. AL. The many species described by Burgess and here treated as synonyms may deserve further assessment; see S for details. A diploid species (2n=18). [= FNA, K, X; = *Aster divaricatus* Linnaeus – G, Y; = *A. divaricatus* var. *divaricatus* – RAB, C, SE, W; < *A. divaricatus* – F, WV

(also see *Eurybia chlorolepis*); > *A. boykinii* E.S. Burgess - S; > *A. castaneus* E.S. Burgess – S; > *A. divaricatus* – S; > *A. excavatus* E.S. Burgess – S; > *A. flexilis* E.S. Burgess – S; > *A. stillettiformis* E.S. Burgess – S; > *A. tenebrosus* E.S. Burgess – S]

Eurybia eryngiifolia (Torrey & A. Gray) Nesom, Eryngo-leaved Aster. Cp (FL, GA): pine savannas; rare. East Gulf Coastal Plain endemic: sw. GA and Panhandle FL west to AL. [= FNA, K, WH, X; = *Aster eryngiifolius* Torrey & A. Gray – S, SE]

Eurybia hemispherica (Alexander) Nesom, Prairie Grass-leaved Aster. Mt (GA), Cp (FL, GA?): glades, barrens, rocky woodlands; uncommon (rare in FL). E. TN west to MO, south to nw. GA, se. GA, and FL Panhandle. Apparently diploid (2n=18) and tetraploid (2n=36). [= FNA, K, WH, X; = *Aster hemisphericus* Alexander – C, F, SE; = *A. paludosus* Aiton ssp. *hemisphericus* (Alexander) Cronquist – G; = *A. hemisphaericus* – W, orthographic variant]

Eurybia jonesiae (Lamboy) Nesom, Piedmont Big-leaved Aster. Pd (GA): moist forests; rare. August-October. Endemic to the Piedmont: e. GA west to e. AL (Lee Co.). A hexaploid species (2n=54). [= FNA, K, X; = *Aster jonesiae* Lamboy; = *A. commixtus* (Nees) Kuntze – S, misapplied; < *A. commixtus* (Nees) Kuntze – SE, misapplied]

Eurybia macrophylla (Linnaeus) Cassini, Big-leaved Aster. Mt (GA, NC, SC, VA, WV), Pd (VA): moist to dryish forests, in NC mostly at moderate to high elevations, particularly in red oak forests on ridgetops; common (uncommon in Piedmont). Late July-September. NB and QC west to MN, south to PA, MD, VA, NC, ne. GA, e. TN, and IN. *Aster macrophyllus* var. *ianthinus* [= *Aster multiformis*] is sometimes recognized. It is alleged to differ in having the stipitate glands of the pedicels with minute heads (vs. broadly capitate), the leaves thin in texture and only slightly scabrous (vs. thick in texture and strongly scabrous). Many other varieties have been recognized by Fernald (1950); see F for a key. *E. macrophylla* is octoploid (2n=72). [= FNA, K, X; = *Aster macrophyllus* Linnaeus – RAB, C, G, SE, W, Y; > *Aster macrophyllus* var. *macrophyllus* – F, WV; > *A. macrophyllus* var. *ianthinus* (E.S. Burgess) Fernald – F, WV; > *A. macrophyllus* var. *pinguifolius* E.S. Burgess – F; > *A. macrophyllus* var. *pinquifolius* E.S. Burgess – WV, misspelling; > *A. macrophyllus* var. *excelsior* E.S. Burgess – F, WV; > *A. macrophyllus* var. *velutinus* E.S. Burgess – F, WV; > *A. macrophyllus* var. *sejunctus* E.S. Burgess – F; > *A. macrophyllus* var. *apricensis* E.S. Burgess – F; > *A. macrophyllus* – S; > *A. multiformis* E.S. Burgess – S; > *A. riciniatus* E.S. Burgess – S]

Eurybia mirabilis (Torrey & A. Gray) Nesom, Piedmont Aster. Pd (NC, SC): nutrient-rich bottomlands and moist slopes in the lower Piedmont; rare. July-September. Endemic to the lower Piedmont of NC and SC. A diploid species (2n=18). [= FNA, K, X; = *Aster mirabilis* Torrey & A. Gray – S; < *A. commixtus* (Nees) Kuntze – RAB, SE, misapplied]

Eurybia paludosa (Aiton) Nesom, Savannah Grass-leaved Aster. Cp (FL, GA, NC, SC): wet savannas, sandhill / pocosin ectones; common (rare in FL). July-October. An Atlantic Coastal Plain endemic: ne. NC south to se. GA and ne. FL (Nassau County). A teraploid species (2n=36). [= FNA, K, WH, X; = *Aster paludosus* Aiton – RAB, C, GW, SE; = *A. paludosus* ssp. *paludosus* – G]

Eurybia radula (Aiton) Nesom, Low Rough Aster. Mt (VA, WV), Cp (DE): circumneutral to calcareous wet meadows, possibly stream banks; rare. July-September. NL (Newfoundland) and NL (Labrador) south to DE (historically), MD, WV, and w. VA. A diploid species (2n=18). [= FNA, K, X; = *Aster radula* Aiton – C, G, SE, W, WV; > *A. radula* var. *radula* – F]

Eurybia saxicastellii (J.J.N. Campbell & Medley) Nesom, Rockcastle Wood-aster. Mt (KY, TN): boulder/cobble bars along the Rockcastle River; rare. Endemic to the Cumberland Plateau region of KY and n. TN (Scott County, TN) (Chester, Wofford, & Kral 1997). A hexaploid species (2n=54). [= K, X; = *Aster saxicastellii* J.J.N. Campbell & Medley – C; = *E. saxicastelli* – FNA, orthographic variant]

Eurybia schreberi (Nees) Nees, Schreber's Aster. Mt (VA, WV), Pd (DE, VA): mesic forests and seepage slopes; uncommon (rare in DE). Late June-October. NH west to WI, south to DE, MD, sc. and w. VA, ne. TN (Chester, Wofford, & Kral 1997), AL, and KY. *E. schreberi* is hexaploid (2n=54). [= FNA, K, X; = *Aster schreberi* Nees – C, G, SE, W, Y; > *A. schreberi* – F; > *A. glomeratus* (Bernhart ex Nees) E.S. Burgess – F]

Eurybia spectabilis (Aiton) Nesom, Low Showy Aster. Cp (DE, NC, SC, VA), Pd (NC): pine barrens, dry road banks; rare. August-October. Coastal Plain (and rarely adjacent provinces) from MA south to SC; disjunct in AL. An octoploid species (2n=72). [= X; = *Aster spectabilis* Aiton – RAB, C, SE; > *A. spectabilis* Aiton var. *cinerascens* Blake – G; > *A. spectabilis* Aiton var. *spectabilis* – F, G; > *A. spectabilis* var. *suffultus* Fernald – F, G; > *A. smallii* Alexander – S; > *A. spectabilis* – S]

Eurybia spinulosa (Chapman) Nesom, Apalachicola Aster. Cp (FL): longleaf pine savannas; rare. Endemic to Panhandle FL (Bay, Calhoun, Gulf, and Franklin counties). May-July. [= FNA, K, WH, X; = *Aster spinulosus* Chapman – GW, S, SE]

Eurybia surculosa (Michaux) Nesom, Creeping Aster. Mt (NC, SC, VA): rock outcrops, glades, rocky woodlands; uncommon (rare in VA). Late August-October. A Southern Appalachian endemic: se. KY and w. VA south to w. NC, e. TN, nw. SC, and n. GA. Alleged occurrences of *E. surculosa* on the Coastal Plain in se. SC and e. GA are based on misidentifications of *E. compacta*. A tetraploid species (2n=36). [= FNA, K, X; = *Aster surculosus* Michaux – RAB, C, F, G, S, SE, W]

Euthamia (Nuttall) Cassini 1825 (Flat-topped Goldenrod)

A genus of about 8-10 species, herbs, of North America. There are a number of serious problems remaining in our knowledge of *Euthamia*. References: Sorrie (in prep.)=V; Haines in FNA (2006b); Sieren (1981)=Z; Taylor & Taylor (1983)=Y; Johnson (1995)=X; Cronquist (1980)=SE.

1 Leaves with numerous slightly raised, pale, translucent, blister-like pustules; leaves transmit light when held up; plant glabrous ..... ***E. leptocephala***

1 Leaves without pale pustules, or if present then leaves opaque and do not transmit light; plants glabrate to pubescent.

2 Major veins on leaf underside 3-5 (if 3 then all 3 veins bold), leaves 5-12 mm wide; heads with 20-50 flowers.

3 Leaves 3-6 (-8) mm wide, punctae on leaf upperside bold, flower heads 10-20 flowered ..... ***[E. gymnospermoides]***

3 Leaves 5-12 mm wide, punctae on leaf upperside obscure or not bold, flower heads 20-50 flowered.

4 Leaf undersides, upper stems, and branches glabrate, often with villous hairs on midrib of leaf underside ..... ***E. graminifolia*** *var.* ***graminifolia***

4 Leaf undersides, upper stems, and branches copiously to moderately short villous ..... ***E. graminifolia** var. **nuttallii***
2 Major veins on leaf underside 1-3 (-5) (if 3 or 5 then only the midvein bold), leaves <6 mm wide (-8 in gymnospermoides); heads with 10-20 flowers.
5 Leaves < 3 mm wide; major veins 1 (-3), nearly always with axillary fascicles (rarely without); [of Coastal Plain and lower Piedmont from se LA eastward] ..... ***E. caroliniana***
5 Leaves >3 mm wide, main veins 3 (-5), without axillary fascicles.
6 Upper surface of leaves glabrous, inflorescence branches glabrous or glabrate; [of midwestern interior] ..... ***[E. gymnospermoides]***
6 Upper surface of leaves with line of very short, scabridulous hairs on midvein near base, and often also beyond midleaf; [of outer Coastal Plain] ..... ***E. hirtipes***

Euthamia caroliniana (Linnaeus) Greene ex Porter & Britton. Cp (DE, FL, GA, NC, SC, VA), Pd (VA), Mt (VA): pine savannas, moist forests, ditches, pastures, disturbed areas; common. September-December. S. ME south to s. FL and west to se. LA, mainly on the Coastal Plain, extending somewhat into the Piedmont in places (reports from further north or further west are mased on misidentifications or on broader circumscriptions of the taxon). [= FNA, K, WH, V, X; > *Solidago microcephala* (Nuttall) Bush – RAB, F, G; >< *Solidago tenuifolia* Pursh – RAB; > *E. tenuifolia* (Pursh) Nuttall var. *microcephala* Nuttall – C; > *E. tenuifolia* var. *tenuifolia* – C; > *Solidago tenuifolia* var. *tenuifolia* – F; > *Solidago tenuifolia* – G; < *E. tenuifolia* – GW (also see *E. hirtipes*); > *E. minor* (Michaux) Greene – GW, SE; = *E. minor* – S; > *E. tenuifolia* (Pursh) Nuttall – SE; = *E. tenuifolia* – W, Z]

Euthamia graminifolia (Linnaeus) Nuttall *var.* ***graminifolia***. Mt (VA, WV), Pd (DE, VA), Cp (DE, SC*, VA): moist to dry weedy situations, riverbanks, bottomlands, bog margins; common (rare in SC). August-September. NL (Newfoundland) and ND south to MD, c. VA, WV, n. KY, TN, and e. IA; a SC Coastal Plain report (Hill & Horn 1997) is probably an introduction. Also introduced on the Gulf Coast (LA and MS?). [= C, V, X, Y, Z; < *E. graminifolia* – S, SE, W; < *Solidago graminifolia* (Linnaeus) Salisbury – RAB; < *Euthamia graminifolia* – FNA; > *Solidago graminifolia* var. *polycephala* Fernald – F; > *S. graminifolia* var. *graminifolia* – F, G; < *E. graminifolia* var. *graminifolia* – K]

Euthamia graminifolia (Linnaeus) Nuttall *var.* ***nuttallii*** (Greene) W. Stone. Mt (NC, VA, WV), Pd (DE, VA), Cp (DE, SC*, VA): moist to dry weedy situations, riverbanks, bottomlands, bog margins; common (rare in NC and SC). August-September. NL (Newfoundland) south to se. VA, w.NC, KY, nw. TN and MO. Also introduced on the Gulf Coast (LA and MS?). [= C, V, X, Y, Z; < *E. graminifolia* – S, SE, W; < *Solidago graminifolia* (Linnaeus) Salisbury – RAB; < *Euthamia graminifolia* – FNA; = *S. graminifolia* var. *nuttallii* (Greene) Fernald – F, G; < *E. graminifolia* var. *graminifolia* – K]

Euthamia hirtipes (Fernald) Sieren, Marsh Flat-topped Goldenrod. Cp (DE, FL, GA, NC, SC, VA): brackish marshes, salt marshes, marsh edges, wet hammocks; uncommon (rare in VA). September-December. S. NJ and DE south to c. peninsular FL, west to s. AL. *E. hirtipes* has been variously treated: considered by Fernald to be a hybrid of "*minor*" and "*graminifolia* var. *nuttallii*," by Sieren to be a species endemic to NC, SC, and VA, by Taylor and Taylor (1983) to be a variety of *E. graminifolia* ranging from se. VA south to FL and west to LA, and by GW to be equivalent to *E. tenuifolia*. [= V, Z; < *Solidago tenuifolia* Pursh – RAB; < *Euthamia graminifolia* – FNA; = *Euthamia ×hirtipes* (Fernald) Sieren (pro sp.) – C; > *Solidago ×hirtipes* Fernald – F; >< *Solidago gymnospermoides* (Greene) Fernald – F, G, misapplied as to our plants; >< *Solidago leptocephala* Torrey & A. Gray – F, misapplied as to our plants; < *E. tenuifolia* – GW; = *E. graminifolia* (Linnaeus) Nuttall var. *hirtipes* (Fernald) C. & J. Taylor – K, WH, X, Y]

Euthamia leptocephala (Torrey & A. Gray) Greene. Mt (GA), Pd (GA): fields, pastures, roadsides, prairies, savannas; uncommon. KY, IL, MO, and OK south to nw. GA (Floyd and Heard counties), AL, and TX. [= C, FNA, GW, K, S, SE, V, Z; = *Solidago leptocephala* Torrey & A. Gray – F, G]

Euthamia gymnospermoides Greene, Texas Goldentop. Prairies, roadsides, and light woodlands. MI, nw. MN, and e. ND south to c. IN, sw. KY (Graves Co), w. TN (Hardeman, Lawrence counties), ec. and c. AR, ne. TX, w. OK, and e. CO.; disjunct in Coffee Co. TN. [= FNA, K, SE, V, Z; < *Solidago gymnospermoides* (Greene) Fernald – F, G]

Eutrochium Rafinesque 1838 (Joe-pye-weed)

The separation of *Eutrochium (Eupatoriadelphus)* from *Eupatorium* has been supported by Schmidt & Schilling (2000). Lamont (2004) makes the necessary combinations under the oldest available generic name, *Eutrochium* Rafinesque. References: Lamont in FNA (2006c); Lamont (2004)=X; Schmidt & Schilling (2000)=Y; Lamont (1995)=Z.

1 Florets (4-) 6-9 (-12) per head; leaves more or less 3-nerved from the base, rather abruptly contracted to the short petiole, thick in texture, 5-12 (-15) cm long, strongly resin-dotted beneath; leaves in whorls of (2-) avg. 3-4 (-5); stem generally purple-speckled (sometimes uniformly purple); [primarily of the Coastal Plain] ..... ***E. dubium***
1 Florets **either** (8-) 9-22 **or** 4-7 per head; leaves generally pinnately veined (rarely with a tendency to be 3-nerved), usually cuneate and less abruptly contracted to the petiole, thick or thin in texture, 6-35 cm long, weakly or not at all resin-dotted beneath (except often strongly resin-dotted in *E. maculatum*); leaves in whorls of (2-) 3-7; stem purple-speckled, purple at the nodes, purple throughout, or green; [collectively widespread in our area].
2 Florets (8-) 9-22 per head; leaves mostly in whorls of (3-) avg. 4-5 (-6), 6-20 cm long; inflorescence more or less flat-topped; stem usually speckled with purple (rarely evenly purplish) ..... ***E. maculatum** var. **maculatum***
2 Florets 4-7 per head; leaves in whorls of (2-) 3-7, 8-35 cm long; inflorescence rounded; stem usually purple throughout, purple at the nodes, or lacking purplish pigment.
3 Stem hollow (with a large central cavity), purple throughout, strongly glaucous when fresh; flowers bright pink-purple; leaves in whorls of (3-) avg. 5 (-7); leaves mostly 3.5-5.5× as long as broad ..... ***E. fistulosum***
3 Stem solid (rarely with a slender central cavity), dark purple at the nodes or greenish purple throughout, not glaucous or only slightly so when fresh; flowers pale pink-purple; leaves in whorls of (2-) avg. 3-4 (-5); leaves mostly 2-4× as long as broad.
4 Stem persistently glandular-pubescent throughout; lower surface of leaves glandular-pubescent; leaves mostly 2-2.5× as long as wide; stem greenish-purple (or evenly purple); [of the Mountains] ..... ***E. steelei***

4 Stem glandular-puberulent in the inflorescence, glabrous below the inflorescence; lower surface of leaves with few, sessile resin dots; leaves mostly 2.5-4× as long as broad; stem greenish, often dark purple at the nodes, particularly when sun-grown; [widespread in our area] ..... ***E. purpureum*** *var.* ***purpureum***

Eutrochium dubium (Willdenow ex Poiret) E.E. Lamont, Three-nerved Joe-pye-weed. Cp (DE, NC, SC, VA), Pd (DE, NC, SC), Mt (NC): swamp forests, pocosins, other wet, acidic habitats; common (uncommon in Piedmont south of DE). July-October. NS, s. ME, and NH south to se. SC, on or near the Coastal Plain. Reported as adventive in West Virginia (Harmon, Ford-Werntz, & Grafton 2006). [= FNA, X; = *Eupatoriadelphus dubius* (Willdenow ex Poiret) King & H.E. Robinson – GW, Y; = *Eupatorium dubium* Willdenow ex Poiret – RAB, C, F, G, K, SE, W, Z; = *Eupatorium purpureum* – S, misapplied]

Eutrochium fistulosum (Barratt) E.E. Lamont, Hollow-stem Joe-pye-weed. Mt (GA, NC, SC, VA, WV), Pd (DE, GA, NC, SC, VA), Cp (DE, FL, GA, NC, SC, VA): moist forests, marshes, ditches; common (uncommon in Coastal Plain). July-October. S. ME, NY, IL, and MO, south to c. peninsular FL, Panhandle FL, and e. TX. [= FNA, X; = *Eupatoriadelphus fistulosus* (Barratt) King & H.E. Robinson – GW, Y; = *Eupatorium fistulosum* Barratt – RAB, C, F, G, K, SE, W, WH, WV, Z; = *Eupatorium maculatum* – S, misapplied]

Eutrochium maculatum (Linnaeus) E.E. Lamont *var.* ***maculatum***, Spotted Joe-pye-weed. Mt (NC, VA, WV), Pd (VA): marl fens, wet calcareous meadows, cove forests, grassy balds; uncommon (rare in VA and WV). Late July-October. The species is widespread across n. North America. NL (Newfoundland), ME, QC, ON, and MN, south to PA, OH, n. KY, c. IL, and c. IA, and in the Mountains south to e. WV, w. VA, and w. NC. Var. *bruneri* (A. Gray) E.E. Lamont is more western; var. *foliosum* (Fernald) E.E. Lamont, is more northern. Further investigation is needed of the peculiar and implausible change in habitat of this species, from calcareous wetlands in c. VA northward, to mesic high elevation slopes and forests (in acidic to very acidic soils) from sw. VA southward. Such a change is suggestive of the presence of an unrecognized, cryptic taxon in the Southern Appalachians. [= FNA, X; = *Eupatorium maculatum* Linnaeus var. *maculatum* – F, G, K, SE; < *Eupatorium maculatum* – RAB, W, WV; = *Eupatorium maculatum* ssp. *maculatum* var. *maculatum* – C, Z; < *Eupatoriadelphus maculatus* – Y]

Eutrochium purpureum (Linnaeus) E.E. Lamont *var.* ***carolinianum*** Sorrie, Carolina Joe-Pye-weed. Pd (NC, SC): dry forests, woodlands, oak savannas, and roadsides; rare. See Sorrie (2010) for additional detail. [< *Eutrochium purpureum* var. *purpureum* – FNA, X; < *Eupatorium purpureum* Linnaeus var. *purpureum* – K, Z; < *E. purpureum* – RAB, C, F, SE, W, WH; < *Eupatorium purpureum* var. *purpureum* – G, WV; < *Eupatorium trifoliatum* Linnaeus – S]{not yet keyed}

Eutrochium purpureum (Linnaeus) E.E. Lamont *var.* ***purpureum***, Purple-node Joe-pye-weed. Mt (GA, NC, SC, VA, WV), Pd (DE, GA, NC, SC, VA), Cp (FL, DE, GA, NC, SC, VA): upland, usually mesic forests; common (rare in Coastal Plain, uncommon in DE Piedmont). July-October. NH west to se. MN, IA, and e. NE, south to SC, GA, Panhandle FL, n. LA, and e. OK; var. *holzingeri* (Rydberg) E.E. Lamont, differing in having the lower leaf surface densely and persistently pubescent (vs. glabrous or nearly so) is found in the Midwest (Lamont 1990). *Eupatorium purpureum* var. *amoenum* is smaller, more slender, with narrower leaves which are nearly glabrous below; it is probably only a form. [< *Eutrochium purpureum* var. *purpureum* – FNA, X; < *Eupatorium purpureum* Linnaeus var. *purpureum* – K, Z; < *E. purpureum* – RAB, C, F, SE, W, WH; > *Eupatorium purpureum* var. *amoenum* (Pursh) Gray – G, WV; < *Eupatorium purpureum* var. *purpureum* – G, WV; < *Eupatorium trifoliatum* Linnaeus – S]

Eutrochium steelei (E.E. Lamont) E.E. Lamont, Appalachian Joe-pye-weed, Steele's Joe-pye-weed. Mt (NC, VA): cove hardwood and northern hardwood forests, up to at least 1600 m; uncommon. July-October. A Southern Appalachian endemic: e. KY and w. VA south w. NC and e. TN. [= FNA, X; = *Eupatoriadelphus steelei* (E. Lamont) G.J. Schmidt & Schilling – Y; = *Eupatorium steelei* E.E. Lamont – Z]

Facelis Cassini 1819

A genus of 3 species, herbs, of South America. References: Nesom in FNA (2006a); Arriagada (1998)=Z; Cronquist (1980)=SE; Anderberg (1991)=Y.

* ***Facelis retusa*** (Lamarck) Schultz 'Bipontinus', Trampweed. Cp (FL, GA, NC, SC, VA), Pd (GA, NC, SC), Mt (SC): fields, roadsides, lawns, disturbed areas; common (rare in VA), native of s. South America. Late April-June. [= RAB, FNA, K, SE, WH, Y, Z; *? F. apiculata* Cassini – S]

Filago Linnaeus 1753 (Cotton-rose, Herba Impia, Rabbit-tobacco)

A genus of about 40 species, herbs, of Eurasia, North America, and n. Africa. Arriagada (1998) favors the inclusion of *Evax* in *Filago*. References: Morefield in FNA (2006a); Arriagada (1998)=Z; Cronquist (1980)=SE; Anderberg (1991)=Y.

1 Inner flowers of the head with a well-developed capillary pappus; heads woolly, but not so densely and completely as to hide the phyllaries ... . ***F. vulgaris***

1 All flowers of the head lacking a pappus of capillary bristles; heads completely surrounded by wool, the phyllaries hidden ..... ***[see Diaperia]***

* ***Filago vulgaris*** Lamarck, Herba Impia. Pd (NC, VA), Mt (VA, WV), Cp (VA): disturbed areas; uncommon, native of Europe. May-September. [= FNA, K, Y; = *F. germanica* – RAB, C, F, G, SE, WV, Z; = *Gifola germanica* Dumortier – S]

Flaveria de Jussieu 1789

A genus of about 21 species, herbs and subshrubs, subcosmopolitan in tropical and subtropical areas. References: Yarborough & Powell in FNA (2006c); Cronquist (1980)=SE.

1 Heads borne in axillary glomerules; disc florets 0-1 (-2) ..... ***F. trinervia***
1 Heads borne in terminal arrays; disc florets (2-) 3-8.
  2 Lower leaves petiolate, 10-25 (-70) mm wide; annual; cypselas 2.0-2.5+ mm long..... ***F. bidentis***
  2 Lower leaves sessile, 1-4 (-15) mm wide; perennial; cypselas 1.2-1.8 mm long ..... ***F. linearis***

* ***Flaveria bidentis*** (Linnaeus) Kuntze. Cp (FL, GA): disturbed areas; rare, native of tropical America. FL Panhandle, s. FL, AL, GA. [= FNA, K, S, SE, WH]

Flaveria linearis Lagasca y Segura, Narrowleaf Yellowtops. Cp (FL): beaches, marshes, hammocks, pinelands; rare. Native in peninsular and Panhandle FL. [= FNA, GW, K, S, WH; < *F. linearis* – SE]

* ***Flaveria trinervia*** (Sprengel) C. Mohr, Clustered Yellowtops. Cp (SC, VA): waste areas around wool-combing mill, ore piles, seaport ballast; rare, probably only a waif, introduced from sw. United States (Nesom 2004d). March-December. Also known from ballast at Mobile, AL (Cronquist 1980). [= FNA, K, S, SE, WH]

Fleischmannia Schultz 'Bipontinus' 1850

A genus of about 80 species of s. North America, south through Central America to w. (Andean) South America. References: Nesom in FNA (2006c); Wooten & Clewell (1971)=Z; Schultz & Schilling (2000).

Fleischmannia incarnata (Walter) King & H.E. Robinson, Pink Thoroughwort, Pink Eupatorium. Pd (GA, NC, SC, VA), Mt (GA, NC, SC, VA, WV), Cp (FL, GA, NC, SC, VA): nutrient-rich, moist to dry, forests and woodlands over diabase, limestone, coquina limestone, or other basic rocks, or on rich alluvium; rare. Late August-October. Se. VA west to WV, s. OH, s. IN, s. IL, s. MO, and e. OK, south to w. peninsular FL, Panhandle FL, s. TX, and e. Mexico, the distribution fragmented. See Wooten & Clewell (1971) for further information about this species. [= FNA, K, WH, Z; = *Eupatorium incarnatum* Walter – RAB, C, F, G, S, SE, W, WV]

Gaillardia Fougeroux 1786 (Blanket-flower, Gaillardia, Fire-wheels)

A genus of about 15-30 species, herbs, of temperate North America and South America. References: Strother in FNA (2006c); Cronquist (1980)=SE; Turner & Whalen (1975)=Z; Turner et al. (2003)=Y.

1 Receptacle naked, lacking well-developed setae (if setae present, < 1 mm long) ..... ***G. aestivalis*** *var.* ***aestivalis***
1 Receptacle with well-developed setae 2-3 mm long.
  2 Leaves fleshy; perennial or annual, strongly branching, the secondary branches spreading and therefore forming compact, rounded "bushes" ..... ***G. pulchella*** *var.* ***drummondii***
  2 Leaves herbaceous; annual, with secondary branches ascending ..... ***G. pulchella*** *var.* ***pulchella***

Gaillardia aestivalis (Walter) H. Rock *var.* ***aestivalis***, Sandhills Gaillardia. Cp (FL, GA, NC, SC), Mt? (GA?): sandhills, disturbed sandy soils; common, rare north of FL. July-October. Sc. NC south to c. peninsular FL, west to TX. The occurrence in nw. GA reported in Jones & Coile (1988) is odd. [= K, SE; < *G. aestivalis* – RAB, FNA; = *G. lanceolata* Michaux var. *lanceolata* – G; < *G. lanceolata* – S]

Gaillardia pulchella Fougeroux *var.* ***drummondii*** (Hooker) B.L. Turner, Beach Blanket-flower. Cp (FL, GA, NC, SC): sandy flats behind the dunes; common. April-December. Ne. NC south to FL, west to TX. [= Y; = *G. pulchella* Fougeroux var. *picta* (Sweet) A. Gray – K, Z; < *G. pulchella* – RAB, C, F, FNA, G, SE, WH; = *G. picta* Sweet – S]

* ***Gaillardia pulchella*** Fougeroux *var.* ***pulchella***, Common Blanket-flower. Cp (DE, FL, GA, NC, SC, VA), Pd (GA, NC, SC, VA): disturbed areas, persistent after cultivation; rare, introduced from further south and west. April-September. [= K, Y, Z; < *G. pulchella* – RAB, C, F, FNA, G, SE, WH; = *G. drummondii* (Hooker) A.P. de Candolle – S, misapplied]

Galinsoga Ruiz & Pavón 1794 (Peruvian-daisy, Quickweed)

A genus of about 13 species, herbs, of temperate and subtropical Central America and South America. References: Canne-Hilliker in FNA (2006c); Cronquist (1980)=SE.

1 Rays 0-1.5 (-2) mm long, lacking pappus scales (or with vestigial scales); outer phyllaries 2-4, with scarious margins; inner paleae deeply 3-lobed; pappus scales of the disc florets not awn-tipped; stem usually glabrous or sparsely pubescent with appressed (rarely spreading) hairs; gland-tipped hairs of the peduncles < 0.5 mm long; teeth of leaf margin obscure, broadly rounded or reduced to thickened bumps..... ***G. parviflora*** *var.* ***parviflora***
1 Rays 2-3 mm long, with pappus scales about as long as the corolla tube; outer phyllaries 1-2, with green herbaceous margins; inner paleae usually entire; pappus scales of the disc florets awn-tipped; stem usually moderately pubescent with long, spreading hairs; gland-tipped hairs of the peduncles > 0.5 mm long; teeth of leaf margins usually well developed, acute..... ***G. quadriradiata***

* ***Galinsoga parviflora*** Cavanilles *var.* ***parviflora***, Lesser Peruvian-daisy. Mt (NC, SC, VA, WV), Pd (VA), Cp (VA): disturbed areas, roadsides, barnyards; uncommon (rare in WV), native of Central and South America. May-November. [= FNA; < *G. parviflora* – C, F, G, K, S, SE, W, WV]

* ***Galinsoga quadriradiata*** Ruiz & Pavón, Common Peruvian-daisy, Devil's-delight, Raceweed. Mt (GA, NC, SC, VA, WV), Pd (DE, GA, NC, SC, VA), Cp (DE, FL, NC, SC, VA): disturbed areas, roadsides, barnyards; common (uncommon in GA, NC, SC, uncommon in DE Piedmont, rare in FL), native of Central and South America. May-November. A serious weed, especially in the cooler climates of the Mountains; Small (1933) described it as "a particularly pestiferous weed of such rapid growth and seeding as to make eradication extremely difficult." Fortunately, it does not seem especially prone to invade undisturbed natural areas. [= C, K, SE, W; > *G. ciliata* (Rafinesque) Blake – RAB, F, G, S, WV; > *G. caracasana* (A.P. de Candolle) Schultz 'Bipontinus' – F, G; > *G. bicolorata* St. John & White – F, G]

Gamochaeta Weddell 1856 (Cudweed, Everlasting)

A genus of about 50-80 species, herbs, subcosmopolitan, but primarily in South America. *Gamochaeta* is more closely related to other genera than it is to *Gnaphalium*. References: Nesom in FNA (2006a); Nesom (1990)=Z; Arriagada (1998)=Y; Nesom (2004b, 2004c)=X; Cronquist (1980)=SE; Pruski & Nesom (2004). Key based closely on FNA.

1 Leaves concolored or weakly bicolored (abaxial and adaxial faces more or less equally greenish to gray-greenish, indument usually loosely tomentose or arachnose, sometimes subpannose).
  2 Blades of basal and lower cauline leaves 4-16 mm wide; bracts among the inflorescence heads spatulate to oblanceolate, the lowermost (at least) surpassing the heads ..... ***G. pensylvanica***
  2 Blades of basal and lower cauline leaves 2-6 (10) mm wide; bracts among the inflorescence heads linear, oblanceolate, or oblong, surpassing the heads or not.
    3 Involucres 2.5-3 mm high, seated in tomentum; capitulescence initially cylindric and uninterrupted, at least distally, the main axis obscured by clustered heads; phyllaries in 3-4 (-5) series, the outer and middle ovate-lanceolate with narrowly to broadly acute apices, the outer 1/3-½ as long as the inner, none with purplish color; flowering May-July ..... ***G. antillana***
    3 Involucres 3-3.5 mm high, lightly arachnose only at the base if at all; capitulescence interrupted at least distally, the main axis visible up to the terminal heads; phyllaries in 5-7 series, the outer and middle ovate-triangular with sharply acute-acuminate apices, the outer ½-2/3 as long as the inner, at least the innermost commonly tinged with purple at the stereome-lamina junction; flowering (February-) March-May (sometimes later because of moisture or disturbance) ..... ***G. calviceps***
1 Leaves strongly to weakly bicolored with greenish glabrescent upper surfaces; leaves spatulate-obovate to oblanceolate; basal leaves present at flowering.
  4 Basal and proximal cauline leaves usually withering before anthesis (clusters of smaller leaves usually present in cauline axils); stems erect or ascending; plants (30-) 50-85 cm; apices of inner phyllaries acute-acuminate; flowering mostly July-August ..... ***G. simplicicaulis***
  4 Basal and proximal cauline leaves present or not at anthesis; stems erect to decumbent-ascending; plants mostly 10-50 cm; apices of inner phyllaries acute to obtuse, rounded, or blunt; flowering mostly April-June (-July in *G. calviceps*).
    5 Upper leaf surfaces glabrous or glabrate; involucres 2.5-3.0 mm high, more-or-less purplish, the bases glabrous; outer phyllaries elliptic-obovate to broadly ovate-elliptic, apices rounded to obtuse; bisexual florets 2-3 ..... ***G. coarctata***
    5 Upper leaf surfaces sparsely arachnose (hairs persistent, evident at 10× magnification); involucres 3.0-4.5(-5) mm high, sometimes purplish, bases (imbedded in tomentum) often sparsely arachnose on the lower 1/5-1/2; outer phyllaries ovate, ovate-triangular, or ovate-lanceolate, apices acute to acuminate; bisexual florets 2-6.
      6 Stems not pannose (indument whitish, like closely appressed, polished cloth, hairs usually not individually evident); involucres 3.0-3.5(-4.0) mm high; apices of inner phyllaries acute to acute-acuminate; bisexual florets 2-4; cypselae purple ..... ***G. chionesthes***
      6 Stems usually ± pannose or pannose-tomentose (hairs individually evident, longitudinally arranged); involucres 3.0-4.5 mm high; apices of inner phyllaries acute, obtuse, or truncate-rounded, sometimes apiculate; bisexual florets 3-6; cypselae tan to brownish.
        7 Blades of cauline leaves oblanceolate to oblanceolate-oblong or oblanceolate-obovate; involucres 3.0-3.5 mm high; laminae of inner phyllaries elliptic-oblong to oblong, apices truncate-rounded or obtuse and apiculate; bisexual florets (3-) 4-6; plants usually fibrous-rooted, rarely taprooted ..... ***G. argyrinea***
        7 Blades of cauline leaves oblanceolate to spatulate (basal cells of hairs on adaxial faces persistent, expanded, glassy); involucres 4.0-4.5 mm high; laminae of inner phyllaries triangular, apices acute (not apiculate); bisexual florets 3-4; plants fibrous-rooted or taprooted ..... ***G. purpurea***

Gamochaeta antillana (Urban) Anderberg, Caribbean Everlasting. Cp (FL, GA, NC, SC, VA): disturbed areas, fields, lawns; common. March-July. VA south to s. FL, west to AR and TX; Cuba; South America; Europe (introduced); New Zealand (introduced). [= FNA, WH, X; < *Gamochaeta falcata* (Lamarck) Cabrera – K, Z; < *Gnaphalium purpureum* Linnaeus var. *falcatum* (Lamarck) Torrey & A. Gray – RAB, C, G, SE; < *Gnaphalium calviceps* Fernald – F; < *Gnaphalium falcatum* Lamarck – S; < *Gnaphalium purpureum* Linnaeus – W]

* ***Gamochaeta argentina*** Cabrera. Cp (SC): waste areas near wool-combing mill; rare, perhaps merely a waif, native of Argentina and Uruguay. See Nesom (2004d). [= FNA] {not yet keyed}

Gamochaeta argyrinea Nesom. Cp (DE, FL, GA, NC, SC, VA), Pd (GA, NC, SC, VA), Mt (GA, NC, SC, VA): disturbed areas, roadsides, fields, lawns; common (rare in DE?). March-July. DE, MD, WV, KY, s. MO, se. KS, south to Panhandle FL and e. TX. [= FNA, WH, X; < *Gamochaeta purpurea* (Linnaeus) Cabrera – K, Y, Z; < *Gnaphalium purpureum* Linnaeus var. *purpureum* – RAB, C, G, SE; < *Gnaphalium purpureum* Linnaeus – F, S, W]

Gamochaeta calviceps (Fernald) Cabrera. Cp (GA, NC, SC, VA), {GA, NC, SC}: disturbed areas, roadsides; uncommon (rare in VA). March-July. VA south to FL, west to TX; South America, California (introduced); Europe (introduced), New

Zealand (introduced). [= FNA, X; < *Gamochaeta falcata* (Lamarck) Cabrera – K, Z; < *Gnaphalium purpureum* Linnaeus var. *falcatum* (Lamarck) Torrey & A. Gray – RAB, C, G, SE; < *Gnaphalium calviceps* Fernald – F; < *Gnaphalium falcatum* Lamarck – S; < *Gnaphalium purpureum* Linnaeus – W]

* ***Gamochaeta chionesthes*** Nesom. Cp (FL, GA, NC, SC), Pd (GA): roadsides, disturbed areas; rare, apparently introduced from South America. March-July. [= FNA, WH, X; < *Gamochaeta purpurea* (Linnaeus) Cabrera – K, Y, Z; < *Gnaphalium purpureum* Linnaeus var. *purpureum* – RAB, C, G, SE; < *Gnaphalium purpureum* Linnaeus – F, S, W]

* ***Gamochaeta coarctata*** (Willdenow) Kerguélen. Cp (FL, GA, NC, SC, VA), Pd (GA, NC, SC): sandy roadsides, disturbed areas; common (rare in VA), native of South America. March-July. [= FNA, WH, X; < *Gamochaeta americana* (P. Miller) Weddell – K, Y, Z, misapplied; < *Gnaphalium purpureum* Linnaeus var. *americanum* (P. Miller) Klatt – RAB, misapplied]

* ***Gamochaeta pensylvanica*** (Willdenow) Cabrera, Pennsylvania Everlasting. Cp (FL, GA, NC, SC, VA), Pd (GA, NC, SC), Mt (GA?, NC): fields, roadsides, pastures, disturbed areas; common, probably native of South America. March-July. PA south to s. FL, west to TX, mostly on the Coastal Plain, and widespread in South America and elsewhere. [= FNA, K, WH, X, Z; >< *Gnaphalium purpureum* Linnaeus var. *spathulatum* (Lamarck) Baker – RAB; < *Gnaphalium purpureum* Linnaeus var. *purpureum* – C, G, SE; > *Gnaphalium peregrinum* Fernald – F; >< *Gnaphalium spathulatum* Lamarck – S; < *Gnaphalium purpureum* Linnaeus – W]

Gamochaeta purpurea (Linnaeus) Cabrera, Spoonleaf Purple Everlasting. Cp (DE, FL, GA, NC, SC, VA), Pd (DE, GA, NC, SC, VA), Mt (GA, NC, SC, VA, WV): fields, roadsides, pastures, disturbed areas; common. Late March-September. ME west to MI, south to s. FL and e. TX; apparently disjunct in CA and OR, adventive in w. US, Mexico, South America, and elsewhere. [= FNA, WH, X; < *Gamochaeta purpurea* (Linnaeus) Cabrera – K, Y, Z; < *Gnaphalium purpureum* Linnaeus var. *purpureum* – RAB, C, G, SE; < *Gnaphalium purpureum* Linnaeus – F, S, W, WV]

* ***Gamochaeta simplicicaulis*** (Willdenow ex Sprengel) Cabrera. Cp (FL, GA, NC, SC): disturbed areas, roadsides; uncommon (rare in FL), apparently native of South America. Late June-August. See Nesom (1999, 2000d, 2004b) for additional information. [= FNA, WH, X]

Garberia A. Gray 1879 (Garberia)

A monotypic genus, a shrub, of peninsular FL. References: Lamont in FNA (2006c).

Garberia heterophylla (W. Bartram) Merrill & F. Harper, Garberia. Cp (FL): scrub; rare. October-December. Endemic from ne. FL south to s. peninsular FL. [= FNA, WH; = *G. fruticosa* (Nuttall) A. Gray – S, SE]

Glebionis Cassini 1826 (Chryanthemum)

A genus of 2 species, annuals, native of Eurasia and n. Africa. References: Strother in FNA (2006a); Cronquist (1980)=SE; Arriagada & Miller (1997)=Z.

1 Leaf blades 2-3-pinnate; rays pale yellow, 15-25 mm long ..... ***G. coronaria***
1 Leaf blades not lobed or coarsely 1-pinnate; rays golden yellow, 8-20 mm long..... ***G. segetum***

* ***Glebionis coronaria*** (Linnaeus) Cassini ex Spach, Garland Chrysanthemum, Crown-daisy. Cp (FL), {NC, SC}: disturbed areas; rare, native of Eurasia, cultivated and escapes and occurs as waifs in our area. [= FNA, WH; = *Chrysanthemum coronarium* Linnaeus – K, Z]

* ***Glebionis segetum*** (Linnaeus) Fourreau, Corn Marigold, Corn Chrysanthemum. Pd (NC): disturbed areas, trash heaps, field edges; commonly cultivated, rarely escaped, persistent, or as a waif, native of Eurasia. April-May. [= FNA; = *Chrysanthemum segetum* Linnaeus – RAB, C, F, G, K, S, SE]

Gnaphalium Linnaeus 1753 (Cudweed, Rabbit Tobacco)

A genus of about 40 species (as recircumscribed more narrowly), distributed on most continents. References: Nesom in FNA (2006a); Anderberg (1991)=Z. [also see *Gamochaeta* and *Pseudognaphalium*]

1 Involucre 2-3 mm high; plants to 2.5 dm tall; inflorescence of many, small, axillary and terminal clusters overtopped by subtending leaves..... ***Gn. uliginosum***
1 Involucre 4-7 mm high; plants generally well over 2.5 dm tall; inflorescence terminal, usually elongate ..... ***[see Pseudognaphalium]***

Gnaphalium uliginosum Linnaeus, Low Cudweed. Mt (VA, WV), Cp* (DE*), Pd* (DE*): high elevation openings, especially in ruts or mud-puddles, rocky places; rare, possibly introduced in North America. July-October. NL (Newfoundland) west to BC, south to VA, WV, OH, IN, MN, CO, UT, and OR. [= C, F, FNA, G, K, S, SE, WV, Z]

Grindelia Willdenow 1807 (Gum-plant, Tarweed, Rosinweed, Gumweed)

A genus of about 55 species, herbs and shrubs, of w. North America and South America. References: Strother & Wetter in FNA (2006b); Cronquist (1980)=SE.

1 Phyllaries loose (but not squarrose), only slightly imbricate ..... ***G. lanceolata*** *var.* ***lanceolata***
1 Phyllaries squarrose-reflexed, strongly imbricate..... ***G. squarrosa*** *var.* ***squarrosa***

* ***Grindelia lanceolata*** Nuttall *var.* ***lanceolata***. Mt (VA), Cp (SC, VA): disturbed areas, waste areas around wool-combing mill; rare, presumably introduced from farther west. This species is regarded as native as far east as the Nashville Basin of c. TN and scattered localities in the Ridge and Valley Province of e. TN (Chester, Wofford, & Kral 1997). [= C, K; < *G. lanceolata* – F, FNA, G, SE]
* ***Grindelia squarrosa*** (Pursh) Dunal *var.* ***squarrosa***, Curly-top Gumweed. Mt (VA), Pd (VA), Cp (DE): disturbed areas; uncommon (rare in VA), introduced from farther west. Other varieties are also adventive eastward, and might be expected in our area. [= C, F, G, K, SE; < *G. squarrosa* – FNA]

Guizotia Cassini in Cuvier 1829 (Niger-seed)

A genus of 6 species, herbs, of Africa. References: Strother in FNA (2006c); Sherff & Alexander (1955)=Z.

* ***Guizotia abysinica*** (Linnaeus f.) Cassini, Niger-seed, Niger-thistle, Ramtilla. Pd, Cp (VA): disturbed areas; rare, native of Africa. September-October. [= C, F, G, K; = *G. abyssinica* – FNA, Z, orthographic variant]

Gutierrezia Lagasca y Segura 1816

A genus of 28 species, annual and perennial herbs and subshrubs, of w. North America and w. South America. References: Nesom in FNA (2006b).

1 Subshrub; stems minutely hispidulous; ray florets 2-8; disc florets 2-9 ..... ***G. sarothrae***
1 Annual; stems glabrous; ray florets 5-23; disc florets 7-13..... ***G. texana*** *var.* ***texana***

* ***Gutierrezia sarothrae*** (Pursh) Britton & Rusby, Kindlingweed. Cp (SC): waste areas around wool-combing mill; rare, perhaps merely a waif, native of w. North America. See Nesom (2004d). [= FNA, K; = *Xanthocephalum sarothrae* (Pursh) Shinners]
* ***Gutierrezia texana*** (A.P. de Candolle) Torrey & A. Gray *var.* ***texana***, Texas Snakeweed Cp (SC): waste areas around wool-combing mill; rare, perhaps merely a waif, native of sc. North America. See Nesom (2004d). [= FNA, K; = *Xanthocephalum texanum* (A.P. de Candolle) Shinners]

Hartwrightia A. Gray ex S. Watson 1888 (Hartwrightia)

A monotypic genus, a perennial herb, of se. United States (FL and GA). References: Nesom in FNA (2006c).

Hartwrightia floridana A. Gray ex S. Watson, Hartwrightia. Cp (FL, GA): seepages and wet pinelands; rare. July-September. Se. GA south to c. peninsular FL. [= FNA, K, S, SE, WH]

Helenium Linnaeus 1753 (Sneezeweed, Bitterweed)

A genus of about 32-40 species, herbs, of America. References: Bierner (1989)=Y; Bierner (1972)=Z; Rock (1957); Knox (1987); Rydberg (1915); Cronquist (1980)=SE.

1 Stem leaves very numerous, 0.5-2 (-4) mm wide, not decurrent on the stem or branches; plant a taprooted annual; [section *Amarum*].
  2 Disc corollas yellow, the lobes yellow or yellow-brown; lower and basal leaves usually withered at anthesis; lower leaves usually entire (rarely toothed); basal leaves entire to toothed (rarely pinnatifid)..... ***H. amarum*** *var.* ***amarum***
  2 Disc corollas yellow, the lobes (and sometimes also the upper portion of the corolla tube) purple; lower and basal leaves often persistent; lower leaves linear to ovate, entire, toothed, lobed or pinnatifid; basal leaves pinnatifid..... ***H. amarum*** *var.* ***badium***
1 Stem leaves few to numerous, at least the larger > 4 mm wide, decurrent on the stems and branches; plant a fibrous-rooted perennial **or** a taprooted annual.
  3 Ray flowers lacking a pistil and style, sterile; [section *Leptopoda*].
    4 Disc flowers with lobes brown, red, or purple.
      5 Disc flowers 5-lobed and with 5 stamens..... ***H. brevifolium***
      5 Disc flowers predominately 4-lobed and with 4 stamens ..... ***H. flexuosum***
    4 Disc flowers with lobes yellow.

6 Midstem leaves barely decurrent on the stem, the decurrency < 0.5 cm; basal leaves often pinnatifid (less commonly merely dentate, repand, or entire), the lower portion of the leaf not contracted so as to be petiolate in form; achene pubescent on the ribs; peduncle pubescent; basal leaves (3.0-) 4.5-8.0 (-19.0) cm long, 0.3-1.1 cm wide, averaging ca. 7-10× as long as wide ..... ***H. pinnatifidum***

6 Midstem leaves decurrent on the stem, the decurrency > 2 cm , and usually extending to the next leaf down; basal leaves usually repand or entire (rarely somewhat lobed or pinnatifid), the lower portion narrowed into a petiolate form which enlarges at its base to more-or-less clasp the stem; achene glabrous, or pubescent on the ribs; peduncle pubescent or glabrous; basal leaves averaging narrower or broader in shape (see below).

7 Peduncle pubescent to tomentose or lanose between the uppermost leaf and the head; achene pubescent on the ribs; heads 1-4 per plant; basal leaves (2.5-) 4.0-10.5 (-18.0) cm long, (0.8-) 1.2-2.0 (-2.5) cm wide, averaging ca. 4-6× as long as wide ..... ***H. brevifolium***

7 Peduncle glabrous or glabrate between the uppermost leaf and the head; achene glabrous; heads 1 per plant; basal leaves (3.0-) 6.5-17.0 (-25.0) cm long, (0.4-) 0.6-1.0 (-1.5) cm wide, averaging ca. 10-15× as long as wide ..... ***H. vernale***

3 Ray flowers bearing a pistil and style, fertile.

8 Plant a fibrous-rooted perennial; [native species, collectively widespread and common]; [section *Helenium*].

9 Leaves not basally disposed, the basal leaves usually absent at flowering (if present, mostly < 2 cm long), the stem leaves not progressively reduced upward; pappus scales brownish, 0.3-1.2 mm long (usually < 1 mm long); upper cauline leaves serrate (rarely entire), mostly oblanceolate, usually broadest near the midpoint or beyond it, with conspicuous lateral veins apparent on the lower surface ..... ***H. autumnale***

9 Leaves basally disposed, the basal rosette usually present at flowering, the basal leaves > 4 cm long, larger than the progressively smaller stem leaves; pappus scales white-hyaline, 0.9-1.9 mm long (usually > 1 mm long); upper cauline leaves entire, lanceolate, usually broadest at or near the base and rather evenly tapered to the apex, lacking conspicuous lateral veins ..... ***H. virginicum***

8 Plant a tap-rooted annual or biennial; [alien species, rare waifs of wool-combing mills]; [section *Tetrodus*].

10 Disc corollas 4-lobed; heads 7-11 (-14) mm high, 6-11 wide (excluding the ray flowers) ..... ***H. quadridentatum***

10 Disc corollas 5-lobed; heads 4-8 mm high, 4-8 mm wide (excluding the ray flowers).

11 Upper leaves entire ..... ***H. elegans*** *var.* ***elegans***

11 Upper leaves serrate ..... ***H. microcephalum*** *var.* ***microcephalum***

* ***Helenium amarum*** (Rafinesque) H. Rock *var.* ***amarum***, Bitterweed. Cp (FL, GA, NC, SC, VA), Pd (GA, NC, SC, VA), Mt (GA, NC, SC, VA): roadsides, overgrazed pastures, urban areas; common (rare in Mountains), apparently introduced from further west. May-December. Now widespread in e. North America. Bierner (1989) discusses the taxonomy of section *Amarum*, consisting only of the 2 varieties of *H. amarum*. Var. *amarum* is widespread; var. *badium* (A. Gray ex S. Watson) Waterfall, distinguished in part by its purple disk flowers, occurs in OK, TX, and Mexico. The plant has a very bitter taste and is generally avoided by grazing animals, a point noted by Rafinesque in his original description (in 1817): "the whole plant is odoriferous and intensely bitter, it gives an abominable taste to the milk of the cows that feed on it in summer." Overgrazed areas come to be dominated by *H. amarum*. In areas where it is frequently mowed, *H. amarum* appears to evolve a genotype capable of flowering and fruiting when only a few cm tall. [= C, FNA, K, Y; = *H. tenuifolium* Nuttall – F, S; = *H. amarum* – RAB, G, W, Z; < *H. amarum* – SE, WH]

* ***Helenium amarum*** (Rafinesque) H. Rock *var.* ***badium*** (A. Gray ex S. Watson) Waterfall. Cp (SC): waste areas around wool-combing mill; rare, perhaps only a waif, native of OK and TX. May-June. See Nesom (2004d). [= FNA, K, Y; < *H. amarum* – SE; = *H. badium* (A. Gray ex S. Watson) Greene – Z]

Helenium autumnale Linnaeus, Common Sneezeweed. Mt (GA, NC, SC, VA, WV), Pd (GA, NC, SC, VA), Cp (DE, FL, GA, NC, SC, VA): moist pastures, forests, woodlands, forest edges; common. September-October. QC west to BC, south to n. peninsular FL, TX, and CA. Like *H. amarum*, *H. autumnale* is bitter and unpalatable to grazing animals, becoming more abundant in pastures. [= RAB, FNA, WH; > *H. autumnale* var. *autumnale* – C, F, G, K, SE, WV; > *H. autumnale* var. *parviflorum* (Nuttall) Fernald – F, K, WV; > *H. latifolium* P. Miller – S; > *H. parviflorum* Nuttall – S; < *H. autumnale* – GW, W (also see *H. virginicum*)]

Helenium brevifolium (Nuttall) A. Wood. Cp (GA, NC, VA), Mt (NC, VA), Pd (GA, NC, VA): seepage bogs; rare. May-June. *H. brevifolium* has a peculiar distribution, reaching its greatest abundance on the Gulf Coastal Plain, from Panhandle FL west to e. LA, and occurring at widely scattered disjunct sites in c. and n. AL, wc. GA, c. and w. NC, ec. TN (Chester, Wofford, & Kral 1997), and sw. and se. VA. [= RAB, C, FNA, G, GW, K, SE, W, WH, Z; > *H. brevifolium* – F, S; > *H. curtisii* A. Gray – F, S]

* ***Helenium elegans*** A.P. de Candolle *var.* ***elegans***. Cp (SC): waste areas around wool-combing mill; rare, perhaps only a waif, native of LA, OK, and TX. May. See Nesom (2004d). [= FNA, K, Z]

Helenium flexuosum Rafinesque, Southern Sneezeweed. Cp (DE, FL, GA, NC, SC, VA), Pd (DE, GA, NC, SC, VA), Mt (GA, NC, SC, VA, WV): moist pastures, moist forests, riverbanks; common. May-August. S. ME west to MN, south to c. peninsular FL and TX. [= RAB, C, FNA, G, GW, K, SE, W, WH, WV, Z; > *H. nudiflorum* Nuttall – F, S; > *H. polyphyllum* Small – S]

* ***Helenium microcephalum*** A.P. de Candolle *var.* ***microcephalum***. Cp (SC): waste areas around wool-combing mills; rare, perhaps only a waif, native of OK, TX, NM, and CO. May-July. See Nesom (2004d). [= FNA, K, Z]

Helenium pinnatifidum (Nuttall) Rydberg. Cp (FL, GA, NC, SC): wet savannas and adjacent ditches; rare (NC Rare, SC Rare). April-May. A Southeastern Coastal Plain endemic: se. NC south to s. FL, west to Panhandle FL, sw. GA, and s. AL. [= RAB, FNA, GW, K, SE, WH, Z; = *H. vernale* – S, misapplied]

* ***Helenium quadridentatum*** Labill. {SC}: location and habitat unknown; presumably introduced from sc. United States. Reported for SC by Rydberg (1915), Small (1933), and Kartesz (1999); also east to AL (SE). [= FNA, K, S, SE, Z]

Helenium vernale Walter. Cp (FL, GA, NC, SC): wet savannas and adjacent ditches; rare (rare in NC). April-May. A Southeastern Coastal Plain endemic: se. NC south to ne. FL, Panhandle FL, and west to e. LA. [= RAB, FNA, GW, K, SE, WH, Z; = *Helenium helenium* (Nuttall) Small – S]

Helenium virginicum S.F. Blake, Virginia Sneezeweed. Mt (VA): seasonal sinkhole ponds and clearings where such ponds once occurred; rare. July-September. *H. virginicum* is bimodally endemic in VA (Augusta and Rockingham counties, VA, where a series of sinkhole ponds (dolines) on acid colluvium support numerous Coastal Plain disjuncts) and MO (Ozarkian

highlands). See Knox (1987) for a comparison of this narrow endemic and *H. autumnale*. Knox (1997) presents a study of the demography and habitat of *H. virginicum*. [= C, F, FNA, G, K, SE; < *H. autumnale* – GW, W]

Helianthus Linnaeus 1753 (Sunflower)

A genus of about 50 species, herbs, of North America. References: Schilling in FNA (2006c); Heiser *et al.* (1969); Cronquist (1980)=SE; Schilling *et al*. (1998). Key adapted from FNA, SE, RAB, and Heiser *et al.* (1969).

1 Leaves basally disposed, the plants scapose to subscapose, the stem leaves relatively few (with 2-8 nodes below the inflorescence), those on the upper stem opposite or alternate, strongly reduced upward in size as compared to the persistent basal leaves; [section *Atrorubentes*] ..... **Key A**
1 Leaves cauline, plants leafy the length of the stem, the stem leaves many (with 10 or more nodes below the inflorescence), basal leaves lacking (at least at anthesis).
2 Plant a tap-rooted annual (rarely surviving a second year) ..... **Key B**
2 Plant a perennial from crown buds or rhizomes, the roots sometimes tuberous-thickened; [section *Atrorubentes*].
3 Disk flowers red or purple (at least in part) ..... **Key C**
3 Disk flowers yellow ..... **Key D**

Key A – sunflowers with basally disposed leaves

1 Disk flowers yellow.
2 Basal leaves 13-30 cm long, 0.7-2.0 cm wide; leaves 10-20× as long as wide, glabrous ..... ***H. longifolius***
2 Basal leaves 6-15 cm long, 2-8 cm wide; leaves 1.5-5× as long as wide, scabrous or hirsute (rarely glabrous) ..... ***H. occidentalis*** *ssp.* ***occidentalis***
1 Disk flowers red or purple (at least in part).
3 Basal leaves 6-20 cm long; lower several pairs of stem leaves up to 1/2 as long and wide as the basal leaves.
4 Trichomes on the leaf abaxial midrib > 1 mm long; lower stem with a few pairs of leaves (< 8 nodes below the capitulescence), these strongly reduced upward; leaf blades (1.3-) 1.7-2.5 (-3)× as long as wide; petiole often > 1/3 as long as the blade, broadly winged toward the blade; plants to 2 m tall; nonflowering stems usually absent; [widespread in our area] ..... ***H. atrorubens***
4 Trichomes on the leaf abaxial midrib < 1 mm long; lower stem leafy, often to above the middle (> 8 nodes below the capitulescence); leaf blades 1-1.7 (-2)× as long as wide; petiole usually < 1/3 as long as the blade, narrowly winged toward the blade; plants to 3 m tall; nonflowering stems usually present; [west of our area] ..... ***[H. silphioides]***
3 Basal leaves 4-15 cm long; lower several pairs of stem leaves often < 1/2 as long and wide as the basal leaves.
5 Basal leaves (1.6-) 2-5× as long as wide; ray flowers present, typically 1.5-3.5 cm long; [of wet savannas and bogs] ..... ***H. heterophyllus***
5 Basal leaves 1-1.5× as long as wide; ray flowers none, or present but < 1 cm long; [of dry savannas and sandhills] ..... ***H. radula***

Key B – annual sunflowers

1 Disk flowers yellow.
2 Leaves ovate, 10-40 cm long, 5-25 cm wide, toothed, the base often cordate or subcordate; disc corollas 5-8 mm long; stems 10-30 dm tall; [section *Helianthus*] ..... ***H. annuus***
2 Leaves 5-10 cm long, 0.2-1.0 cm wide, entire or nearly so, the base cuneate; disc corollas 2.8-3.5 mm long; stems 4-10 dm tall; [section *Porteri*] ..... ***H. porteri***
1 Disk flowers red or purple (at least in part).
3 Leaves, stems and phyllaries densely covered with soft, silvery-white pubescence; [section *Helianthus*] ..... ***H. argophyllus***
3 Leaves, stems, and phyllaries nearly glabrous to scabrous or hirsute.
4 Style branches yellow; [section *Agrestes*] ..... ***H. agrestis***
4 Style branches red; [section *Helianthus*].
5 Phyllaries ovate to ovate-oblong, > 4 mm wide, abruptly contracted to an acuminate tip, the margins strongly ciliate; leaves 5-25 cm wide; disk (2-) 3-30 cm wide; plants (0.5-) 1-3 m tall ..... ***H. annuus***
5 Phyllaries lanceolate, gradually tapering to an acuminate tip, the margins not ciliate or weakly so; leaves 1.5-9 cm wide; disk 1-2.5 cm wide; plants 0.4- 1 (-1.5) m tall.
6 Tips of the receptacular bracts in the center of the head conspicuously white-bearded; stems normally not mottled ..... ***H. petiolaris*** *var.* ***petiolaris***
6 Tips of the receptacular bracts in the center of the head not bearded; stems normally mottled with purple
7 Peduncles 25-50 cm long; leaves usually shallowly but regularly serrate; ligules usually > 2 cm long ..... ***H. debilis*** *ssp.* ***cucumerifolius***
7 Peduncles usually < 25 cm long; leaf usually deeply irregularly serrate; ligules usually < 2 cm long ..... ***H. debilis*** *ssp.* ***tardiflorus***

Key C – perennial sunflowers with leafy stems and red disk flowers

1 Leaf blades long and narrow, linear or lanceolate and usually > 10× as long as wide.
2 Stems glabrous and glaucous; leaf margins not revolute ..... ***[H. salicifolius]***

2 Stems pubescent; leaf margins often revolute.
3 Plants short, < 1.5 m tall; leaves < 1 cm wide; rhizomes lacking or poorly developed ..... ***H. angustifolius***
3 Plants robust, > 1.5 m tall; leaves > 1 cm wide; rhizomes well developed ..... ***H. simulans***
1 Leaf blades shorter and broader, lanceolate, lance-ovate, deltoid, deltoid-ovate and usually < 5× as long as wide.
4 Phyllaries 1.5-3 mm broad, lanceolate ..... ***H. floridanus***
4 Phyllaries 3-5 mm broad, oblong, ovate, or obovate.
5 Abaxial surfaces of leaves and ligules lacking subsessile glandular trichomes; leaves usually broadly ovate to orbicular and with a petiole > 1 cm long ..... ***[H. silphioides]***
5 Abaxial surfaces of leaves and ligules with subsessile glandular trichomes; leaves usually lanceolate to lance-ovate or rhombic-ovate and with a petiole usually < 1 cm long.
6 Phyllaries oblong-lanceolate, apex acuminate, abaxially usually pubescent ..... ***H. laetiflorus***
6 Phyllaries elliptical to oblong-ovate, apex acute, abaxially glabrate ..... ***H. pauciflorus*** *ssp.* ***pauciflorus***

Key D – perennial sunflowers with leafy stems and yellow disk flowers

1 Stems below the capitulescence glabrous or nearly so, sometimes glaucous.
2 Leaves whorled at principal nodes, either alternate or opposite at other nodes ..... ***H. verticillatus***
2 Leaves either alternate or opposite (or both).
3 Leaves grayish-green or bluish green in color, sessile, and abaxially glabrous and glaucous.
4 Rays 10-14; leaves strumose adaxially, rough to the touch; phyllaries 3.5-4.5 mm wide ..... ***H. eggertii***
4 Rays 5-10; leaves glabrous or glabrate adaxially, smooth or only slightly rough to the touch; phyllaries 2-3 mm wide .... ***H. laevigatus***
3 Leaves light to dark green, sometimes whitish abaxially, but not grayish or bluish green in color; leaves sessile or petiolate, glabrous or pubescent.
5 Leaves linear-lanceolate, with only a single main vein ..... ***H. smithii***
5 Leaves linear-lanceolate to lanceolate, lance-ovate, or ovate, triplinerved at base.
6 Rays few, usually 5 or 8; heads small, the involucres 9 mm broad or less.
7 Leaves abaxially whitish in color and glabrous and glaucous, lacking subsessile glandular trichomes ("resin dots") ..... ***H. glaucophyllus***
7 Leaves abaxially greenish in color, usually tomentulose (sometimes glabrate), with abundant subsessile glandular trichomes ..... ***H. microcephalus***
6 Rays usually 10 or more in larger heads; heads larger, the involucres usually > 9 mm broad.
8 Leaves sessile, rounded to cordate at base, and trinerved, with the 2 lateral veins diverging from the midrib at the very base of the leaf ..... ***H. divaricatus***
8 Leaves sessile to petiolate, but narrowing gradually to base and triplinerved, the 2 lateral veins diverging from the midrib above the base of the blade.
9 Anther appendages yellow.
10 Leave blade lanceolate to lance-ovate, sessile to petiolate but the petiole usually < ¼ as long as the blade; phyllaries not conspicuously graduated and imbricate, usually loose and spreading ..... ***H. grosseserratus***
10 Leaf blade ovate to elliptic, with a distinct petiole usually > 2 cm long and ½ as long as blade or longer; phyllaries conspicuously graduated and imbricate, usually appressed, not exceeding disk ..... ***H. occidentalis*** *ssp.* ***occidentalis***
9 Anther appendages dark or reddish-brown.
11 Plants producing abundant tubers; leaves subsessile, the petioles < 1 cm long; [endemic to the Piedmont of NC and SC] ..... ***H. schweinitzii***
11 Plants rhizomatous, but not producing tubers; leaves petiolate, the petioles 1-5 cm long; [collectively widespread in our area].
12 Phyllaries equal to or slightly exceeding disk, apex acute; leaves moderately serrate to entire, with a petiole 1-3 cm long, and abaxially with usually abundant subsessile glandular trichomes ("resin dots") ..... ***H. strumosus***
12 Longer phyllaries usually exceeding disk by ½ their length or more, apex acuminate; larger leaves moderately to conspicuously serrate, with a petiole 2-5 cm long, and abaxially with usually relatively few subsessile glandular trichomes ..... ***H. decapetalus***
1 Stems pubescent throughout, not glaucous.
13 Leaves sessile and cordate, mostly or all opposite ..... ***H. mollis***
13 Leaves petiolate or sessile, but not cordate, and alternate or opposite.
14 Phyllaries attenuate, conspicuously exceeding the disk in length and reflexed, apically with numerous subsessile glandular trichomes ("resin dots"); leaf bases often convex, the basically ovate or lance-ovate blade joined to a broadly winged and gradually narrowed petiole ..... ***H. resinosus***
14 Phyllaries acute to attenuate, but not reflexed, subsessile glandular trichomes present or absent; leaf bases usually attenuate to truncate or rounded, the blade lance-linear or lanceolate, or if ovate or lance-ovate either sessile or with a petiole that is at most narrowly winged.
15 Leaves conduplicate and entire, usually with only a single prominent main vein; inflorescence when well developed spiciform or racemose ..... ***H. maximilianii***
15 Leaves not conduplicate, entire or serrate, triplinerved (with a prominent lateral pair of veins near the base); inflorescence not spiciform or racemose.
16 Phyllaries conspicuously graduated and imbricate, usually appressed.
17 Leaf blades lanceolate to ovate, petiole 1-5 cm long and usually < ½ as long as blade; anther appendages with dark pigment; cypselas 4-5 mm, usually sterile ..... ***H. laetiflorus***
17 Leaf blades ovate to elliptic, petiole distinct, > 2 cm and usually > ½ as long as the blade; anther appendages yellow; cypselas 3-4 mm long, fertile ..... ***H. occidentalis*** *ssp.* ***occidentalis***
16 Phyllaries not conspicuously graduated and imbricate, usually loose or spreading.

18 Leaves with a prominent petiole > 2 cm long, blades lance-ovate to ovate and > 5 cm broad; cypselas 5-7 mm long; tubers produced late in growing season ..... ***H. tuberosus***
18 Leaves sessile or with a short petiole usually < 2 cm long; blades linear to lanceolate, < 4.5 cm broad; cypselas 3-5 cm long; tubers present or absent.
19 Leaves truncate to broadly rounded at base, shortly but distinctly petiolate ..... ***H. hirsutus***
19 Leaves cuneate, gradually narrowing to base, sessile to petiolate.
20 Ligules lacking subsessile glandular trichomes; leaves not strongly revolute ..... ***H. giganteus***
20 Ligules abaxially with subsessile glandular trichomes ("resin dots"); leaves usually revolute.
21 Heads relatively small, the discs usually < 15 mm across; tubers present ..... ***H. schweinitzii***
21 Heads larger, the discs (at least the larger) > 15 mm across; tubers absent.
22 Leaves conspicuously undulate; ovate to elliptical to lanceolate, occasionally linear (if so, usually < 10 cm long), usually < 5× as long as wide; heads 1-6 per plant; outer phyllaries acute to obtuse ..... ***H. floridanus***
22 Leaves not conspicuously undulate; linear to lanceolate, > 5× as long as broad (and also 8-16 cm long); heads 3-16 per plant; outer phyllaries acuminate to acute.
23 Plants short, < 1.5 m tall; leaves < 1 cm wide; rhizomes lacking or poorly developed ..... ***H. angustifolius***
23 Plants robust, > 1.5 m tall; leaves > 1 cm wide; rhizomes well developed ..... ***H. simulans***

Helianthus agrestis Pollard, Southeastern Sunflower. Cp (FL, GA): mucky areas in pine flatwoods; rare (GA Special Concern). August-December. S. GA south to s. FL. [= FNA, GW, K, S, SE, WH]

Helianthus angustifolius Linnaeus, Narrowleaf Sunflower. Cp (DE, FL, GA, NC, SC, VA), Mt (GA, NC, SC, VA, WV*), Pd (GA, NC, SC, VA): savannas, ditches, marshes, other wet habitats; common (uncommon in Piedmont of GA, NC, and SC, uncommon in DE Coastal Plain, rare in VA Piedmont, rare in Mountains). (July-) September-October (-frost). Primarily Coastal Plain, from Long Island, NY south to c. peninsular FL and west to TX, irregularly inland to OH, IN, and MO. This plant is very showy when in flower on roadsides, especially in October. [= RAB, C, FNA, G, GW, K, S, SE, W, WH, WV; > *H. angustifolius* var. *angustifolius* – F; > *H. angustifolius* var. *planifolius* Fernald – F]

* ***Helianthus annuus*** Linnaeus, Common Sunflower. Cp (DE, FL, GA, NC, SC, VA), Pd (DE, NC, SC, VA), Mt (NC, SC, VA, WV): disturbed areas, often cultivated in gardens, sometimes cultivated in fields; uncommon, native of the Plains states. June-October. This is the common cultivated sunflower grown for its flowers, seeds, and oil. [= RAB, C, F, FNA, G, K, S, SE, W, WH, WV]

* ***Helianthus argophyllus*** Torrey & A. Gray, Silverleaf Sunflower. Cp (FL, NC): dunes and disturbed sandy soil on a barrier island; rare, native of TX. July-October. Native to s. TX. Heiser *et al.* (1969) noted a collection from NC, but stated their uncertainty as to its establishment. *H. argophyllus* is well-established near Captain Charlie's on Bald Head Island, Brunswick County, where it has apparently persisted and spread over the last 30 years (at least). [= F, FNA, K, S, SE, WH]

Helianthus atrorubens Linnaeus, Appalachian Sunflower. Mt (GA, NC, SC, VA), Pd (GA, NC, SC, VA), Cp (FL, NC, SC, VA): dry soils of rocky, sandy, or clayey woodlands and roadbanks; common (uncommon in VA Mountains, rare in FL). Late July-October. N. VA west to w. TN, and south to c. GA, Panhandle FL, AL, and se. LA. Related to the Ozarkean *H. silphioides* Nuttall. [= RAB, C, FNA, G, K, SE, W; > *H. atrorubens* var. *alsodes* Fernald – F; > *H. atrorubens* var. *atrorubens* – F; < *H. atrorubens* – S (also see *H. silphioides* Nuttall)]

Helianthus debilis Nuttall *ssp.* ***cucumerifolius*** (Torrey & A. Gray) Heiser, Cucumber-leaf Sunflower. Cp (FL, GA*?, NC*, SC*, VA*), Mt* (VA*, WV*): sandy soils of fields and roadsides; common (uncommon in FL, rare in VA and WV), native from FL westward along the Gulf Coast states. May-August. [= FNA, K; = *H. debilis* var. *cucumerifolius* (Torrey & A. Gray) A. Gray – RAB, C, F, WV; = *H. cucumerifolius* Torrey & A. Gray – G, S; = *H. debilis* ssp. *cucumerifolius* (Torrey & A. Gray) Heiser var. *cucumerifolius* (Torrey & A. Gray) A. Gray – SE; < *H. debilis* ssp. *cucumerifolius* – WH]

Helianthus debilis Nuttall *ssp.* ***tardiflorus*** Heiser. Cp (FL, GA): sandy beaches, dry pinelands; uncommon. March-September. GA, FL, AL, and MS. [= FNA, K; < *H. debilis* – S; = *H. debilis* ssp. *cucumerifolius* (Torrey & Gray) Heiser var. *tardiflorus* (Heiser) Cronquist – SE; < *H. debilis* ssp. *cucumerifolius* – WH]

Helianthus decapetalus Linnaeus, Forest Sunflower. Mt (GA, NC, SC, VA, WV), Pd (DE, GA, NC, SC, VA), Cp (NC, SC, VA): mesic woodlands and forests; common (rare in Coastal Plain). July-October. ME and QC west to WI and IA, south to GA and MO. [= RAB, C, FNA, G, K, S, SE, W; > *H. decapetalus* – F, WV; > *H. trachelifolius* P. Miller – F, WV]

Helianthus divaricatus Linnaeus, Spreading Sunflower. Pd (DE, GA, NC, SC, VA), Mt (GA, NC, SC, VA, WV), Cp (DE, FL, GA, NC, SC, VA): mesic to dry woodlands and forests, forest edges; common (rare in Coastal Plain, rare in DE Piedmont). June-August. ME, QC, ON, and IA south to Panhandle FL, LA, and OK. [= RAB, C, FNA, G, K, S, SE, W, WH, WV; > *H. divaricatus* var. *angustifolius* Kuntze – F; > *H. divaricatus* var. *divaricatus* – F]

Helianthus eggertii Small, Eggert's Sunflower. Pd (SC): limestone and diabase barrens; rare. Sc. KY, c. TN, and n. AL; apparently disjunct in nc. SC (P. McMillan, pers. comm. 2003, specimen at CLEMS). [= FNA, K, S, SE]

Helianthus floridanus A. Gray ex Chapman, Florida Sunflower. Cp (GA, NC, SC): wet savannas and pocosin edges; common (rare in NC and SC). September-October. A Southeastern Coastal Plain species: se. NC south to c. peninsular FL, and west to se LA. [= RAB, FNA, GW, K, S, SE, WH]

Helianthus giganteus Linnaeus, Tuberous Sunflower, Swamp Sunflower. Pd (DE, NC, SC, VA), Mt (GA, NC, VA, WV), Cp (DE, NC, VA): bog edges, moist thickets, ditches; common (uncommon south of VA). Late July-October. NB and ME west to MN, south to n. SC, n. GA, e. and c. TN, c. KY, n. IN, n. IL, and WI. [= RAB, C, F, FNA, G, GW, K, S, SE, W, WV; > *H. giganteus* – S; > *H. alienus* E.E. Watson – S; > *H. validus* E.E. Watson – S]

Helianthus glaucophyllus D.M. Smith, Whiteleaf Sunflower. Mt (NC, SC), Pd (SC): moist forests, woodlands, and woodland edges, at medium elevations, mostly from 1000-1500 m (but sometimes lower), generally flowering only when in a canopy gap (as caused by a tree-fall) or along banks of narrow roads; rare. July-September. A narrow Southern Appalachian

endemic: w. NC, nw. SC, and ne. TN (Chester, Wofford, & Kral 1997). First reported for SC by Hill & Horn (1997). [= RAB, FNA, K, SE, W]

* ***Helianthus grosseserratus*** Martens, Sawtooth Sunflower. Pd (DE, GA, NC, VA), Mt (VA, WV), Cp (DE, VA): disturbed areas; uncommon (rare in GA, NC, and VA Coastal Plain, rare in VA Mountains, rare in DE Piedmont), introduced from farther west. The original range of this species was apparently centered in OH, IN, IL, IA, and MO, but its exact extent is obscured by its subsequent spread. Reported for NC by Matthews & Mellichamp (1989). [= C, F, FNA, G, K, W, WV; = *H. grosse-serratus* – S, SE, orthographic variant]

Helianthus heterophyllus Nuttall, Savanna Sunflower. Cp (GA, NC, SC): wet savannas, seepage bogs; uncommon (rare in GA). August-October. A Southeastern Coastal Plain endemic: se. NC south to Panhandle FL and west to se. LA. [= RAB, FNA, GW, K, S, SE, WH]

Helianthus hirsutus Rafinesque, Hairy Sunflower. Mt (GA, NC, SC, VA, WV), Pd (GA, NC, SC, VA), Cp (FL, SC): woodlands and other sunny or semi-sunny habitats; uncommon (rare in FL and VA). July-October. PA and MN, south to n. FL and TX. [= RAB, C, FNA, G, K, S, SE, W, WH, WV; > *H. hirsutus* var. *hirsutus* – F; > *H. hirsutus* var. *trachyphyllus* Torrey & Gray – F; > *H. hirsutus* var. *stenophyllus* Torrey & Gray – F]

* ***Helianthus laetiflorus*** Persoon. Cp (NC, SC, VA), Pd (NC, SC, VA), Mt (VA, WV): disturbed areas; uncommon, introduced from farther west. Late July-September. Widely scattered in e. and c. North America, believed to be a derivative of the hybrid of *H. pauciflorus* Nuttall ssp. *subrhomboideus* (Rydberg) O. Spring & E. Schilling and *H. tuberosus*. [= RAB, G, S, SE, WV; = *H.* ×*laetiflorus* Persoon (pro sp.) – C, FNA, K; = *H. laetiflorus* var. *laetiflorus* – F]

Helianthus laevigatus Torrey & A. Gray, Shale-barren Sunflower, Smooth Sunflower. Mt (NC, VA, WV), Pd (NC, SC, VA): on dry, rocky or shaly soils, on roadbanks, powerline rights-of-way, open woodlands, in the Carolinas nearly limited to the Carolina Slate Belt; common in VA, uncommon in WV, rare in NC and SC). August-October. The primary range of *H. laevigatus* is in the mountains of c. and w. VA and e. WV, from whence it is disjunct to a few areas in the Piedmont of NC and SC, most notably the Carolina Slate Belt in Montgomery and Stanly counties, NC. [= RAB, C, F, FNA, G, K, SE, W, WV; > *H. laevigatus* – S; > *H. reindutus* (Steele) E.E. Watson – S]

Helianthus longifolius Pursh, Longleaf Sunflower. Mt (GA, NC*), Pd, Cp (GA): sandstone and granite glades and woodlands, loamy to xeric longleaf pine sandhills; rare. August-October. This species is apparently rare, occurring in ne. AL, n. GA (introduced in sw. NC). [= RAB, FNA, K, S, SE]

* ***Helianthus maximilianii*** Schräder, Maximilian Sunflower. Pd (NC, SC, VA), Mt (NC, SC, VA, WV), Cp (NC, VA): moist roadsides and disturbed areas; uncommon, introduced from farther west. September-October. MI and MB west to BC and south to TX; introduced in the East. [= C, SE, W; = *H. maximiliani* – RAB, F, FNA, G, K, S, orthographic variant]

Helianthus microcephalus Torrey & A. Gray, Small-headed Sunflower. Pd (GA, NC, SC, VA), Mt (GA, NC, SC, VA, WV), Cp (GA, NC, SC): dry woodlands and roadbanks; common (uncommon in Coastal Plain, rare in VA Piedmont). July-October. NJ west to MN, south to Panhandle FL and se. LA. [= RAB, F, FNA, G, K, S, W, WH, WV; < *H. microcephalus* – C, SE]

Helianthus mollis Lamarck, Ashy Sunflower, Gray Sunflower. Cp* (NC, SC, VA), Pd* (GA, NC, VA), Mt (GA, NC*, VA*, WV*): calcareous prairies and barrens, disturbed places; rare, in much of our area introduced from farther west. July-September. Apparently native of the Midwest, centered in IN, IL, MO, AR, c. TN, and w. KY, its original distribution obscured by its subsequent spread. Native in nw. GA. [= RAB, C, FNA, G, K, S, SE, W; > *H. mollis* var. *cordatus* S. Watson – F; > *H. mollis* var. *mollis* – F]

Helianthus occidentalis Riddell *ssp.* ***occidentalis***, Naked-stem Sunflower. Mt (GA, NC, VA, WV), Pd (VA), Cp (FL): rocky or sandy flood-scoured riversides, dry hammocks (in FL); rare. July-October. MD and DC west to MN, and south to w. NC, n. GA, Panhandle FL, and TX. Ssp. *occidentalis* occupies most of the range of the species. Ssp. *plantagineus* (Torrey & Gray) Shinners occurs in sw. LA, se. TX, and AR. Var. *dowellianus* Torrey & Gray, of uncertain status (if valid, then usually treated as a variety under ssp. *occidentalis*), occurs in the Appalachian portion of the range. The species has been collected only twice in NC, the type collection of *H. dowellianus* M.A. Curtis, from "near Franklin, Macon Co.," and in 1897, near Asheville, Buncombe County ("sandy bottoms along the French Broad River near Biltmore"). GAHP reports *H. occidentalis* as a rare species in the state, from "limestone glades and barrens, rocky or cherty soils" (GAHP 2003); it is uncertain what variety is represented. [= FNA, K; > *H. occidentalis* Riddell var. *dowellianus* (M.A. Curtis) Torrey & A. Gray – C, F, SE; = *H. occidentalis* – RAB, G, S, W, WH; > *H. occidentalis* – WV; > *H. dowellianus* M.A. Curtis – WV]

* ***Helianthus pauciflorus*** Nuttall *ssp.* ***pauciflorus***, Stiff Sunflower. Mt (GA), Pd (GA*, VA*), Cp (VA*): disturbed areas; rare, native in the more western portion of our area, introduced eastwards. July-September. Reported for VA by Fernald (1950) under the name *H. laetiflorus* var. *rigidus* and for nc. GA by Jones & Coile (1988) under the name *H. rigidus* (Cassini) Desf. [= FNA, K; = *H. pauciflorus* var. *pauciflorus* – C; > *H. laetiflorus* var. *rigidus* (Cassini) Fernald – F; > *H. rigidus* (Cassini) Desfontaines – S; *? H. rigidus* var. *rigidus* – SE]

* ***Helianthus petiolaris*** Nuttall *ssp.* ***petiolaris***, Plains Sunflower. Cp (NC, SC, VA): disturbed areas in sandy soil; rare, native of the Great Plains. May-August. [= FNA, K; < *H. petiolaris* – RAB, F, G, S; = *H. petiolaris* var. *petiolaris* – C, SE]

Helianthus porteri (A. Gray) Pruski, Confederate Daisy. Pd (GA, NC*, SC): in shallow soils over granite on low-elevation granite domes or flatrocks; uncommon, native in GA and SC, introduced and vigorously established in NC (SC Rare). August-September. A Piedmont endemic: nw. SC south to GA and ec. AL. The species has often been treated in *Viguiera*; see Pruski (1998) and Schilling et al. (1998) for discussion of the reasons for treating this species in *Helianthus*. It is well-established at two sites in NC, on Rocky Face Mountain (Alexander County, NC) and Mitchell Mill Flatrock (Wake County, NC), where it was introduced with soil blocks of *Diamorpha smallii* as part of a ecological experiment (Mellinger 1972; McCormick & Platt 1964). [= FNA, K; = *Viguiera porteri* (A. Gray) Blake – S, SE]

Helianthus radula (Pursh) Torrey & A. Gray, Roundleaf Sunflower, Rayless Sunflower. Cp (FL, GA, SC): sandhills, dryish savannas, and dry pine flatwoods; common (rare in SC). Late August-October. S. SC south to s. peninsular FL and west

to se. LA. It is readily distinguishable from all other species by its rosette of orbicular to nearly round leaves, borne flat against the ground. [= RAB, FNA, GW, K, S, SE, WH]

Helianthus resinosus Small, Resinous Sunflower. Pd (GA, NC, SC), Mt (GA, NC, SC), Cp (FL, GA, NC, SC): woodlands, thickets, roadsides; uncommon. June-October. Nc. and w. NC south to Panhandle FL and west to MS. Listed for VA by F; documentation unknown. [= FNA, K, S, SE, W, WH; = *H. tomentosus* Michaux – RAB, F, S, misapplied]

Helianthus schweinitzii Torrey & A. Gray, Schweinitz's Sunflower. Pd (NC, SC): clayey soils of woodlands and roadsides, in areas formerly with post oak-blackjack oak savannas, xeric oak-pine woodlands, or "Piedmont prairies," now primarily on mowed road or powerline rights-of-way; rare. Late August-October. Piedmont of nw. NC and nc. SC, primarily within 100 km of Charlotte, NC. Some earlier reports (as in Heiser *et al.* 1969) of occurrences in se. NC, e. SC, and c. SC are based on misidentifications. See Matthews, Barden, & Matthews (1997) for an informative discussion about this species. [= RAB, FNA, K, S, SE]

Helianthus simulans E. Watson. Cp (FL, GA, NC*, SC), Pd* (GA*, SC*): wet soils, ditches, roadsides; uncommon (rare in GA and SC). October-November. Native from SC south to c. peninsular FL, FL Panhandle, and west to LA; now spread more widely by horticultural use. [= FNA, GW, K, S, SE, WH]

Helianthus smithii Heiser, Smith's Sunflower. Mt (GA): dry forests and woodlands; rare. August-September. Known from n. GA, e. AL, and se. TN. It has small heads (like *H. microcephalus*, *H. laevigatus*, *H. schweinitzii*), the leaves narrowly lanceolate and subsessile (like *H. schweinitzii* or *H. laevigatus*), the leaves resin-dotted below (like *H. microcephalus*), but nearly glabrous. It may be a hybrid derivative of *H. microcephalus* and *H. strumosus*. [= FNA, K; < *H. microcephalus* – C, SE]

Helianthus strumosus Linnaeus, Roughleaf Sunflower. Mt (GA, NC, SC, VA, WV), Pd (DE, GA, NC, SC, VA), Cp (FL, GA, NC, SC, VA): woodlands and roadsides; common (rare in Coastal Plain, rare in DE). Late July-September. ME, MN, and KA south to ne. FL, Panhandle FL, and TX. [= RAB, C, F, FNA, G, K, SE, W, WH, WV; > *H. strumosus* – S; > *H. montanus* E.E. Watson – S; > *H. saxicolus* – S]

* ***Helianthus tuberosus*** Linnaeus, Jerusalem Artichoke. Mt (GA, NC, SC, VA, WV), Pd (DE, GA, NC, SC, VA), Cp (DE, FL, GA, NC, SC, VA): native in rich bottomlands and along streams, disturbed areas, cultivated in gardens for the edible tubers; common, native of farther west (uncommon in DE Coastal Plain, rare in FL, rare in DE Piedmont). July-October. [= RAB, C, FNA, K, S, SE, W, WH; > *H. tuberosus* var. *tuberosus* – F, G]

Helianthus verticillatus Small, Whorled Sunflower. Mt (GA): seasonally wet to moist calcareous prairies; rare. August-October. Nw. GA, ne. AL, and sc. TN. This taxon is a species, not a hybrid; its morphological characteristics alone (with its unique whorled leaves) make hybrid status implausible. See Matthews et al. (2002) for additional information. [= FNA, S; = *H.* ×*verticillatus* E.E. Watson (pro sp.) – K; = "a hybrid of *H. angustifolius* with either *H. eggertii* or *H. grosseserratus*"– C, SE]

Helianthus carnosus Small, Flatwoods Sunflower. Cp (FL): wet flatwoods, wet prairies; rare. September-November. Endemic to ne. FL (including Clay County in our area). [= FNA, K, S, SE, WH] {not yet keyed}

* *Helianthus salicifolius* A. Dietrich. Reported for MD by Kartesz (1999). Not in our area in FNA. [= C, F, FNA, G, K, SE] {not keyed; check for documentation}

Helianthus silphioides Nuttall. East to se. TN (Chester, Wofford, & Kral 1997) and e. AL. [= C, F, FNA, K, SE; = *H. atrorubens* Linnaeus var. *pubescens* Kuntze] {synonymy incomplete}

Heliomeris Nuttall 1848 (Golden-eye)

A genus of 4-5 species, annuals and perennials, of sw. United States and Mexico. References: Schilling in FNA (2006c).

* ***Heliomeris multiflora*** (Nuttall) Blake *var.* ***multiflora***, Golden-eye. Cp (SC): waste areas around wool-combing mill; rare, perhaps only a waif, native of western United States and Mexico. May. [= FNA, K; = *Viguiera multiflora* (Nuttall) Blake]

Heliopsis Persoon 1807 (Sunflower-everlasting, Oxeye)

A genus of about 18 species, herbs, of America. References: Smith in FNA (2006c); Fisher (1957)=Z; Cronquist (1980)=SE. Key adapted in part from Z.

1 Plants 3-8 dm tall; larger leaves on a plant generally 3-8 cm long; heads 1 (-3) per plant; rays 6-10 (-13) per head; rays 1-2 (-2.4) cm long; [of the Coastal Plain]..... ***H. helianthoides*** *var.* ***gracilis***

1 Plants (4-) 8-15 dm tall; larger leaves on a plant generally 7-15 cm long; heads (1-) 3-8 per plant; rays (8-) 10-16 per head; rays (1.5-) 2-4 cm long; [widespread in our area, rare in the Coastal Plain].

2 Leaves smooth on both sides (or sometimes sparsely pubescent below and slightly scabrous above); leaves (4.0-) 4.5-6.0 (-12) cm wide; stem glabrous and glaucous below, slightly pubescent above, the hairs generally all slender and ascending..... ***H. helianthoides*** *var.* ***helianthoides***

2 Leaves moderately to densely scabrous on both sides; leaves 2.0-3.5 (-5.0) cm wide; stem also scabrous with short, broad-based hairs ..... ***H. helianthoides*** *var.* ***scabra***

Heliopsis helianthoides (Linnaeus) Sweet *var.* ***gracilis*** (Nuttall) Gandhi & Thomas, Smooth Oxeye, Pineywoods Oxeye, Coastal Plain Sunflower-everlasting, Coastal Plain Oxeye. Cp (FL, GA, SC): moist calcareous forests; rare. April-July; May-July. A Southeastern Coastal Plain endemic: se. SC (Berkeley, Dorchester, and Charleston counties) south to GA (Jones & Coile

1988) and Panhandle FL, and west to LA (Thomas & Allen 1996). [= K, WH; = *H. minor* (Hooker) C. Mohr – S; = *H. gracilis* Nuttall – SE, Z]

Heliopsis helianthoides (Linnaeus) Sweet *var.* ***helianthoides***, Eastern Sunflower-everlasting, Eastern Oxeye. Mt (GA, NC, SC, VA, WV), Pd (DE, GA, NC, SC, VA), Cp (DE, VA): forests, woodlands, woodland borders; common (rare in Coastal Plain, rare in DE Piedmont). May-October. VT, ON, and WI south to GA and LA. [= C, G, K, SE; < *H. helianthoides* – RAB, W; > *H. helianthoides* var. *helianthoides* – F; > *H. helianthoides* var. *solidaginoides* (Linnaeus) Fernald – F; = *H. helianthoides* – S, WV; = *H. helianthoides* ssp. *helianthoides* – Z]

Heliopsis helianthoides (Linnaeus) Sweet *var.* ***scabra*** (Dunal) Fernald, Western Sunflower-everlasting, Rough Oxeye, Western Oxeye. Mt (WV), Pd (VA): dry, open forests and woodlands, woodland borders; uncommon (rare in VA). May-October. NL (Newfoundland) and SK south to VA, WV, KY, GA, LA, TX, and NM. FNA mentions frequent intergradation, and some plants in our area best considered var. *scabra* do not seem to be "pure." [= C, F, G, K, SE; = *H. scabra* Dunal – S, WV; = *H. helianthoides* ssp. *scabra* (Dunal) Fisher – Z]

Helminthotheca Zinn 1757 (Oxtongue)

A genus of 4 species, herbs, of Europe. References: Strother in FNA (2006a).

* ***Helminthotheca echioides*** (Linnaeus) Holub, Bristly Oxtongue. Cp (VA?): disturbed areas; rare, native of Europe. July-September. Reported from DC and VA; uncertain whether documented from our area. [= FNA; = *Picris echioides* Linnaeus – C, F, G, K, SE]

Heterotheca Cassini 1817 (Camphorweed, Golden-aster)

A genus of about 28 species, herbs, of North America. References: Semple in FNA (2006b); Wagenknecht (1960)=Z; Semple (1996)=Y; Gandhi & Thomas (1989)=X; Semple (2004)= Q; Cronquist (1980)=SE; Semple (1983). Key adapted in part from Z and X. [also see *Chrysopsis* and *Pityopsis*]

1 Ray flowers with pappus; perennial, from creeping rhizomes; upper and lower leaves cuneate to a sessile base..... ***H. camporum*** *var.* ***glandulissimum***
1 Ray flowers without pappus; annual or biennial, taprooted; upper leaves rounded to clasping at the sessile base, lower leaves (deciduous by late in the season) petiolate.
  2 Plants erect, 0.5-2 m tall; leaves hirsute-pilose on both sides or scabrous above; phyllaries moderately hirsute and glandular on the back; [of a variety of weedy habitats, mainly inland]..... ***H. latifolia*** *var.* ***latifolia***
  2 Plants erect or decumbent, 0.3-1 m tall; leaves scabrous on both sides or only beneath; phyllaries densely hirsute and glandular on the back; [of coastal dunes] ..... ***H. subaxillaris***

* ***Heterotheca camporum*** (Greene) Shinners *var.* ***glandulissima*** Semple, Nashville Camphorweed. Mt , Pd (GA, NC, VA), Cp (NC): roadsides, disturbed areas; rare, native of c. TN. This variety is apparently native in the Nashville Basin of Tennessee. [= FNA; = *H. camporum* var. *glandulissimum* – K, Y, orthographic variant; = *Chrysopsis camporum* Greene var. *glandulissima* (Semple) Cronquist – C; < *Chrysopsis camporum* – F, SE, W; < *Chrysopsis villosa* (Pursh) Nuttall var. *camporum* (Greene) Cronquist – G]

* ***Heterotheca latifolia*** Buckley *var.* ***latifolia***, Common Camphorweed. Pd (GA, NC, SC, VA), Cp (FL, NC, SC, VA), Mt (NC, SC): roadsides, disturbed areas; common, native of the sc. United States and adjacent Mexico. [= Y, Z; = *H. subaxillaris* (Lamarck) Britton & Rusby var. *latifolia* (Buckley) Gandhi & Thomas – X; < *H. subaxillaris* – RAB, C, F, G, K, S, SE, W, WH; = *H. subaxillaris* (Lamarck) Britton & Rusby ssp. *latifolia* (Buckley) Semple – FNA, Q]

Heterotheca subaxillaris (Lamarck) Britton & Rusby, Dune Camphorweed. Cp (DE, FL, GA, NC, SC, VA), Pd (GA): coastal dunes and sand-flats; common. July-October (-December). NJ south to FL, west to TX and Mexico, along the coast. This taxon is apparently native in our area, and is a conspicuous component of the flora of ocean dunes. [= Y; = *H. subaxillaris* (Lamarck) Britton & Rusby var. *subaxillaris* – X, Z; < *H. subaxillaris* – RAB, C, F, G, K, S, SE, WH (also see *H. latifolia*); = *H. subaxillaris* ssp. *subaxillaris* – FNA, Q]

Hieracium Linnaeus 1753 (Hawkweed, King-devil)

A genus of 250-1000 species, herbs, primarily temperate. *Hieracium* is a complicated genus, with many apomictic races sometimes recognized as taxa. Sometimes separated into *Hieracium* and *Pilosella*. References: Strother in FNA (2006a); Cronquist (1980)=SE. Key adapted from C.

1 Leaves primarily cauline, the largest leaves definitely on the stem, basal leaves usually absent; [*Hieracium* s.s.].
  2 Florets 8-20 (-30) per head; leaves nearly glabrous, or with a few long hairs on the lower surface; upper stem glabrous..... ***H. paniculatum***
  2 Florets 30-110 per head; leaves setose, with long hairs on the upper and lower surfaces; upper stem stipitate-glandular, stellate-pubescent, or glabrous.
    3 Leaves with entire margins, rounded to obtuse at the tip; [widespread in our area]..... ***H. scabrum***
    3 Leaves with toothed to laciniate margins, acute to obtuse at the tip; [disjunct at high elevations in WV] ..... ***H. umbellatum***
1 Leaves primarily basal, the largest leaves basal, leaves in some species extending onto the lower portion of the stem.

4 Plants stoloniferous; [aliens of weedy habitats, especially pastures, roadsides, and lawns]; [*Pilosella*].
5 Heads 1 (-3) per plant ..... ***H. pilosella***
5 Heads (1-) 2-many per plant.
6 Heads (1-) 2-6 per plant, leaves nearly glabrous on the upper surface ..... ***H. flagellare***
6 Heads (3-) 5-50 per plant; leaves nearly glabrous or distinctly long-pubescent on the upper surface.
7 Flowers deep orange ..... ***H. aurantiacum***
7 Flowers yellow.
8 Leaves not glaucous; leaves hairy on the upper surface ..... ***H. caespitosum***
8 Leaves glaucous; leaves glabrous (or nearly so) on the upper surface ..... ***H. floribundum***
4 Plants not stoloniferous; [primarily natives (except *H. caespitosum* and *H. piloselloides*), of various (mostly dry) habitats].
9 Cypselas 1.5-2 mm long, truncate at the tip; basal leaves mostly 5-12× as long as wide (the petiole included); well-developed basal leaves rarely over 3 cm wide; [alien]; [*Pilosella*].
10 Leaves and stem not glaucous; leaves hairy on the upper surface ..... ***H. caespitosum***
10 Leaves and stem glaucous; leaves sparsely hairy to nearly glabrous on the upper surface ..... ***H. piloselloides***
9 Cypselas 2-4 mm long, usually distinctly narrowed to the tip (except *H. scabrum*); basal leaves mostly 1.5-5× as long as wide (the petiole included); well-developed basal leaves often over 3 cm wide; [native]; [*Hieracium* s.s.].
11 Leaves purple-veined (when fresh).
12 Lower stem strongly pilose; leaves weakly purple-veined ..... ***H. marianum***
12 Lower stem glabrous or nearly so; leaves strongly purple-veined ..... ***H. venosum***
11 Leaves not purple-veined.
13 Inflorescence a narrow panicle.
14 Cypselas truncate, broadest at the tip; flowers 40-100 per head ..... ***H. scabrum***
14 Cypselas narrowed to the tip; flowers 20-40 per head
15 Hairs of the lower stem 1-4 mm long; inflorescence 2-4× as long as wide; [widespread in our area] ..... ***H. gronovii***
15 Hairs of the lower stem 6-15 mm long; inflorescence 4-7× as long as wide; [of KY and TN westward] ..... ***[H. longipilum]***
13 Inflorescence corymbiform.
16 Cypselas 2-3 mm long, truncate, broadest at the tip; flowers 40-100 per head ..... ***H. scabrum***
16 Cypselas 2.2-5 mm long, at least the longer achenes narrowed to the tip; flowers 15-40 per head.
17 Stem with several well-developed leaves slightly smaller than the basal leaves; inflorescence corymbiform or tending toward paniculate.
18 Involucre mostly 6-9 mm high; inflorescence generally elongate and cylindric (appearing corymbiform in depauperate individuals); achenes 2.5-4 mm long; corollas 8-9 mm long ..... ***H. gronovii***
18 Involucre mostly 8-11 mm high; inflorescence broadly corymbiform; achenes 3.5-5 mm long; corollas 10-13 mm long ..... ***H. megacephalum***
17 Stem leafless, or with only a few leaves distinctly smaller than the basal leaves; inflorescence strongly corymbiform.
19 Involucre glabrous or with short stipitate glands, but lacking long setae (either gland-tipped or glandless) ..... ***H. marianum***
19 Involucre with long setae (either gland-tipped or glandless).
20 Involucral setae gland-tipped; [of the Coastal Plain] ..... ***H. megacephalum***
20 Involucral setae not gland-tipped (but with shorter gland-tipped hairs); [of the Mountains (and Piedmont?) of VA] ..... ***H. traillii***

* ***Hieracium aurantiacum*** Linnaeus, Orange Hawkweed, Devil's-paintbrush, Orange King-devil, Fox-and-cubs. Mt (GA, NC, VA, WV), Pd (VA): pastures, roadsides; rare, native of Europe. May-July. [= RAB, F, FNA, G, K, SE, W, WH, WV; **= *Pilosella aurantiaca*** (Linnaeus) F. Schultz & Schultz 'Bipontinus']

* ***Hieracium caespitosum*** Dumortier, Yellow King-devil, Yellow Fox-and-cubs. Mt (GA, NC, SC, VA, WV), Pd (DE, NC, VA), Cp (DE, VA): pastures, fields, roadsides, grassy balds; common (uncommon in DE, rare in VA Coastal Plain), native of Europe. May-July. [= C, FNA, K, SE, W; *? H. pratense* Tausch – RAB, F, G, WV; **= *Pilosella caespitosa*** (Dumortier) Sell & C. West]

* ***Hieracium flagellare*** Willdenow, Whiplash Hawkweed. Mt? (VA), Pd (DE): roadsides; rare, native of Europe. Considered to derive from hybridization between *H. caespitosum* Dumortier and *H. pilosella* Linnaeus. [= C, F, FNA, SE; = *H. ×flagellare* Willdenow (pro sp.) var. *flagellare* – K; **= *Pilosella flagellaris*** (Willdenow) Sell & C. West]

* ***Hieracium floribundum*** Wimmer & Grabowski, Glaucous Hawkweed. Mt (VA), Pd (VA): roadsides, pastures; rare, native of Europe. Considered to derive from hybridization between *H. caespitosum* Dumortier and *H. lactucella* Wallroth. [= C, F, G; = *H. ×floribundum* Wimmer & Grabowski (pro sp.) – K; **= *Pilosella floribunda*** (Wimmer & Grabowski) Arvet-Touvet]

Hieracium gronovii Linnaeus, Beaked Hawkweed. Cp (DE, FL, GA, NC, SC, VA), Pd (DE, GA, NC, SC, VA), Mt (GA, NC, SC, VA, WV): sandhills, dry forests, woodland margins, roadsides; common (uncommon in VA Piedmont). July-November. MA west to s. ON and KS, south to c. peninsular FL and TX. [= RAB, C, F, FNA, G, K, S, SE, W, WH, WV]

Hieracium marianum Willdenow, Maryland Hawkweed. Cp (NC, SC), Pd (NC, SC), Mt (NC, SC, WV) {GA}: dry forests, woodland margins, roadsides; common (uncommon in WV). May-November. NH west to OH, south to FL and MS. Considered to derive from hybridization between *H. gronovii* Linnaeus and *H. venosum* Linnaeus. There is apparently no definite report from VA. [= F, K, S, WV; = *H. ×marianum* Willdenow (pro sp.) – RAB, C, SE]

Hieracium megacephalum Nash, Bigheaded Hawkweed. Cp (GA): dry sandy soils of pinelands and hammocks; uncommon. S. GA south to s. FL. [= FNA, SE; = *Hieracium megacephalon* Nash – K, WH, orthographic variant; > *H. megacephalon* – S; > *H. argyraeum* Small – S]

Hieracium paniculatum Linnaeus, Leafy Hawkweed. Mt (GA, NC, SC, VA, WV), Pd (DE, NC, VA): dry to mesic forests, especially along dirt roads; common. July-October. NS and QC west to MN, south to w. NC, n. GA, and OH. The leafy stem and lack of basal leaves of *H. paniculatum* readily distinguish it from our other species of *Hieracium*. In fact, it often puzzles the inexperienced botanist, who may overlook the possibility that this plant is a *Hieracium*! The milky sap and obscure teeth on the leaves are good corroborative characters. [= RAB, C, F, FNA, G, K, S, SE, W, WV]

* ***Hieracium pilosella*** Linnaeus, Mouse-ear Hawkweed. Mt (GA, NC, VA, WV), Pd (DE, NC, VA), Cp (DE, VA): pastures, roadsides, disturbed areas; uncommon (rare in DE), native of Europe. May-July. [= RAB, C, FNA, G, SE, W; > *H. pilosella* var. *pilosella* – F, K, WV; **= *Pilosella officinarum*** F. Schultz & Schultz 'Bipontinus']

* ***Hieracium piloselloides*** Villars, Glaucous King-devil. Mt (GA, NC, SC, VA, WV), Pd (DE, VA), Cp (VA): fields, pastures, roadsides, uncommon (rare in GA, NC, SC, VA, and WV), native of Europe. May-September. [= C, FNA; *? H. florentinum* Allioni – RAB, G, SE, W; > *H. florentinum* – F; > *H. piloselloides* – K; > *Hieracium praealtum* (Villars) ex Gochnat var. *decipiens* W.D.J. Koch – F, K; **= *Pilosella piloselloides*** (Villars) Soják]

Hieracium scabrum Michaux, Rough Hawkweed. Mt (GA, NC, SC, VA, WV), Pd (DE, NC, VA), Cp (DE, VA): dry forests, woodland margins, roadsides; common (rare in GA, rare in Coastal Plain south of DE). July-November. NS and QC west to MN, south to VA, n. GA, KY, and MO. [= RAB, C, FNA, G, S, SE, W, WV; > *H. scabrum* var. *scabrum* – F, K]

Hieracium traillii Greene, Shale-barren Hawkweed. Mt (VA, WV), Pd? (VA): shale barrens and dry shaley woodlands, other xeric woodlands; uncommon. May-June. Sc. PA south to w. VA and e. WV. [= C, F, FNA, G, SE, W; = *H. greenii* Porter & Britton – K, S, WV, a preoccupied name]

Hieracium umbellatum Linnaeus, Northern Hawkweed. Mt (WV): rocky areas; rare. Circumboreal, south in North America to PA, WV (Spruce Knob), IN, MO, CO, and OR. [= C, FNA, K; > *H. canadense* Michaux var. *fasciculatum* (Pursh) Fernald – F, G; > *H. canadense* var. *hirtirameum* Fernald – F, G]

Hieracium venosum Linnaeus, Veiny Hawkweed. Mt (GA, NC, SC, VA, WV), Pd (DE, GA, NC, SC, VA), Cp (DE, GA, NC, SC, VA): dry forests, woodland margins, roadsides; common. April-September. NY west to MI, south to GA, AL, and TN; apparently disjunct in FL. [= RAB, C, FNA, G, S, SE, W, WV; > *H. venosum* var. *venosum* – F, K; > *H. venosum* var. *nudicaule* (Michaux) Farwell – F, K]

* ***Hieracium lachenalii*** K.C. Gmelin, European Hawkweed. Pd (DE), Mt (WV): disturbed areas; uncommon, native of Europe. [= C, K; ? *H. vulgatum* Fr. – FNA, F, G] {not yet keyed}

Hieracium longipilum Torrey. ON, OH, KY, and TN west to MN, NE, KS, OK, and TX. [= C, F, FNA, G, K, SE]

* *Hieracium sabaudum* Linnaeus. Naturalized south to NJ and PA; native of Europe. August-October. May be found in our area. [= C, F, FNA, G, K] {not keyed}

Many of our species hybridize, and some of the species listed above are apparently hybrid derivatives. I prefer to treat taxa such as *H. marianum* as species (even if hybridization-derived) because they occur independently of the parental taxa (see above). Other hybrids of native species known in our area include: *H. gronovii* × *H. paniculatum* [*H.* ×*alleghaniense* Britton (pro sp.)], *H. gronovii* × *H. venosum, H. paniculatum* × *H. scabrum, H. paniculatum* × *H. venosum* [*H.* ×*scribneri* Small (pro sp.); *H. scribneri* – K], *H. scabrum* × *H. venosum.*

Hymenopappus L'Héritier 1788 (Woolly-white)

A genus of about 11-14 species, herbs, of s. North America. References: Strother in FNA (2006c); Cronquist (1980)=SE.

Hymenopappus scabiosaeus L'Héritier *var.* ***scabiosaeus***. Cp (FL, GA, SC): turkey oak sandhills and adjacent sandy fields; common (rare in GA and SC). Sc. SC south to n. peninsular FL, west to AR, MO, and OK, and north in the interior to n. IN, c. and s. IL, and se. MO. Var. *corymbosus* (Torrey & A. Gray) B.L. Turner is distributed in the s. Great Plains and adjacent areas, from NE south to TX and Coahuila. [= C, FNA, K, SE; < *H. scabiosaeus* – RAB, F, G, S, WH]

Hymenoxys Cassini 1825

A genus of about 25 species, herbs, of w. North America, south through Central America to South America. References: Bierner in FNA (2006c).

* ***Hymenoxys odorata*** A.P. de Candolle. Cp (SC): waste areas around wool-combing mill; rare, perhaps only a waif, native of sw. United States. See Nesom (2004d). [= K; = *Picradenia odorata* (A.P. de Candolle) Britton]

Hypochaeris Linnaeus 1753 (Cat's-ear)

A genus of about 60 species, herbs, of South America, Europe, Asia, and n. Africa. The controversial spelling of the genus name is now resolved in favor of *Hypochaeris*. References: Bogler in FNA (2006a); Cronquist (1980)=SE.

1 Stem with at least a few well-developed leaves, clasping and similar to the basal; pappus of one length, all long and plumose.
  2 Flowers yellow; middle and outer phyllaries hispid; heads usually 5-8 mm across at anthesis, the involucre campanulate ..... ***H. chillensis***
  2 Flowers white; middle and outer phyllaries glabrous or puberulent; heads usually 2-4 mm wide at anthesis, the involucre cylindric ..... ***H. microcephala*** *var.* ***albiflora***
1 Stem naked, or only with few and very small bracts; pappus of two lengths, the outer short and barbellate, the inner long and plumose.
  3 Plants glabrous or apparently so; plants mostly annual ..... ***H. glabra***
  3 Plants conspicuously pubescent, as on the hispid leaves; plants mostly perennial ..... ***H. radicata***

* ***Hypochaeris chillensis*** (Kunth) Britton, Brazilian Cat's-ear. Cp (FL, GA, NC, SC), Pd (GA, SC), Mt (SC): roadsides, fields, other disturbed places; common, native of South America. Late April-July. More common in the NC Coastal Plain than shown in RAB (common in Duplin, Sampson, and Wayne cos.) (A.J. Bullard, pers. comm. 2003). [= FNA; ? *Hypochaeris brasiliensis* (Less.) Grisebach var. *tweediei* (Hooker & Arnott) Baker – K, SE, WH; *?* *Hypochoeris elata* (Weddell) Grisebach – RAB, misapplied]

* ***Hypochaeris glabra*** Linnaeus, Smooth Cat's-ear. Cp (FL, GA, NC, SC), Pd (NC, SC), Mt (WV): roadsides, fields, disturbed areas; common (rare in NC and WV, uncommon in FL), native of Europe. Late March-July. [= FNA, K, S, WH; = *Hypochoeris glabra* – RAB, C, SE, WV, orthographic variant]

* ***Hypochaeris microcephala*** (Schultz 'Bipontinus') Cabrera *var.* ***albiflora*** (Kuntze) Cabrera, White-flowered Cat's-ear. Cp (GA): disturbed areas; rare, native of South America. This species has been found as a naturalized introduction at Fort Pulaski (Chatham County, GA) (T. Govus, pers. comm. 2006) and in Camden County, GA (Carter, Baker, & Morris 2009). [= FNA, K, SE]

* ***Hypochaeris radicata*** Linnaeus, Spotted Cat's-ear. Cp (DE, FL, GA, NC, SC, VA), Pd (DE, GA, NC, SC, VA), Mt (GA, NC, SC, VA, WV): roadsides, fields, disturbed areas; common (uncommon in DE Piedmont, rare in FL), native of Eurasia. April-July (or later). [= FNA, G, K, S, WH; = *Hypochoeris radicata* – RAB, C, F, SE, WV, orthographic variant]

Inula Linnaeus 1753 (Elecampane)

A genus of about 90-100 species, of temperate and subtropical Old World. References: Arriagada (1998)=Z; Cronquist (1980)=SE.

* ***Inula helenium*** Linnaeus, Elecampane. Mt (NC, VA, WV), Pd (DE, VA), Cp (DE): damp pastures, roadsids, other disturbed areas; rare, native of Europe. May-September. [= RAB, C, F, FNA, G, K, S, SE, W, WV, Z]

Ionactis Greene 1897 (Stiff-leaved Aster)

A genus of 5 species, herbs, of North America. *Ionactis* has usually been included in *Aster*, but differs in many characters and is more closely related to *Heterotheca* (Nesom & Leary 1992). References: Nesom in FNA (2006b); Nesom & Leary (1992)=Z; Cronquist (1980)=SE.

Ionactis linariifolia (Linnaeus) Greene, Stiff-leaved Aster. Cp (DE, FL, GA, NC, SC, VA), Pd (DE, GA, NC, SC, VA), Mt (GA, NC, SC, VA, WV): dry savannas, sandhills, pine flatwoods, prairie-like openings, glades, and barrens, high elevation rock outcrops and glades, to at least 1450 m, dry roadbanks, woodland edges, rocky woodlands; common (uncommon in WV, rare in DE). August-November. ME and QC west to WI, south to ne. FL, Panhandle FL, and TX. There appears to be substantial variation in *I. linariifolius*, with montane (and northern) populations having considerably longer and broader leaves than Coastal Plain (and southern) populations; additional study is needed. [= FNA, WH, Z; = *I. linariifolius* – K, S, orthographic variant; = *Aster linariifolius* Linnaeus – RAB, C, G, SE, W, WV]

Iva Linnaeus 1753 (Marsh-elder)

A genus of about 9 species, shrubs and herbs, of North America and the West Indies, as circumscribed more narrowly by recent authors. References: Turner (2009a)=Z; Cronquist (1980)=SE; Jackson (1960)=Y; Strother in FNA (2006c).

1 Plants perennial, fleshy, glabrous (or strigillose on the leaf faces); [mostly of maritime situations, such as brackish marshes, marsh edges, or ocean dunes]; [section *Iva*].
  2 Outer phyllaries united; [rare waif of disturbed areas and beaches] ..... ***I. axillaris***
  2 Outer phyllaries distinct; [collectively common and widespread natives of the outer Coastal Plain].
    3 Leaves 1.5-4.5 (-6.0) cm long, 0.4-1.0 (-1.5) cm wide, 1-3 mm thick when fresh, mostly untoothed; involucres 4-7 mm high; leaves alternate from midstem upward; [mostly of dunes and the upper beach] ..... ***I. imbricata***
    3 Leaves 4-10 cm long, 0.7-4.0 cm wide, 0.5-1 mm thick when fresh, usually toothed; involucres 2-4 mm high; leaves opposite (alternate above or in the inflorescence); [mostly of marshes, marsh edges, and wet hammocks].
      4 Larger leaves 4-7 (-8.5) cm long, 0.7-1.5 (-2.1) cm wide, 4-10× as long as wide, subentire or with 1-8 (rarely more) teeth on each side; [of NJ southward] ..... ***I. frutescens* *var.* *frutescens***
      4 Larger leaves 6-10 cm long, 2.0-4.0 cm wide, 1.5-4× as long as wide, usually with 8-17 teeth on each side; [of n. NC northward] ..... ***I. frutescens* *var.* *oraria***
1 Plants annual (perennial in *I. asperifolia*) , not fleshy, more-or-less pubescent (at least in the inflorescence); [of mainly inland wetlands or disturbed areas].
  5 Leaves 20-70 mm wide, ovate; staminate flowers usually 8-16 (-20) per head; [mostly of disturbed ground]; [section *Iva*] ..... ***I. annua***
  5 Leaves 0.5-8 mm wide, linear; staminate flowers 1-9 per head; [section *Linearbracta*].
    6 Involucres 1.5-2 mm high; outer phyllaries distinct, glandular-punctate; leaves 0.5-3 mm wide; pistillate flowers 3 per head ..... ***I. microcephala***
    6 Involucres 2.5-3 mm high; outer phyllaries connate, not glandular-punctate; leaves 1-8 mm wide; pistillate flowers 1 (-2) per head
      7 Plants annuals, erect, 5-12 dm tall; staminate flowers 1-5 per head ..... ***[I. angustifolia]***

7 Plants perennials, decumbent, rooting at the nodes, 2-5 dm tall; staminate flowers 3-9 per head.....***I. asperifolia***

* ***Iva asperifolia*** Lessing, Narrowleaf Marsh-elder. Cp (FL): wet disturbed areas; rare, native of sw. United States and Mexico. August-September. Perhaps *I. asperifolia* and *I. angustifolia* are best treated as only varietally distinct, as done by Turner (2009). [= S, Y; < *I. angustifolia* Nuttall ex deCandolle – FNA, K, SE, WH; = *Iva asperifolia* var. *asperifolia* – Z]

Iva annua Linnaeus, Sumpweed, Rough Marsh-elder. Cp (FL, GA*?, NC*, SC*, VA*), Pd* (NC, SC, VA), Mt (GA, WV*): fields, disturbed places; rare, in the eastern and inland part of area probably introduced (by native Americans) from further west. September-November. PA, ND, and CO south to FL, NM, and Mexico (the original distribution uncertain). This species was apparently an important crop of native Americans. The so-called var. *macrocarpa* (Blake) R.C. Jackson, known only from archeological remains and presumed extinct, is almost certainly a cultivated form, selected for its large seeds. [= RAB, C, FNA, GW, SE, W, WH; = *I. ciliata* Willdenow – F; > *I. ciliata* Willdenow var. *ciliata* – G; > *I. ciliata* var. *macrocarpa* Blake – G; > *I. annua* var. *annua* – K, Y; > *I. annua* var. *caudata* (Small) R.C. Jackson – K, Y; > *I. annua* var. *macrocarpa* (Blake) R.C. Jackson – K, Y; > *I. ciliata* – S; > *I. caudata* Small – S]

* ***Iva axillaris*** Pursh, Deer-root. Cp (SC): waste areas around wool-combing mill; rare, perhaps only a waif, native of w. United States. May-October. See Nesom (2004d). [= FNA, K, Y]

Iva frutescens Linnaeus ***var. frutescens***, Southern Maritime Marsh-elder. Cp (DE?, FL, GA, NC, SC, VA): brackish marshes and marsh edges, normally on the back side of barrier islands; common. Late August-November. NJ south to s. FL, west to TX. See *I. frutescens* var. *oraria* for discussion of the two taxa. [= C, F, G, SE; = *I. frutescens* ssp. *frutescens* – GW, K, Y; < *I. frutescens* – RAB, FNA, S, WH]

Iva frutescens Linnaeus ***var. oraria*** (Bartlett) Fernald & Griscom, Northern Maritime Marsh-elder. Cp (DE, MD, NC, VA): brackish marshes and marsh edges, normally on the back side of barrier islands; common (uncommon south of MD). Late August-November. NS south to Dare County, NC. The two varieties are morphologically distinct, except in the zone of overlap (NJ south to Dare County, NC), where intermediates will be encountered. Even in the zone of overlap, though, most plants are readily identified to variety. There might be some merit in considering these taxa species, with limited hybridization in a small portion of their total distributions. [= C, F, G, SE; = *I. frutescens* ssp. *oraria* (Bartlett) R.C. Jackson – K, Y; < *I. frutescens* – RAB, FNA, S; = *I. oraria* Bartlett]

Iva imbricata Walter, Dune Marsh-elder. Cp (FL, GA, NC, SC, VA): dunes, upper beach, island-end flats; common (rare in VA). Late August-November. Se. VA south to s. FL, west to LA; Bahamas and Cuba. This plant is often the most oceanward perennial plant, often the first perennial to colonize the upper beach or incipient dunes on island-end flats, where it occurs with such upper beach annuals as *Euphorbia polygonifolia*, *Euphorbia bombensis*, *Cakile edentula*, and *Amaranthus pumilus*. [= RAB, C, F, FNA, G, K, S, SE, WH, Y]

Iva microcephala Nuttall, Small-headed Marsh-elder. Cp (FL, GA, NC, SC): wet pine flatwoods, flatwood ponds, clay-based Carolina bays; common (rare north of FL). September-October. C. NC south to s. FL, west to se. AL. A seed-banking annual, locally abundant some years and absent others depending on the variable hydrologic conditions of Carolina bays and other seasonally flooded wetlands. [= RAB, FNA, GW, K, S, SE, WH, Y]

Iva angustifolia Nuttall ex deCandolle, Narrowleaf Marsh-elder. Cp (LA): wet disturbed areas. August-September. Native of sw. United States and Mexico, eastward to Livingston Parish, LA. See *I. asperifolia* above for taxonomic comments. [= Y; < *I. angustifolia* – FNA, K, SE; = *I. asperifolia* Lessing var. *angustifolia* (Lessing) B.L. Turner – Z]

Ixeris (Cassini) Cassini 1822

A genus of ca. 20 species, herbs, of e. and se. Asia. References: Strother in FNA (2006a).

* *Ixeris stolonifera* A. Gray, Creeping Lettuce. Established as a weed in lawns, gardens, and plant nurseries in se. PA (Rhoads & Klein 1993) NY (Long Island), and DE (Cronquist 1980). Native of Japan. June-August. [= C, FNA, K, SE; = *Lactuca stolonifera* (A. Gray) Bentham ex Maximowicz – F]

Jamesianthus Blake & Sherff 1940 (Warbonnet)

A monotypic genus, a perennial herb, endemic to c. AL and wc. GA. References: Strother in FNA (2006c).

Jamesianthus alabamensis Blake & Sherff, Alabama Warbonnet. Mt (GA): streambanks over limestone or other calcareous rocks; rare (GA Special Concern). Endemic to stream banks in c. AL and wc. GA. The opposite leaves are squared off at the base in a distinctive manner. [= FNA, K, SE]

Krigia Schreber 1791 (Cynthia, Dwarf-dandelion)

A genus of 7 species, herbs, of (mainly e.) North America. References: Chambers & O'Kennon in FNA (2006a); Kim & Turner (1992)=Z; Cronquist (1980)=SE; Chambers (2004)=Y.

1 Phyllaries erect in fruit, 2-4× as long as wide; pappus absent (or represented by minute scales or bristles < 2 mm long); plant a leafy-stemmed winter annual.
2 Phyllary midveins evident but not forming curved keels; cypselae fusiform, ca. 2× as long as broad..... ***K. cespitosa***
2 Phyllary midveins becoming prominent and curving inward at bases to form keels; cypselae obovoid, ca. 1.5× as long as broad..... ***[K. wrightii]***
1 Phyllaries reflexed in fruit, 3-8× as long as broad; pappus present, consisting of 5 or more scales and 5 or more bristles (the bristles > 4 mm long); plant a scapose, subscapose, or leafy-stemmed perennial or a scapose or subscapose winter annual.
3 Pappus of 5 scales and 5 bristles; plant a winter annual; stem leafless or leafy at the base only..... ***K. virginica***
3 Pappus of 15-40 scales and 15-40 bristles; plant a perennial; stem leafless, leafy at the base only, or with many leaves extending up the stem.
4 Stems leafless, the peduncles terminal; perennial from ovoid tubers, with long slender stolons which form new plants or tubers; pappus bristles (5.0-) 5.3-7.7 (-10.0) mm long ..... ***K. dandelion***
4 Stems leafy, at least at the base, the peduncles axillary; perennials from stout creeping rhizomes or short caudices, not bearing tubers; pappus bristles 4.0-7.0 mm long.
5 Peduncles usually 1 per leaf axil; leaves linear-lanceolate, the larger 1-12 mm wide; perennial from an underground rhizome (to 5 mm in diameter), larger plants with an extensive rootmat and multiple stems ..... ***K. montana***
5 Peduncles usually 2 per leaf axil; leaves oblanceolate, the larger 15-45 mm wide; solitary-stemmed perennial from a short caudex ..... ***K. biflora*** *var.* ***biflora***

Krigia biflora (Walter) S.F. Blake *var.* ***biflora***, Orange Dwarf-dandelion. Mt (GA, NC, VA), Pd (GA, NC): rich, moist forests; uncommon (rare in GA, NC, and VA). May-October. Var. *biflora* ranges from MA s. ON and MN south to GA, AL, MS, AR, and e. OK; the smaller var. *viridis* (Standley) Kim occurs in CO, AZ, and NM. The natural hexaploid hybrid *Krigia* ×*shinnersiana* K.L. Chambers *[K. biflora* × *montana]* is documented from the Craggy Mountains, Buncombe County, NC (Chambers 2004; Kim & Turner 1992). [= K, Z; < *K. biflora* – RAB, C, F, FNA, G, SE, W, WV; = *Cynthia virginica* (Linnaeus) D. Don – S]

Krigia cespitosa (Rafinesque) K.L. Chambers, Opposite-leaf Dwarf-dandelion. Cp (FL, GA, NC, SC, VA), Pd (GA, NC, SC, VA), Mt (GA, WV*): fields, roadsides, disturbed places; common (rare in VA and WV). Late March-early June. Se. VA and NE south to c. peninsular FL and TX. *K. gracilis* (A.P. de Candolle) Shinners occurs in TX, OK, and LA; it is sometimes treated as *K. cespitosa* var. *gracilis* (A.P. de Candolle) K.L. Chambers, but is better considered as a species, as it is sympatric and generally distinct. [= *K. cespitosa* (Rafinesque) K.L. Chambers var. *cespitosa* – FNA, Y; < *K. cespitosa* – GW, WH, Z; = *K. oppositifolia* Rafinesque – RAB, C, G, SE, W; = *Serinia oppositifolia* (Rafinesque) Kuntze – F, S; < *K. caespitosa* – K, orthographic variant]

Krigia dandelion (Linnaeus) Nuttall, Colonial Dwarf-dandelion. Pd (GA, NC, SC, VA), Cp (FL, GA, NC, SC, VA): rocky woodlands, roadsides, disturbed areas; common (uncommon in VA Coastal Plain, rare in GA, NC, SC Coastal Plain). April-May. NJ, IL, and KA, south to Panhandle FL and ne. TX. [= RAB, C, F, FNA, G, GW, K, SE, W, Z; = *Cynthia dandelion* (Linnaeus) A.P. de Candolle – S]

Krigia montana (Michaux) Nuttall, Mountain Dwarf-dandelion. Mt (GA, NC, SC): cliffs and rock outcrops at medium to high elevations; uncommon (rare in SC). May-September. A Southern Appalachian endemic: w. NC, e. TN, nw. SC, and ne. GA. The natural hexaploid hybrid *Krigia* ×*shinnersiana* K.L. Chambers *[K. biflora* × *montana]* is documented from the Craggy Mountains, Buncombe County, NC (Chambers 2004; Kim & Turner 1992). [= RAB, FNA, K, SE, W, Z; = *Cynthia montana* (Michaux) Standley – S]

Krigia virginica (Linnaeus) Willdenow, Virginia Dwarf-dandelion. Cp (DE, FL, GA, NC, SC, VA), Pd (DE, GA, NC, SC, VA), Mt (GA, NC, SC, VA, WV): rocky woodlands, roadsides, disturbed areas; common (uncommon in WV). Late March-July. ME west to MN, south to c. peninsular FL and c. TX. [= RAB, C, F, FNA, G, GW, K, S, SE, W, WH, Z]

Krigia occidentalis Nuttall. {GA}. March-May. MO and KS south to LA and TX; disjunct eastwards in GA. [= FNA, K] {add to synonymy}

Krigia wrightii (A. Gray) K.L. Chambers ex K.J. Kim, Wright's Dwarf-dandelion. AR and OK south to LA and TX. [= FNA]

Lactuca Linnaeus 1753 (Lettuce)

A genus of about 75 species, herbs, nearly cosmopolitan (especially north temperate). References: Strother in FNA (2006a); Cronquist (1980)=SE; McVaugh (1972). [also see *Ixeris*]

Identification notes: Most species are highly variable in leaf lobing.

1 Achene beaks stout and short, 0.1-0.5 (-1.0) mm long (< ½ as long as the body of the achene); rays blue to violet (rarely yellow or white).
2 Pappus tawny; flowers mostly 20-30 per head..... ***L. biennis***
2 Pappus bright white; flowers mostly 10-15 per head..... ***L. floridana***
1 Achene beaks filiform and long, 1-4 mm long (> ½ as long as the body of the achene); rays yellow or blue (sometimes white or drying bluish).
3 Each face of the achene with (3-) 5-9 nerves; stems typically white or pale green; rays yellow (sometimes drying blue); [aliens].
4 Unlobed cauline leaves lanceolate to linear..... ***L. saligna***
4 Unlobed cauline leaves oblong, obovate, or spatulate.
5 Phyllaries usually erect in fruit; midribs of leaves usually smooth ..... ***L. sativa***
5 Phyllaries usually reflexed in fruit; midribs of leaves prickly setose ..... ***L. serriola***

3 Each face of the achene with 1 (-3) nerves; stems typically medium to dark green or reddish; rays yellow or blue; [natives, though often weedy].
6 Unlobed leaves and lobes of lobed leaves narrow, usually < 1 cm wide; leaves basally disposed, the basal and lower-stem leaves the largest and most persistent; plants 3-12 dm tall; [primarily of the Coastal Plain, rare elsewhere].....***L. graminifolia** var. **graminifolia***
6 Unlobed leaves and lobes of lobed leaves wider, usually > 1 cm wide; leaves well-distributed on the stem; plants 3-33 dm tall; [collectively widespread].
7 Fruiting involucres 10-15 mm tall; achenes 2.5-3.5 mm long (excluding the beak)..... ***L. canadensis***
7 Fruiting involucres 15-22 mm tall; achenes 4.5-6 mm long (excluding the beak).
8 Leaf margins not prickly (or barely so); flowers 13-25 per head; [widespread in our area] .....***L. hirsuta***
8 Leaf margins prickly; flowers 20-56 per head; [of KY and MS westward].....***[L. ludoviciana]***

Lactuca biennis (Moench) Fernald, Tall Blue Lettuce. Mt (NC, VA, WV), Pd (DE, NC, VA), Cp (DE): pastures, roadsides, forest edges, thickets; common (uncommon south of DE). August-November. NL (Labrador) and AK south to NC, TN, IA, CO, UT, and CA. [= RAB, C, F, FNA, G, K, SE, W, WV; > *Mulgedium spicatum* (Lamarck) Small var. *spicatum* – S; > *Mulgedium spicatum* var. *integrifolium* (Torrey & A. Gray) Small – S]

Lactuca canadensis Linnaeus, American Wild Lettuce. Mt (NC, SC, VA, WV), Pd (DE, GA, NC, SC, VA), Cp (DE, FL, GA, NC, SC, VA): fields, roadsides, disturbed ground; common (uncommon in FL). June-November. NS and BC south to n. peninsular FL, TX, and CA. [= RAB, C, FNA, K, SE, W, WH; > *L. canadensis* var. *canadensis* – F, G, WV; > *L. canadensis* var. *latifolia* Kuntze – F, G, WV; > *L. canadensis* var. *longifolia* (Michaux) Farwell – F, G, WV; > *L. canadensis* var. *obovata* Wiegand – F, G; > *L. canadensis* – S; > *L. sagittifolia* – S]

Lactuca floridana (Linnaeus) Gaertner, Woodland Lettuce. Pd (DE, GA, NC, SC, VA), Mt (GA, NC, SC, VA, WV), Cp (DE, FL, GA, NC, SC, VA): mesic and dry-mesic forests; common (rare in DE, rare in GA Coastal Plain). August-November. NY, MB and MN south to s. FL and TX. [= RAB, C, FNA, SE, W, WH, WV; > *L. floridana* var. *floridana* – F, G, K; > *L. floridana* var. *villosa* (Jacquin) Cronquist – F, G, K; > *Mulgedium floridanum* (Linnaeus) de Candolle – S; > *Mulgedium villosum* (Jacquin) Small – S]

Lactuca graminifolia Michaux *var.* ***graminifolia***, Coastal Plain Lettuce. Cp (GA, NC, SC), Pd (GA, SC), Mt (VA): mesic to dry-mesic pine-oak woodlands and forests, longleaf pine sandhills, sandy fields, and sandy roadsides; common (rare in Piedmont, rare in Mountains). April-July. E. NC south to s. FL, west to c. LA; disjunct in s. NJ. Var. *arizonica* McVaugh is distributed in mesic canyons in montane w. TX, s. CO, NM, and AZ, south into w. Mexico. Var. *mexicana* McVaugh is distributed in Tamaulipas, Veracruz, Oaxaca, Chiapas, and Guatemala. [= K; < *L. graminifolia* – RAB, F, FNA, SE, W, WH; = *L. graminifolia* – S]

Lactuca hirsuta Muhlenberg ex Nuttall, Downy Lettuce. Cp (GA, NC, SC, VA), Pd (NC, SC, VA), Mt (NC, SC, VA, WV): forests and forest edges; uncommon (rare in Piedmont and Mountains, rare in GA Coastal Plain). Late May-November. NS and ON south to n. FL and TX. [= RAB, C, FNA, S, SE, W, WV; > *L. hirsuta* var. *hirsuta* – F, G, K; > *L. hirsuta* var. *sanguinea* (Bigelow) Fernald – F, G, K]

* ***Lactuca saligna*** Linnaeus, Willowleaf Lettuce. Mt (NC, VA, WV), Pd (DE, SC, VA), Cp (DE, VA), {GA}: fields, roadsides, disturbed ground, perhaps associated with circumneutral soils; common (rare in DE, GA, NC, SC, and VA), native of Europe. August-November. [= RAB, C, F, FNA, G, K, SE, W, WV]

* ***Lactuca sativa*** Linnaeus, Garden Lettuce. Mt (GA, NC, SC, VA), Pd (DE, GA, NC, SC, VA), Cp (DE, GA, NC, SC, VA): cultivated throughout our area in home gardens and commercially, rarely weakly persistent; common as a cultivated plant, rare as a short-lived waif, native of Eurasia. June-October. [= F, FNA, G, K]

* ***Lactuca serriola*** Linnaeus, Prickly Lettuce. Mt (GA, NC, SC, VA, WV), Pd (DE, GA, NC, SC, VA), Cp (DE, FL, GA, NC, SC, VA): roadsides, disturbed ground, pastures; common (rare in FL and GA), native of Europe. June-November. [= C, FNA, K, SE, WH; = *L. scariola* Linnaeus – RAB, F, WH; > *L. serriola* var. *integrata* Gren. & Godr. – G, W; > *L. scariola* – S; > *L. virosa* – S, misapplied]

Lactuca ludoviciana (Nuttall) Riddell, Louisiana Lettuce. MB and BC, south to IN, KY, MS, LA, TX, and CA. [= C, F, FNA, G, K, S, SE]

* *Lactuca virosa* Linnaeus, Bitter Lettuce. Reported for DC and AL (Kartesz 1999; FNA); no specimens have been seen that document this distribution. [= FNA, K] {not keyed}

Lagascea Cavanilles 1803

A genus of 8 species, herbs and shrubs, of sw. United States, Mexico, and Central America, not pantropical by introduction. References: Harris in FNA (2006c); Stuessy (1978)=Z.

* *Lagascea mollis* Cavanilles, Silkleaf. Cp (FL): disturbed areas (on ballast); rare (not recently collected), native of Mexico (but now pantropical). Collected at Apalachicola, Franklin County, FL by A.W. Chapman and previously in FL by Rugel. [= FNA, WH, Z] {not keyed}

Lapsana Linnaeus 1753 (Nipplewort)

A monotypic genus (after the removal of most members to *Lapsanastrum*), an annual herb, of temperate Eurasia. References: Bogler in FNA (2006a); Cronquist (1980)=SE.

* ***Lapsana communis*** Linnaeus, Nipplewort. Mt (GA, NC, VA, WV), Pd, Cp (VA): fields, forests, disturbed areas; uncommon (rare in GA, NC, and Coastal Plain of VA), native of Europe. June-September. First reported for GA (Rabun County) by Stiles & Howel (1998). See Poindexter (2006). [= RAB, C, F, FNA, G, K, SE, W, WV]

Leontodon Linnaeus 1753 (Hawkbit)

A genus of about 30 species, herbs, primarily of temperate Eurasia. Samuel et al. (2006) show that *Leontodon* subgenus *Oporinia* should be recognized as a separate genus from *Leontodon* sensu stricto. References: Samuel et al. (2006); Bogler in FNA (2006a); Cronquist (1980)=SE. [also see *Oporinia*]

1 Heads (solitary-) several; scapes usually scaly-bracted above; pappus of plumose bristles ..... ***[see Oporinia]***
1 Head solitary; scapes usually naked; pappus type mixed, at least the outer pappus of the outer florets in each head of scales.
2 Pappus type mixed on each cypsela (with the scales outward and the plumose bristles inwards; phyllaries densely and coarsely hispid or hirsute ..... ***[L. hispidus]***
2 Pappus type mixed in each head (the outer cypselas with scales, the inner cypselas with plumose bristles); phyllaries glabrate to coarsely hirsute ..... ***L. saxatilis*** *ssp.* ***saxatilis***

* ***Leontodon saxatilis*** Lamarck *ssp.* ***saxatilis***, Little Hawkbit. Cp (VA), Mt (NC): roadsides, fields; rare, native of Europe. July-October. [= FNA; = *Leontodon taraxacoides* (Villars) Willdenow ex Mérat ssp. *taraxacoides* – K; < *L. taraxacoides* – C, W; *? L. nudicaulis* (Linnaeus) Banks ex Schinz & R. Keller – RAB, apparently misapplied; *? L. leysseri* (Wallroth) G. Beck – F, G]

* *Leontodon hispidus* Linnaeus, Bristly Hawkbit. Scattered states in eastern North America. {GA, PA (FNA)} {MD, DC (Kartesz 1999) – investigate} [= FNA; > *Leontodon hispidus* ssp. *hispidus* – K; > *L. hirtus* Linnaeus – K]

Leucanthemum P. Miller 1754 (Oxeye Daisy)

A genus of about 35 species, herbs, of Eurasia. References: Strother in FNA (2006a); Cronquist (1980)=SE; Arriagada & Miller (1997)=Z.

1 Leaves larger near or slightly below mid-stem; leaves toothed only ..... ***L. lacustre***
1 Leaves larger toward the base of the plant; leaves usually at least partly lobed or pinnatisect, as well as toothed ..... ***L. vulgare***

* ***Leucanthemum lacustre*** (Brotero) Sampaio, Portuguese Daisy. Cp (NC, SC, VA), Pd (NC, SC): old fields, ditches, disturbed areas; rare, native of Europe. June-July. [= FNA, K, Z; = *Chrysanthemum lacustre* Brotero – RAB, C, SE]
* ***Leucanthemum vulgare*** Lamarck, Oxeye Daisy, White Daisy, Common Daisy, Marguerite. Mt (GA, NC, SC, VA, WV), Pd (DE, GA, NC, SC, VA), Cp (DE, NC, SC, VA): fields, roadsides, pastures, disturbed areas; common (uncommon in DE), native of Eurasia. April-August. [= FNA, K, Z; = *Chrysanthemum leucanthemum* Linnaeus – RAB, C, G, SE, W; > *C. leucanthemum* var. *pinnatifidum* Lecoq & Lamotte – F, WV; = *Leucanthemum leucanthemum* (Linnaeus) Rydberg – S]

Liatris Schreber 1791 (Blazing-star, Gayfeather)

A genus of 40-50 species, herbs, of e. and c. North America. References: Nesom in FNA (2006c); Gaiser (1946)=Z; Cronquist (1980)=SE; Stucky & Pyne (1990); Godfrey (1948)=Y; Stucky (1991); Stucky (1992); Mayfield (2002). Key adapted in large part from FNA.

1 Pappus plumose, the barbels mostly 0.5-1.0 mm long.
2 Inner phyllaries with apices prolonged, loosely spreading, slightly dilated, and petaloid (white to yellow, pink, or purplish); heads 3-5 mm in diameter, with 4-6 flowers per head; corolla lobes glabrous within; [of the Coastal Plain from SC southward].
3 Heads sessile; petaloid phyllary apices lavender, pink, or magenta, recurved, the petaloid portion short relative to the green phyllary bases ..... ***L. elegans*** *var.* ***elegans***
3 Heads pedunculate on short peduncles; petaloid phyllary apices light yellow or cream (rarely pale lavender), divergent with tips ascending, the petaloid portion elongate relative to the green phyllary bases ..... ***L. elegans*** *var.* ***kralii***
2 Inner phyllaries not prominently petaloid; heads 10-20 mm in diameter, with 10-60 flowers per head; corolla lobes coarsely hairy within; [collectively widespread].
4 Outer phyllaries as long as or (more usually longer than) the inner phyllaries, spreading or reflexed, the spreading portion typically > 2 mm long ..... ***L. squarrosa*** *var.* ***squarrosa***
4 Outer phyllaries shorter than the inner phyllaries, erect-appressed to spreading or reflexed, the spreading portion 0-2 mm long.
5 Stems and leaves usually glabrous; inner phyllaries usually apically rounded to truncate, apiculate, all essentially erect and appressed, usually with a narrow hyaline border ..... ***L. cylindracea***
5 Stems and leaves hirsute to hirsute-pilose; inner phyllaries apically acute-acuminate, all usually spreading to reflexed on the distal 1/3 (outer) to 1/5 (inner), usually without a hyaline border ..... ***L. hirsuta***
1 Pappus barbellate, the barbels 0.1-0.3 (-0.4) mm long.
6 Heads mostly 1-7 (-10) in a subcorymbiform arrangement; [of Bibb Co., AL] ..... ***L. oligocephala***
6 Heads usually > 10 in a spiciform or racemiform arrangement; [collectively widespread].

7 Leaves 3-5-veined.
8 Basal and lower cauline leaves (2-) 4-8 mm wide, cauline usually abruptly reduced in size at ca. midstem, continuing distally as linear, bract-like leaves; heads in a densely (- to loosely) spiciform arrangement; involucres 7-9 mm, purplish to greenish; florets 5-6 (-8) per head; [mainly of the Coastal Plain] ..... ***L. spicata*** *var.* ***resinosa***
8 Basal and lower cauline leaves 4-10 (-20) mm wide, cauline usually gradually reduced in size distally; heads in a densely to loosely spiciform arrangement; involucres (7-) 8-11 mm, usually greenish; florets (4-) 6-8 (-12) per head; [of the Mountains and Piedmont] .. .. ***L. spicata*** *var.* ***spicata***
7 Leaves 1-veined.
9 Mid and inner phyllaries either apically acute or rounded-retuse and minutely involute-cuspidate to apiculate.
10 Stems hirtellous with spreading to slightly deflexed hairs or variously puberulent to hirsute.
11 Stems hirsute to puberulent to pilose-puberulent or strigose-puberulent ..... ***L. gracilis***
11 Stems hirtellous with spreading to slightly deflexed hairs.
12 Heads sessile, relatively crowded in a cylindric arrangement, rigidly ascending, appressed to the rachis and to each other, densely overlapping; [e. NC south to Panhandle FL and AL] ..... ***L. chapmanii***
12 Heads sessile to short-pedunculate, in a relatively loose, spiciform, racemoid, or paniculate, commonly secund arrangement; [e. GA south through ne. FL to c. peninsular FL] ..... ***L. pauciflora***
10 Stems glabrous.
13 Phyllaries apically usually rounded-retuse and minutely involute-cuspidate to apiculate; corolla tubes glabrous within.
14 Stems and basal leaves glabrous; basal leaves mostly arising from congested nodes at very base of plant, (1-) 2-6 (-9) mm wide, abruptly reduced in size distally, surfaces minutely white-dotted by stomates, not glandular-punctate ..... ***L. laevigata***
14 Stems and basal leaves glabrous to very sparsely pilose, leaves usually with a few, spreading cilia near insertion; basal and lower cauline leaves arising from numerous, separated nodes on proximal part of stem, 1-2 (-2.5) mm wide and relatively even-sized, surfaces glandular-punctate ..... ***L. tenuifolia***
13 Phyllaries apically acute; corolla tubes pilose within.
15 Heads often in a secund arrangement; involucres 7-15 mm; phyllaries obovate; florets 3-6.
16 Stems glabrous (rarely sparsely hirtellous); leaves and phyllaries sparsely or not at all gland-dotted; involucres 11-15 mm high; inner phyllaries with acute apices ..... ***L. pauciflora***
16 Stems minutely puberulent-hirtellous; leaves and phyllaries gland-dotted; involucres 7-10 (-14) mm high; inner phyllaries with abruptly acuminate apices, often apiculate por mucronulate ..... ***L. secunda***
15 Heads in a secund arrangement or not; involucres (6-) 7-9 mm; phyllaries ovate-triangular to generally oblong; florets 4-10 (-12).
17 Heads densely arranged, on internodes 1-2 (-5) mm long, often secund; phyllary apex sharply acuminate-acute, distinctly involute, lamina relatively thin, glands consistently present and superficial at least on proximal portion; florets 4-7 (-9); basal and lower cauline leaves 2-5 mm wide, gradually reduced in length distally ..... ***L. cokeri***
17 Heads loosely arranged, on internodes 6-15 (-20) mm long, not secund; phyllary apex sharply acute to obtuse-angled with a thickened apiculum, not markedly involute, lamina relatively thick, usually with evidently sunken punctate glands, without superficial glands; florets 7-10 (-12); basal and lower cauline leaves 4-9 (-12) mm wide, quickly reduced in width and length distally ..... ***L. virgata***
9 Mid and inner phyllaries apically rounded, not rounded-retuse or cuspidate to apiculate.
18 Stems glabrous (rarely sparsely to moderately pilose in *L. pilosa*).
19 Involucres 5-7 (-9) mm; florets 4-5 (-6); corolla tubes glabrous within; pappus bristles usually about half the length of corolla tubes ..... ***L. microcephala***
19 Involucres 6-10 mm; florets (6-) 7-13 (-17); corolla tubes internally pilose; pappus bristles as long as the corolla tubes (shorter in some populations of *L. helleri*).
20 Stems 15-55 cm; leaves and phyllaries weakly or not at all punctate; pappus bristles 1/3-2/3 to equal the corolla tube length; montane ..... ***L. helleri***
20 Stems 40-120 cm; leaves and phyllaries distinctly punctate-glandular to weakly punctate; pappus bristles equal the corolla tube length; coastal plain and piedmont.
21 Stems glabrous; heads loosely arranged, on internodes (2-) 5-10 (-14) mm; peduncles 0-2 (-7) mm; involucres 6-8 mm; phyllaries in 3-4 (-5) series ..... ***L. elegantula***
21 Stems glabrous to sparsely or moderately pilose; heads densely arranged, on internodes (1-) 2-5 (-7) mm; peduncles 0-10 (-17, -80 in proximal part of capitulescence) mm; involucres (7-) 8-10 mm, phyllaries in (3-) 4-5 (-6) series ..... ***L. pilosa***
18 Stems puberulent to strigose.
22 Involucres 2.5-7 mm wide; florets 3-12.
23 Stems and peduncles puberulent to pilose-puberulent or strigose-puberulent; heads usually on ascending peduncles 2-10(-12) mm; involucres 2.5-4(-5) mm wide; phyllaries apically rounded or obtuse to acute or acuminate; florets 3-6 (-9).... ***L. gracilis***
23 Stems and peduncles stiffly short-strigose with closely ascending hairs; heads on divergent, arcuate-ascending peduncles 10-25 (-30) mm; involucres 5-7 mm wide; phyllaries apically rounded to nearly flat; florets 7-12 ..... ***L. patens***
22 Involucres 13-22 (-25) mm wide or (6-) 8-15 mm wide (*L. squarrulosa*); florets 11-80.
24 Heads usually on peduncles usually 8-50 mm (rarely subsessile); phyllaries erect, not reflexing; florets ca. 30-80 (19-33 in *L. scariosa*); corolla tubes glabrous or pilose within.
25 Leaves or leafy bracts 8-20 (-25) below the heads, cauline usually abruptly reduced above the basal; florets 19-33; [plants of the Central and Southern Appalachians] ..... ***L. scariosa*** *var.* ***scariosa***
25 Leaves or leafy bracts 20-85 below the heads, usually continuing relatively even-sized upward above the basal; florets ca. 30-80; [plants of WV and PA northward] ..... ***L. scariosa*** *var.* ***nieuwlandii***
24 Heads usually sessile, less commonly subsessile on peduncles 1-8 mm (rarely more); at least outer phyllaries usually reflexing; florets 11-26 (-30); corolla tubes pilose within.
26 Phyllaries glabrous, bullate, with broad, conspicuous, often erose to lacerate or irregular, hyaline border ..... ***L. aspera***
26 Phyllaries glabrous to puberulent or puberulent-hirtellous, essentially flat (not bullate), without hyaline border or border narrow and inconspicuous ..... ***L. squarrulosa***

Liatris aspera Michaux, Rough Blazing-star. Prairies, barrens, glades. August-September (-October). ON and ND south to Panhandle FL and TX. [= RAB, C, FNA, G, SE, W, WH; > *Liatris aspera* var. *aspera* – F; > *Liatris aspera* Michaux var. *intermedia* (Lunell) Gaiser – F, K, WV, Y; > *Laciniaria aspera* (Michaux) Greene var. *aspera* – S; > *Liatris spheroidea* Michaux – K; > *Laciniaria aspera* (Michaux) Greene var. *spheroidea* (Michaux) Alexander – S]

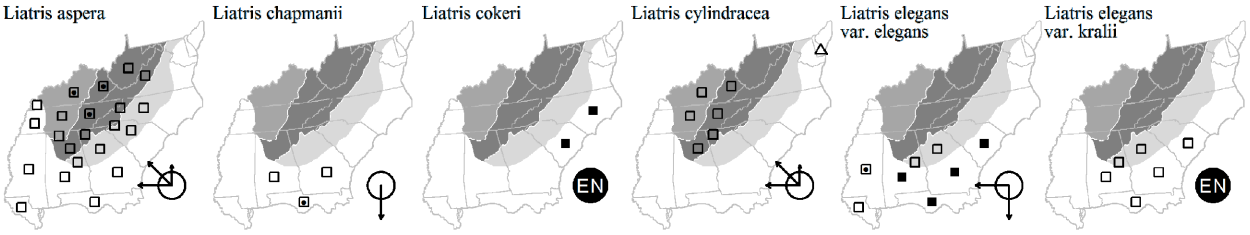
Liatris chapmanii Torrey & A. Gray, Chapman's Blazing-star. Xeric sands of scrub. August-October. Sw. GA, s. AL, south to s. FL. [= FNA, K, SE, WH; = *Laciniaria chapmanii* (Torrey & A. Gray) Kuntze – S] {synonymy incomplete}

Liatris cokeri Pyne & Stucky, Sandhills Blazing-star. Sandhills. (August-) September-October. Sc. and se. NC south to nc. SC. [= FNA; = *Liatris regimontis* (Small) K. Schumann – RAB, SE, W, Y, misapplied; > *Liatris cokeri* – K; > *Liatris regimontis* – K]

Liatris cylindracea Michaux, Barrelhead Blazing-star. Limestone glades, prairies, rarely escaped from cultivation eastwards. July-September. NY, ON, and MN south to se. TN (Ridge and Valley) (Chester, Wofford, & Kral 1997), nw. GA, and c. AL (Bibb County), and OK. [= C, F, FNA, G, K, SE] {synonymy incomplete}

Liatris elegans (Walter) Michaux *var.* ***elegans***, Common Elegant Blazing-star. Sandhills. SC south to FL, west to TX. See Mayfield (2002) for discussion of infraspecific taxa in this species. [= FNA; < *Liatris elegans* – RAB, SE, WH; < *L. elegans* var. *elegans* – K, Z; > *Liatris elegans* var. *flabellata* (Small) Gaiser – K, Z; >< *Laciniaria elegans* (Walter) Kuntze – S; > *Laciniaria flabellata* Small – S]

Liatris elegans (Walter) Michaux *var.* ***kralii*** Mayfield. Kral's Elegant Blazing-star. Sandhills. Se. SC (Allendale Co.) south to n. FL and west to s. MS. See Mayfield (2002) for discussion of infraspecific taxa in this species. [= FNA, K, WH; < *Liatris elegans* – SE, Z; < *Laciniaria elegans* (Walter) Kuntze – S]



Liatris elegantula (Greene) K. Schumann. Cp (FL, GA): sandhills; uncommon. August-October (-November). GA south to n. peninsular FL, west to MS. [= FNA, WH; = *Liatris graminifolia* Willdenow var. *elegantula* (Greene) Gaiser – Z; = *Laciniaria elegantula* Greene; < *Laciniaria graminifolia* (Willdenow) Kuntze – S; < *Liatris graminifolia* – SE] {synonymy incomplete}

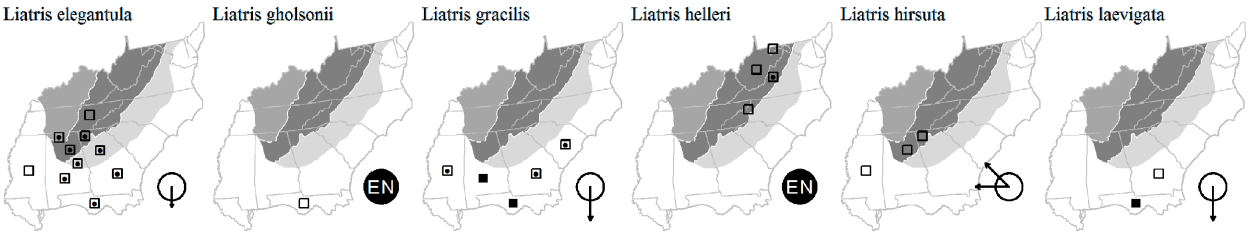
Liatris gholsonii L.C. Anderson, Gholson's Gayfeather. Mesic sandy sites. (July-) August-October (-November). Endemic to Liberty and Leon counties, FL. [= FNA, WH] {not yet keyed; add to synonymy}

Liatris gracilis Pursh, Slender Blazing-star. Sandhills, dry pine flatwoods. (July-) August-October (-November). SC south to s. FL, west to MS. [= RAB, FNA, K, SE, WH; > *Laciniaria laxa* Small – S; > *Laciniaria gracilis* (Pursh) Kuntze – S]

Liatris helleri T.C. Porter, Heller's Blazing-star. High elevation rock outcrops, sometimes on ledges of precipitous cliffs, rocky openings in heath balds, shale barrens. July-mid September. E. WV and w. VA south to w. NC. See Nesom (2005) for additional discussion. [= FNA; > *Liatris helleri* T.C. Porter – RAB, K, SE, W, Y, Z; > *Liatris turgida* Gaiser – RAB, C, F, G, K, SE, W, WV, Y, Z; > *Laciniaria helleri* (Porter) Porter ex Heller – S; > *Laciniaria pilosa* (Aiton) Heller – S, misapplied]

Liatris hirsuta Rydberg. Glades, and prairies. IA and NE south to MS, LA, and TX; disjunct eastward in nw. GA. [= FNA; < *Laciniaria squarrosa* (Linnaeus) Hill – S; = *Liatris squarrosa* (Linnaeus) Michaux var. *hirsuta* (Rydberg) Gaiser – C, F, G, K, SE, Y, Z; < *Liatris squarrosa* – W] {add to synonymy}

Liatris laevigata (Nuttall) Small, Smooth Blazing-star. Longleaf pine sandhills, scrub. August-October (-November). Se. GA (Charlton and Camden counties) (Carter, Baker, & Morris 2009) south to s. FL. [= FNA; = *Liatris tenuifolia* Nuttall *var. quadriflora* Chapman – K, SE, WH; < *Laciniaria tenuifolia* (Nuttall) Kuntze – S]



Liatris microcephala (Small) K. Schumann, Small-head Blazing-star. Outcrops of acidic rocks (sandstone, granite, gneiss). August-October. W. NC and KY south to w. SC, n. and c. GA, and n. AL. [= RAB, C, F, FNA, G, K, SE, W, Y, Z; = *Laciniaria microcephala* Small – S]

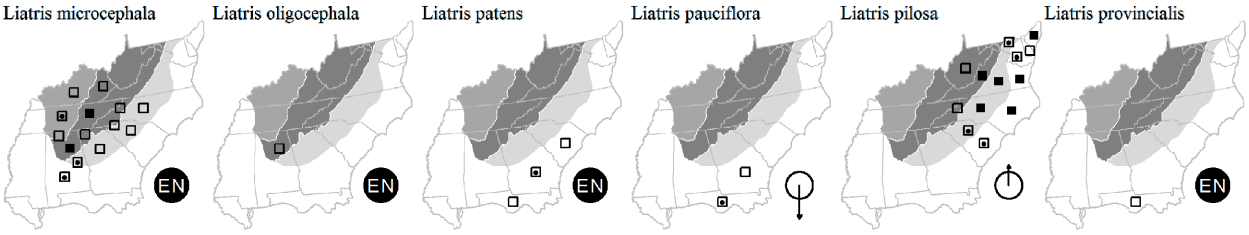
Liatris oligocephala J. Allison, Cahaba Blazing-star, Cahaba Torch. Dolomitic Ketona glades. Endemic to Bibb County, c. AL (Allison & Stevens 2001). Also see Hardig, Allison, & Schilling (2005). June-July (-August). [= FNA]

Liatris patens Nesom & Kral, Georgia Blazing-star. Longleaf pine sandhills and dry flatwoods. Late August-early November. SC south to e. Panhandle FL. See Kral & Nesom (2003) for detailed information. [= FNA, WH]

Liatris pauciflora Pursh, Few-flower Blazing-star. Xeric sands of scrub. August-October. GA (Tatnall Co.) south to c. peninsular FL; alleged by Small (1933) to extend to SC. [< *Liatris pauciflora* – K, SE (also see *L. secunda*); = *Laciniaria pauciflora* (Pursh) Kuntze – S; = *Liatris pauciflora* var. *pauciflora* – FNA, WH]

Liatris pilosa (Aiton) Willdenow. Sandhills, pine barrens, fields, roadbanks. (August-) September-October (-November). NJ, DE, and PA south to SC. [= FNA, K; < *Liatris graminifolia* Willdenow – RAB, SE, W (also see *Liatris virgata*); = *Liatris graminifolia* – C, G; > *Liatris graminifolia* var. *graminifolia* – F; > *Liatris graminifolia* var. *lasia* Fernald & Griscom – F; > *Liatris graminifolia* var. *racemosa* (A.P. de Candolle) Venard – F, WV; > *Liatris graminifolia* var. *typica* – Y, Z; > *Liatris graminifolia* var. *dubia* (Barton) A. Gray – WV, Y, Z; = *Laciniaria graminifolia* (Walter) Kuntze – S]

Liatris provincialis R.K. Godfrey. Sandhills, scrub, dunes. (August-) September-October. Endemic to FL Panhandle (Franklin and Wakulla counties). [= FNA, WH] {not yet keyed; add to synonymy}



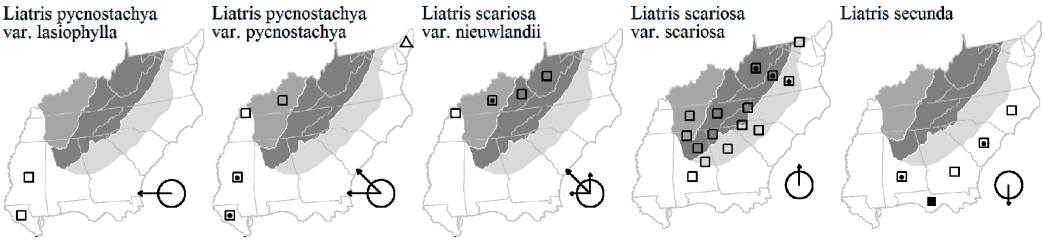
Liatris pycnostachya Michaux *var.* ***lasiophylla*** Shinners. [= FNA; < *Laciniaria pycnostachya* (Michaux) Kuntze – S; < *Liatris pycnostachya* – SE] {not yet keyed; add to synonymy}

Liatris pycnostachya Michaux *var.* ***provincialis***. [= FNA; < *Laciniaria pycnostachya* (Michaux) Kuntze – S; < *Liatris pycnostachya* – C, F, G, SE] {not yet keyed}

Liatris scariosa (Linnaeus) Willdenow *var.* ***scariosa***, Northern Blazing-star. Shale barrens, dry rock outcrops, roadbanks. August-September (-October). PA, MD, and WV south to NC and TN. [= C, FNA, K, SE; < *Liatris scariosa* – RAB, W; = *Liatris scariosa* – F, G; < *Laciniaria scariosa* (Linnaeus) Hill – S (also see *Liatris squarrulosa*); > *Liatris scariosa* var. *scariosa* – WV, Y, Z; > *Liatris scariosa* var. *virginiana* (Lunell) Gaiser – WV, Y, Z]

Liatris scariosa (Linnaeus) Willdenow *var.* ***nieuwlandii*** (Lunell) E.G. Voss. Prairies, glades, and woodlands. August-September (-October). CT, NY, MI, and WI south to PA, WV, IN, IL, and AR. [= FNA, C, G, K, SE; < *Liatris borealis* Nuttall – F; = *Liatris novae-angliae* (Lunell) Shinners var. *nieuwlandii* Lunell] {synonymy incomplete}

Liatris secunda Elliott, Sandhill Blazing-star. Sandhills. August-September (-October). S. NC south to w. Panhandle FL and s. AL. [= RAB, Y; < *Liatris pauciflora* Pursh – K, SE; = *Laciniaria secunda* (Elliott) Small – S; = *L. pauciflora* Pursh var. *secunda* (Elliott) D.B. Ward – FNA, WH]



Liatris spicata (Linnaeus) Willdenow *var.* ***resinosa*** (Nuttall) Gaiser. Bogs, wet pine savannas, seepages. (July-) August-October (-November). NJ south to s. FL, west to LA. [= RAB, F, FNA, G, K, WV, Y, Z; < *Liatris spicata* – C, SE, W, WH; < *Laciniaria spicata* (Linnaeus) Kuntze – S]

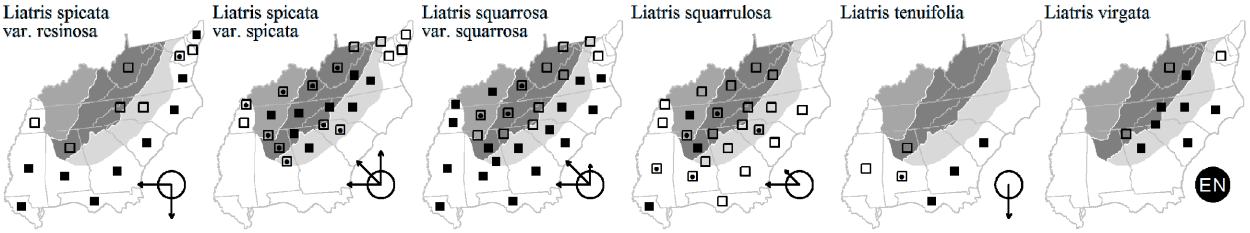
Liatris spicata (Linnaeus) Willdenow *var.* ***spicata***, Florist's Gayfeather. Prairies, roadsides, seepages, bogs, grassy balds. July-September. MA, ON, and MI, south to GA, AL, MS, and AR. [= RAB, F, FNA, G, K, WV; = *Liatris spicata* var. *typica* – Y, Z; < *Liatris spicata* – C, SE, W; < *Laciniaria spicata* (Linnaeus) Kuntze – S]

Liatris squarrosa (Linnaeus) Michaux *var.* ***squarrosa***. Dry woodlands, glades, barrens. [= C, FNA, G, K, SE; > *Liatris squarrosa* var. *squarrosa* – F; > *L. squarrosa* var. *gracilenta* Gaiser – F, Y, Z; < *Liatris squarrosa* – RAB, W, WH, WV; < *Laciniaria squarrosa* (Linnaeus) Hill – S; > *Liatris squarrosa* var. *typica* Gaiser – Y, Z]

Liatris squarrulosa Michaux. Diabase barrens, other glades and barrens, prairies, open woodlands. August-October (-November). S. WV, KY, IL, and MO south to GA, Panhandle FL, AL, and TX. Highly variable and needing additional study to determine if multiple taxa should be recognized. [= C, FNA, K, SE, W, WH; > *Liatris earlei* (Greene) Schumann – F, RAB, Y, Z; > *Liatris squarrulosa* – G; > *Liatris scabra* (Greene) K. Schumann – F, G; > *Laciniaria ruthii* Alexander – S; > *Laciniaria shortii* Alexander – S; = *Liatris scariosa* var. *squarrulosa* – Y, Z]

Liatris tenuifolia Nuttall. Longleaf pine sandhills. August-November. SC south to s. FL, west to AL. [= FNA, RAB; = *Liatris tenuifolia* Nuttall *var. tenuifolia* – K, SE, WH; < *Laciniaria tenuifolia* (Nuttall) Kuntze – S (also see *Liatris laevigata*)]

Liatris virgata Nuttall. Open woods, roadbanks. (July-) August-October (-November). {distribution}. [= FNA, K; < *Liatris graminifolia* – RAB, SE, W; > *Liatris graminifolia* var. *smallii* (Britton) Fernald & Griscom – F, Y, Z; > *Liatris regimontis* (Small) K. Schumann – C, G, Y; > *Liatris regiomontis* – F, orthographic variant; > *Laciniaria regimontis* Small – S; > *Laciniaria smallii* Britton – S; > *Liatris graminifolia* var. *virgata* (Nuttall) Fernald – F]



Ligularia Cassini 1816 (Ligularia)

A genus of 125 species (or more), perennial herbs, natives of temperate Eurasia. References: Barkley in FNA (2006b).

* ***Ligularia dentata*** (A. Gray) H. Hara. Commonly cultivated horticulturally in ne. North America, locally established or persistent, as in MD; native of China and Japan. [= FNA, K; = *Senecio clivorum* (Maximowicz) Maximowicz – C, SE]

Lygodesmia D. Don 1829 (Rush Pink, Skeletonplant)

genus of about 5-7 species, herbs, of w. and s. North America. References: Bogler in FNA (2006a); Tomb (1980)=Z; Cronquist (1980)=SE.

Lygodesmia aphylla (Nuttall) Torrey & A. Gray, Flowering Straws, Rose-rush. Xeric sandhills. C. GA south to s. FL and west to c. Panhandle FL. [= FNA, K, S, SE, WH, Z]

Madia Molina 1782 (Tarweed)

A genus of about 10 species, of w. North America and Chile. References: Baldwin & Strother in FNA (2006c); Cronquist (1980)=SE.

* ***Madia sativa*** Molina, Tarweed. Disturbed areas, scattered occurrences (perhaps only waifs) in eastern North America, including GA, NC, PA; variously considered native of Chile or w. North America (see FNA). [= K; *M. capitata* Nuttall; > *M. sativa* var. *sativa* – SE; > *M. sativa* var. *congesta* Torrey & A. Gray – SE]

Marshallia Schreber 1791 (Barbara's-buttons)

A genus of about 11 species, perennial herbs, of the se. United States. *Marshallia* ranges from sc. VA, sw. PA, WV, s. KY, s. MO, and c. OK, south to c. peninsular FL, and sw. TX. References: Channell (1957)=Z; Watson in FNA (2006c); Watson & Estes (1990)=Y; Cronquist (1980)=SE; Watson, Elisens, & Estes (1991); Watson, Jansen, & Estes (1991); Beadle & Boynton (1901)=X.

1 Leaves not basally disposed, the leaves all about the same size; plants glabrous throughout; plants colonial by persistent rhizomes; internodes 10-25 (and leaves 2-5× as long as wide) ..... ***M. trinervia***
1 Leaves basally disposed, either all of the leaves below the midpoint of the stem, or the upper leaves markedly smaller than the lower stem and basal leaves (the basal leaves sometimes withered); plants pubescent at least below the heads; plants producing lateral offsets which are separated from the parent in less than a year; internodes 1-12 (and leaves 3-15× as long as wide) or 10-35 (and leaves 8-20× as long as wide).
2 Phyllaries with acuminate-subulate tips; paleae (receptacular bracts, interspersed with the flowers) with acuminate-subulate tips; plants usually with 2 or more heads; flowering late July-mid October.
3 Lower stem leaves (and basal leaves) erect, narrowly lanceolate to linear-lanceolate, with attenuate or long-acuminate apices, relatively thick in texture, the 2-4 lateral nerves (parallel to the midnerve) prominent; caudex with fibrous remnants of the previous year's leaves (if not burned off); phyllaries thick, ovate-attenuate; [NC, SC, and extreme e. GA] ..... ***M. graminifolia***
3 Lower stem leaves (and basal leaves) spreading, oblanceolate or spatulate, with rounded or obtuse apices, relatively thin in texture, the 2 lateral nerves (parallel to the midnerve) often obscure; caudex lacking fibrous remnants of the previous year's leaves; phyllaries thin, linear-subulate; [e. GA southward and westward] ..... ***M. tenuifolia***
2 Phyllaries with rounded to acute apices; paleae (receptacular bracts, interspersed with the flowers) slightly to strongly broadened or clavate-thickened just below the acute to obtuse apex; plants with 1 head (or more in *M. mohrii* and *M. ramosa*); flowering in late April-July.
4 Heads 2-10 (-20) (rarely solitary on depauperate plants).
5 Leaves 6-10 cm long, 8-23 mm wide, mostly 3-10× as long as wide; heads 2-5 (-10), 22-37 mm in diameter; [sandstone, limestone, and dolostone glades of nw. GA and c. AL] ..... ***M. mohrii***
5 Leaves 8-20 cm long, 2-7 (-10) mm wide, mostly > 15× as long as wide; heads (2-) 4-10 (-20), 10-25 mm in diameter; [Altamaha Grit glades pinelands, and ultramafic outcrop barrens of e. GA and Panhandle FL] ..... ***M. ramosa***
4 Head solitary.
6 Leafy portion of the stem 0-20 (-30) cm long, the naked peduncle 1.5-10× (or more) as long as the leafy portion of the stem; stem leaves (if present) not reduced upward, the uppermost > 1/2 as long and wide as the largest leaves on the plant; basal leaves obovate

to oblanceolate, the apex obtuse to rounded (often emarginate); outer well-developed phyllaries with obtuse to rounded apex; corollas white to very pale pink; plants flowering late April-May (-early June).

7 Plant with 3-10 leaves on the lower stem, extending (5-) 8-20 (-30) cm up the stem; pappus scales (0.5-) 1.0-1.5 mm long; plant (2-) 3-5 (-7) dm tall; [of the Piedmont from sc. VA southward] ..... ***M. obovata* var. *obovata***

7 Plant scapose (all of the leaves basal) or nearly scapose, with 1-5 leaves extending 1-5 (-10) cm up the stem; pappus scales (1.0-) 1.5-2.5 (-3.0) mm long; plant (0.5-) 1.5-3.5 (-5.0) dm tall; [of the Coastal Plain from NC southward] ..... ***M. obovata* var. *scaposa***

6 Leafy portion of the stem 23-50 cm long, the naked peduncle 0.4-1.2× as long as the leafy portion of the stem; stem leaves reduced upward, the uppermost < 1/3 as long and wide as the largest leaves on the plant; basal leaves obovate to oblanceolate, the apex obtuse to acute or acuminate; outer well-developed phyllaries with acute to obtuse apex; corollas medium pink; plants flowering late June-July.

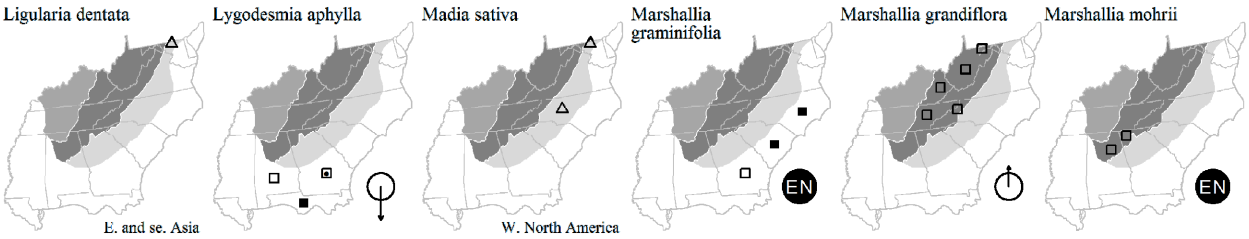
8 Basal and lower cauline leaves (2-) 3-13 (-20) cm long (including the petiole), (5-) 10-20 (-30) mm wide, averaging about 6× as long as wide (including the petiole), the apex obtuse to rounded; pappus scales ca. 2 mm long; plants (2-) 3-5 (-8.5) dm tall; achenes without resin-dots between the ridges; [of the Mountains] ..... ***M. grandiflora***

8 Basal and lower cauline leaves (8-) 15-25 (-32) cm long (including the petiole), (3-) 7-12 (-15) mm wide, averaging about 10× as long as wide (including the petiole), the apex acute to acuminate; pappus scales ca. 1.2 mm long; plants (4-) 6-9 (-10) dm tall; achenes with copious resin-dots between the ridges; [of the Piedmont] ..... ***M. species 1***

Marshallia graminifolia (Walter) Small, Grassleaf Barbara's-buttons. Pine savannas. Late July-mid October. Ne. NC south to se. SC, and rarely to e. GA (Emanuel County) (Sorrie 1998b). Closely related to *M. tenuifolia* Rafinesque, which differs in having a well-developed horizontal rosette of thin-textured spatulate leaves, which do not leave fibrous remains (vs. with firm, ascending, linear-lanceolate basal leaves, which leave fibrous remains). [= GW, RAB, SE, Z; < *M. graminifolia* – FNA; = *M. graminifolia* var. *graminifolia* – K; > *M. laciniarioides* Small - S; > *M. williamsonii* Small – S; > *M. graminifolia* var. *graminifolia* – X; > *M. graminifolia* var. *lacinarioides* (Small) Beadle & F.E. Boynton – X; = *M. graminifolia* ssp. *graminifolia* – Y]

Marshallia grandiflora Beadle & F.E. Boynton, Appalachian Barbara's-buttons, Large-flowered Barbara's-buttons. Sandy or rocky riverbanks, bog margins, dry slopes over mafic rocks. June-August. Sw. PA south to sw. NC, e. TN (Cumberland Plateau) (Chester, Wofford, & Kral 1997), and se. KY. [= C, F, FNA, G, K, S, SE, W, WV, X, Y, Z; < *M. grandiflora* – RAB (also see *M. species 1*)]

Marshallia mohrii Beadle & F.E. Boynton, Coosa Barbara's-buttons. Sandstone, limestone, and dolostone glades, calcareous prairies. Nw. GA and n. and c. AL. It somewhat resembles *M. grandiflora*, but typically has 2-10 heads per plant (or solitary in depauperate individuals). [= FNA, K, S, SE, X, Y, Z]



Marshallia obovata (Walter) Beadle & F.W. Boynton *var.* ***obovata***, Piedmont Barbara's-buttons, Spoon-leaved Barbara's-buttons. Clay flats, woodland borders, dry woodlands. Late April-May (-early June). Sc. VA south to se. TN (Chester, Wofford, & Kral 1997), sw. GA, Panhandle FL, and c. AL, primarily in the Piedmont. [= C, G, K, RAB, SE, Y, Z; = *M. obovata* var. *platyphylla* (M.A. Curtis) Beadle & F.E. Boynton – F, X; < *M. obovata* – FNA, S, W, WH]

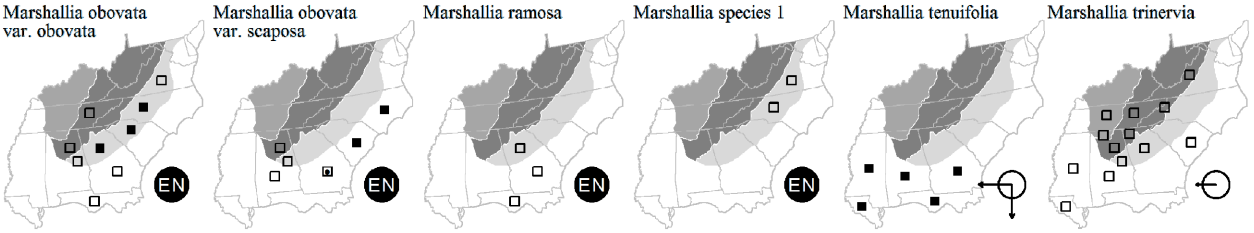
Marshallia obovata (Walter) Beadle & F.W. Boynton *var.* ***scaposa*** Channell. Pine savannas. Late April-May. E. NC south to se. AL, in the Coastal Plain. [= K, RAB, SE, Y, Z; = *M. obovata* var. *obovata* – F, X, misapplied; < *M. obovata* – FNA, S]

Marshallia ramosa Beadle & F.E. Boynton, Pineland Barbara's-buttons, Southern Barbara's-buttons. Pinelands, Altamaha Grit outcrops, woodlands over ultramafic rocks. Coastal Plain from e. GA south to ne. FL and Panhandle FL. It somewhat resembles *M. graminifolia* in its linear leaves, but differs in the phyllaries acute (vs. subulate-acuminate), and flowering period (late May-June vs. July-mid-October). [= FNA, K, S, SE, WH, X, Y, Z]

Marshallia species 1, Oak Barrens Barbara's-buttons. Diabase barrens and fire-maintained woodlands over greenstone. Late June-July; August-September. This species is known from three extant and one extirpated population, in Granville County, NC and Halifax Co. VA, where associated with numerous rare and disjunct taxa of prairie or barren affinities: *Solidago ptarmicoides, Solidago rigida* var. *glabrata, Symphyotrichum depauperatum, Echinacea laevigata, Silphium terebinthinaceum, Baptisia australis* var. *aberrans, Linum sulcatum* var. *sulcatum, Carex meadii, Eryngium yuccifolium* var. *yuccifolium, Scutellaria leonardii, Lithospermum canescens,* and others. [< *M. grandiflora* – RAB]

Marshallia tenuifolia Rafinesque. Pine savannas. E. GA south to c. peninsular FL, west to e. TX. See *M. graminifolia* for additional discussion. [= GW, SE, WH, Z; < *M. graminifolia* – FNA; = *M. graminifolia* (Walter) Small var. *cynanthera* (Elliott) Beadle & F.E. Boynton – K, X; = *M. graminifolia* – S, misapplied; = *M. graminifolia* (Walter) Small ssp. *tenuifolia* (Rafinesque) L. Watson – Y]

Marshallia trinervia (Walter) Trelease, Colonial Barbara's-buttons, Broadleaf Barbara's-buttons. Moist rocky streambanks and in calcareous clays. July. E. SC (?), sw. NC, and sc. TN, south to s. AL and s. MS (Sorrie & Leonard 1999). Reported for VA by C; the documentation is unknown. [= C, F, FNA, G, K, RAB, S, SE, W, X, Y, Z]



Matricaria Linnaeus 1740 (Mayweed)

A genus of about 7 species, herbs, of Eurasia and n. Africa. References: Brouillet in FNA (2006a); Cronquist (1980)=SE; Arriagada & Miller (1997)=Z. [also see *Tripleurospermum*]

1 Heads with evident white rays (very rarely lacking rays); plant chamomile-scented; disc flowers 5-lobed.....***M. chamomilla***
1 Heads discoid (lacking rays); plant pineapple-scented; disc flowers 4-lobed.....***M. discoidea***

* ***Matricaria chamomilla*** Linnaeus, German Chamomile, False Chamomile, Scented Mayweed. Roadsides; native of Europe. July-September. [= F, FNA, G, SE; = *Matricaria recutita* Linnaeus – C, K, Z; = *Chamomilla recutita* (Linnaeus) Rauschert]
* ***Matricaria discoidea*** A.P. de Candolle, Pineapple-weed, Rayless Chamomile. Barnyards, pastures, roadsides; native of w. North America. May-November. [= FNA, K, Z; = *M. matricarioides* (Lessing) T.C. Porter – C, F, G, RAB, SE, illegitimate name; *? Lepidotheca suaveolens* (Pursh) Nuttall; *? Chamomilla suaveolens* (Pursh) Rydberg]

Melampodium Linnaeus 1753

A genus of about 36 species, herbs, of tropoical and subtropical America. References: Strother in FNA (2006c).

* ***Melampodium divaricatum*** (Richard) DC. Disturbed areas; native of tropical America. [= FNA, K, WH]

Melanthera Rohr 1792

A genus of about 35 species, herbs, of tropical and subtropical areas. References: Parks in FNA (2006c); Cronquist (1980)=SE; Wagner & Robinson (2001)=Z.

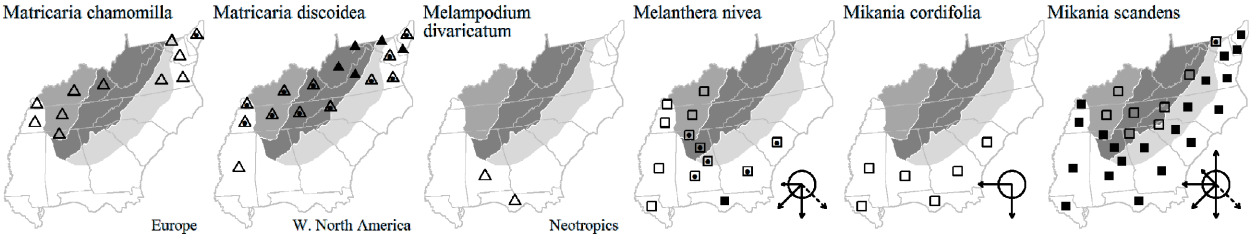
Melanthera nivea (Linnaeus) Small. Calcareous outcrops, sandy woodlands. June-October. E. SC south to s. FL, west to LA; also widespread in the West Indies, Mexico, Central America, and northern South America (Colombia, Ecuador, Peru, and Venezuela). [= FNA, K, SE, WH, Z; > *M. hastata* Michaux – RAB, S]

Mikania Willdenow 1803 (Climbing Hempweed)

A genus of about 430-450 species, vines, perennial herbs, and shrubs, primarily pantropical in distribution, but with extensions into temperate areas (Holmes 1995). References: Holmes in FNA (2006c); Cronquist (1980)=SE.

1 Involucre 6.5-8 mm; achenes 3.5-4.5 mm long; pubescence of the stems, leaves, and involucres spreading; [of se. SC southward].....***M. cordifolia***
1 Involucre 4-5.5 (-6) mm high; achenes 1.5-2.5 (-2.7) mm long; pubescence of the stems, leaves, and involucres puberulent or nearly smooth; [widespread in our area].....***M. scandens***

Mikania cordifolia (Linnaeus f.) Willdenow, Heartleaf Climbing Hempweed. Bottomland hardwood forests, mesic hammocks near the coast, margins of tidal marshes. Se. SC (Beaufort and Colleton counties) (P. McMillan, pers. comm. 2005), e. GA (Bryan & Camden counties) (Carter, Baker, & Morris 2009), south to s. FL, west to s. LA. [= K, S, SE, WH]
Mikania scandens (Linnaeus) Willdenow, Climbing Hempweed. Marshes, swamp forests, wet thickets, seepages. July-October. ME to s. ON, south to s. FL and e. TX, south into the tropics. [=C, G, GW, K, RAB, S, SE, W, WH; > *M. scandens* var. *pubescens* (Nuttall) Torrey & A. Gray – F; > *M. scandens* var. *scandens* – F]



Oclemena E.L. Greene 1903 (Aster, Nodding-aster)

A genus of 3 species, perennial herbs, of e. North America. There now appears to be strong evidence (morphologic and molecular) and something approaching a consensus for the recognition of *Oclemena* as distinct from *Aster*. It appears that *Oclemena* is most closely related to *Ionactis*, and that these two genera are more closely related to *Solidago* and *Heterotheca* than to *Aster* (in a narrower sense). References: Brouillet in FNA (2006b); Nesom (1994)=Z; Semple, Heard, & Xiang (1996)=Y; Cronquist (1980)=SE; Nesom (1997).

1 Leaves 30-100 or more per plant, 1-8 mm wide ..... ***O. nemoralis***
1 Leaves 11-30 per plant, 10-50 mm wide.
2 Leaves obovate, acuminate at the tip, thin in texture; [of the Mountains] ..... ***O. acuminata***
2 Leaves narrowly elliptic, acute to obtuse at the tip, coriaceous in texture; [of the Coastal Plain, from se. SC southward] ..... ***O. reticulata***

Oclemena acuminata (Michaux) Greene, Whorled Aster, Whorled Nodding-aster. Spruce-fir forests, northern hardwood forests, mountain seepages and streambanks, other cool, moist situations. July-September. NL (Newfoundland) and QC south to w. NC, ne. GA, and e. TN. [= FNA, K, Y, Z; = *Aster acuminatus* – C, F, G, RAB, SE, W, WV]

Oclemena nemoralis (Aiton) Greene, Leafy Bog Aster, Bog Nodding-aster. Peaty bogs. NL (Labrador) and ON south to nc. PA, MD, DE (formerly), and NJ. [= FNA, K, Z; = *Aster nemoralis* Aiton – C, F, G]

Oclemena reticulata (Pursh) Nesom, Pine-barren Aster. Wet pine flatwoods. Late April-early June. Se. SC south through e. GA to c. peninsular FL. [= FNA, K, WH, Z; = *Aster reticulatus* Pursh – GW, RAB, SE; = *Doellingeria reticulata* (Pursh) Greene – S]

Onopordum Linnaeus 1753 (Scotch Thistle, Cotton-thistle)

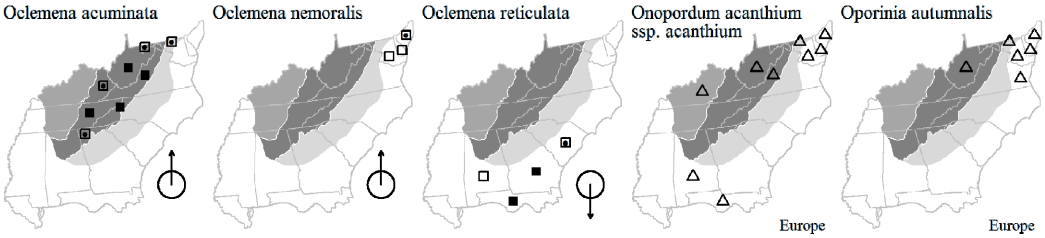
A genus of about 60 species, herbs, of the Mediterranean region and w. Asia. References: Keil in FNA (2006a); Cronquist (1980)=SE.

* ***Onopordum acanthium*** Linnaeus *ssp.* ***acanthium***, Scotch Thistle, Cotton-thistle. Disturbed areas; native of Europe. July-October. [= FNA; > *O. acanthium* – C, F, G, K, S, SE, WH]

Oporinia D. Don 1829 (Fall-dandelion)

A genus of about 20 species, herbs, primarily of temperate Eurasia. Samuel et al. (2006) show that *Leontodon* subgenus *Oporinia* (including *L. autumnalis* among the species treated below) should be recognized as a separate genus from *Leontodon* sensu stricto. References: Samuel et al. (2006); Bogler in FNA (2006a); Cronquist (1980)=SE.

* ***Oporinia autumnalis*** (Linnaeus) D. Don, Fall-dandelion. Roadsides, fields; native of Europe. June-October. [= *Leontodon autumnalis* Linnaeus – FNA, SE, WV; > *Leontodon autumnalis* Linnaeus var. *autumnalis* – C, F, G; > *L. autumnalis* ssp. *autumnalis* – K]



Packera Á. & D. Löve 1976 (Ragwort)

A genus of about 64 species, annual and perennial herbs, of subtropical, temperate, and arctic North American, with a few species in Siberia. These species have usually been considered part of *Senecio*, and have often been given informal status as "the Aureoid group". According to recent interpretations, this group warrants generic status, as *Packera* (Bremer 1994). References:

Trock in FNA (2006b); Barkley (1962)=Z; Cronquist (1980)=SE; Barkley (1999)=Y; Barkley (1978)=X; Bremer (1994); Mahoney & Kowal (2008).

1 Plant an annual (rarely a biennial); leaf with lateral lobes broadly rounded, resembling the terminal lobe; [of wet soil of swamps and wet fields] ..... ***P. glabella***
1 Plant a perennial (rarely a biennial); leaf with lateral lobes absent, or distinctly narrower than the terminal lobe; [of dry to mesic soils, but not generally as above].
2 Principal leaves (especially the basal) 2-3-pinnatifid, the segments mostly 1-3 mm wide ..... ***P. millefolium***
2 Principal leaves entire, toothed, or irregularly and raggedly 1-pinnatifid.
3 Plants densely tomentose or floccose when young, remaining visibly tomentose throughout the growing season on the leaves (these appearing grayish because of the persistent tomentum); basal leaves entire, obscurely crenate, or serrate (rarely lobed).
4 Basal leaves (including petioles) mostly 10-25 cm long, held in a vertical posture; [Coastal Plain and Piedmont of NC, SC, and VA, and Mountains of SC] ..... ***P. tomentosa***
4 Basal leaves (including petioles) mostly 3-10 cm long, arching or prostrate; [Mountains].
5 Tomentum of leaf blades very fine and tight; [shale barrens and woodlands, w. VA and WV north to w. MD and wc. PA] ..... ***P. antennariifolia***
5 Tomentum of leaf blades coarser, looser; [calcareous, mafic, or ultramafic cliffs, barrens, and woodlands, w. VA and e. VA southward to w. NC and e. TN] ..... ***P. paupercula*** *var.* ***appalachiana***
3 Plants glabrate to sparsely floccose when young, becoming glabrous to glabrate later in the growing season, though some species with some persistent floccose tomentum near the base or in the leaf axils (the leaves appearing green); basal leaves serrate or lobed.
6 Basal leaves ovate, orbicular, or reniform, the blade 0.8-2× as long as wide; leaf blades cordate, truncate, or abruptly narrowed at the base.
7 Basal leaves reniform, strongly cordate at the base ..... ***P. aurea***
7 Basal leaves obovate to orbicular, truncate or abruptly narrowed at the base ..... ***P. obovata***
6 Basal leaves oblanceolate, narrowly elliptic, the blade 2-8× as long as wide; leaf blades cuneate at the base (truncate to cordate in *P. schweinitziana*); plants usually not forming clonal patches by stolons or widely creeping rhizomes.
8 Basal leaves with truncate to cordate bases (and typically oblique); [high elevation grassy balds] ..... ***P. schweinitziana***
8 Basal leaves cuneate at the base; [collectively widespread and of various habitats].
9 Heads many, generally 20-100; basal leaves (including petioles) up to 30 cm long and 3.5 cm wide ..... ***P. anonyma***
9 Heads few, generally 5-20; basal leaves (including petioles) up to 12 cm long and 2 cm wide ..... ***P. paupercula*** *var.* ***paupercula*** *and* ***P. crawfordii***

Packera anonyma (Wood) W.A. Weber & Á. Löve, Appalachian Ragwort, Small's Ragwort. Mt (GA, NC, SC, VA, WV), Pd (DE, GA, NC, SC, VA), Cp (FL, GA, NC, SC, VA): rock outcrops, roadsides, woodlands; hammocks, disturbed areas; common (rare in DE). May-early June. S. PA, DE, and KY, south to Panhandle FL and c. MS. [= FNA, K, WH, Y; = *Senecio anonymus* Wood – C, SE, X; = *Senecio smallii* Britton – F, G, RAB, S, WV]

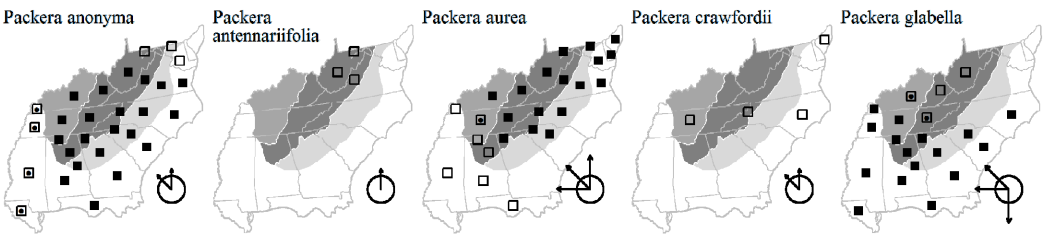
Packera antennariifolia (Britton) W.A. Weber & Á. Löve, Shalebarren Ragwort. Mt (VA, WV): shale barrens and shale woodlands; rare. April-June. Sc. PA and w. MD south to w. VA and e. WV. [= FNA, K, Y; = *Senecio antennariifolius* Britton – C, F, G, SE, WV]

Packera aurea (Linnaeus) Á. & D. Löve, Golden Ragwort, Heartleaf Ragwort. Mt (GA, NC, SC, VA, WV), Pd (DE, NC, SC, VA), Cp (DE, FL, VA): moist forests, bottomlands, bogs, stream banks; common (rare in FL). Late March-June. NL (Labrador) west to MN, south to NC, ne. SC, n. GA, n. AL, and c. AR; disjunct in Panhandle FL. This species is variable, and some of the more striking variants have been named; some may well warrant formal taxonomic recognition, but additional study is needed. [= FNA, K, WH, Y; = *Senecio aureus* Linnaeus – C, G, GW, RAB, SE, WV, X; > *Senecio aureus* var. *aureus* – F; > *Senecio aureus* var. *intercursus* Fernald – F; > *Senecio aureus* var. *gracilis* (Pursh) Hooker – F; > *Senecio aureus* – S; > *Senecio gracilis* Pursh – S]

Packera crawfordii (Britton) A.M. Mahoney & R.R. Kowal ined. Mt, Cp (NC): bogs and fens; rare. NJ, PA, and s. IN south to e. NC, w. NC, and TN. [< *Senecio pauperculus* Michaux – RAB, C, G, GW, S, SE, X; = *Senecio crawfordii* (Britton) G.W. & G.R. Douglas – F; < *Packera paupercula* (Michaux) Á. & D. Löve – FNA]

Packera glabella (Poiret) C. Jeffrey, Butterweed, Smooth Ragwort, Yellowtop. Cp (FL, GA, NC, SC), Pd (GA, SC), Mt (GA, WV): swamp forests, bottomland forests, cleared areas in bottomlands, often in mucky soils; common (rare in WV). March-early June. E. NC south to s. FL, west to e. TX, north in the interior to sw. WV, OH, MO, and SD. [= FNA, K, WH, Y; = *Senecio glabellus* Poiret – C, F, G, GW, RAB, S, SE, WV, X]

Packera millefolium (Torrey & A. Gray) W.A. Weber & Á. Löve, Blue Ridge Ragwort, Yarrowleaf Ragwort. Mt (GA, NC, SC, VA): granitic domes, cliffs, and rocky woodlands, over granite, gneiss, schist, and amphibolite, and in calcareous glades (in sw. VA); rare. Late April-early June. Endemic to sw. NC, nw. SC, and ne. GA; disjunct in sw. VA (Lee Co.). The hybrid with *Packera anonyma* [= *Senecio* ×*memmingeri* Britton (pro sp.)] occurs with the parents. The epithet in *Packera* is often spelled "*millefolia*," ignoring that this epithet is a noun in apposition based on the pre-Linnaean genus name *Millefolium* (for *Achillea*).. [= *Senecio millefolium* Torrey & A. Gray – C, F, S, RAB, SE, X; = *Packera millefolia* – FNA, K, Y, orthographic variant]



Packera obovata (Muhlenberg ex Willdenow) W.A. Weber & Á. Löve, Roundleaf Ragwort, Running Ragwort. Nutrient rich forests and woodlands (dry or moist), usually over calcareous or mafic rocks. April-June. VT west to KS, south to Panhandle FL and TX. [= FNA, K, WH, Y; = *Senecio obovatus* Muhlenberg ex Willdenow – C, RAB, S, SE, X; > *Senecio obovatus* var. *obovatus* – F, G, WV; > *Senecio obovatus* var. *elliottii* (Torrey & A. Gray) Fernald – F, G, WV; > *Senecio obovatus* var. *rotundus* Britton – F; > *Senecio obovatus* – S; > *Senecio rotundus* (Britton) Small – S]

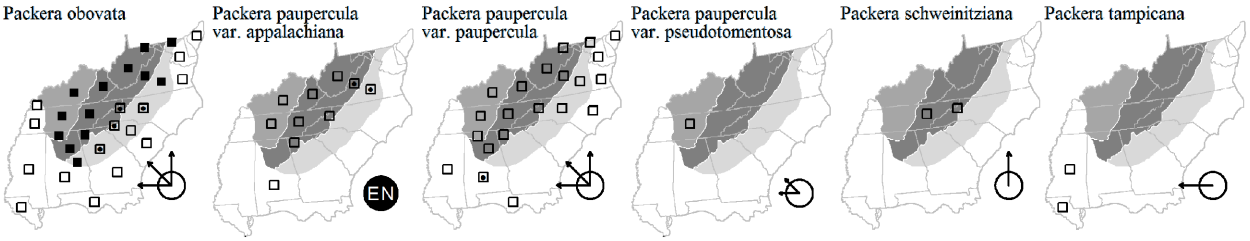
Packera paupercula (Michaux) Á. & D. Löve *var.* ***appalachiana*** A.M. Mahoney, Appalachian Ragwort. Glades, cliffs, barrens, over mafic, ultramafic, or calcareous rocks. April-May. E. WV and w. VA south to w. NC and e. TN. [= ; < *Packera plattensis* (Nuttall) W.A. Weber & Á. Löve – FNA, K, Y, misapplied to our material; < *Senecio plattensis* Nuttall – C, F, G, SE, X, misapplied to our material]

Packera paupercula (Michaux) Á. & D. Löve *var.* ***paupercula***, Balsam Ragwort, Northern Meadow Groundsel. Thickets, meadows, glades, generally over circumneutral soils derived from calcareous or mafic rocks. April-May. NL (Labrador) west to AK, south to GA, Panhandle FL (Bay County), AL, and OR. [< *Packera paupercula* (Michaux) Á. & D. Löve – FNA, K, WH, X, Y; < *Senecio pauperculus* Michaux – C, G, GW, RAB, S, SE; > *Senecio pauperculus* var. *pauperculus* – F; > *Senecio pauperculus* var. *balsamitae* (Muhlenberg ex Willdenow) Fernald – F; > *Senecio pauperculus* var. *praelongus* (Greenman) House – F]

Packera paupercula (Michaux) Á. & D. Löve var. *pseudotomentosa* (Mackenzie & Bush) R.R. Kowal. {habitats}; rare. [] {not yet keyed; add to synonymy}

Packera schweinitziana (Nuttall) W.A. Weber & Á. Löve, New England Ragwort. Grassy balds (in deep soil), at high elevations, in our area generally over metagabbro or amphibolite. May-July. NS and QC south to n. NY; disjunct to a few locations in w. NC and e. TN, notably on grassy balds on Roan Mountain, Snake Mountain, Rich Mountain, and Big Bald. [= FNA, K; = *Senecio schweinitzianus* Nuttall – C, SE, X; = *Senecio robbinsii* Oakes ex Rusby – F, G, RAB, S; = *Packera schweinitzianus* – Y, orthographic variant]

Packera tampicana (de Candolle) C. Jeffery, Great Plains Ragwort. AR and KS south and east to e. LA (Florida parishes) or s. MS (SE), and south to TX and Mexico. [= FNA; = *Senecio imparipinnatus* Klatt – SE] {not yet keyed}



Packera tomentosa (Michaux) C. Jeffrey, Woolly Ragwort. Sandy roadsides, sandy woodlands and forests, granitic flatrocks, granitic domes. April-early June. S. NJ south to GA, west to TX, primarily on the Coastal Plain, but extending inland in the Piedmont and Mountains in thin sandy soils around rock outcrops, and as a roadside weed. [= FNA, K, Y; = *Senecio tomentosus* Michaux – C, F, G, GW, RAB, SE, X; > *Senecio tomentosus* – S; > *Senecio alabamensis* Britton – S]

Palafoxia Lagasca y Segura 1816 (Palafoxia)

A genus of about 12 species, shrubs and herbs, of s. North America. References: Strother in FNA (2006c); Turner & Morris (1976)=Z; Cronquist (1980)=SE.

1 Perennial suffrutescent herb or shrub, 3-15 dm tall; phyllaries unequal, the longer inner phyllaries 8-11 mm long; pappus scales of the inner cypselas 4-7 mm long; [longleaf pine sandhills and sandy scrub, of sc. GA and FL] ..... ***P. integrifolia***
1 Annual herb, 2-8 dm tall; phyllaries equal, 3-10 mm long; pappus scales of the inner cypselas **either** 0.3-1 **or** 2-6 mm long.
  2 Phyllaries 3-5 mm long; corollas 5-6 mm long; leaves 1-4 mm wide; pappus scales of the inner cypselas 0.3-1 mm long; [of calcareous prairies and glades, of MS westward] ..... ***P. callosa***
  2 Phyllaries 5-8 mm long; corollas 7-10 mm long; leaves 5-20 mm wide; pappus scales of the inner cypselas 2-6 mm long; [alien in our area, of disturbed sites] ..... ***P. texana*** *var.* ***ambigua***

Palafoxia callosa (Nuttall) Torrey & A. Gray, Small Palafoxia. Blackland prairies. MO, AR, and OK south to c. TX and Coahuila; disjunct in c. MS. [= FNA, K, SE, Z]

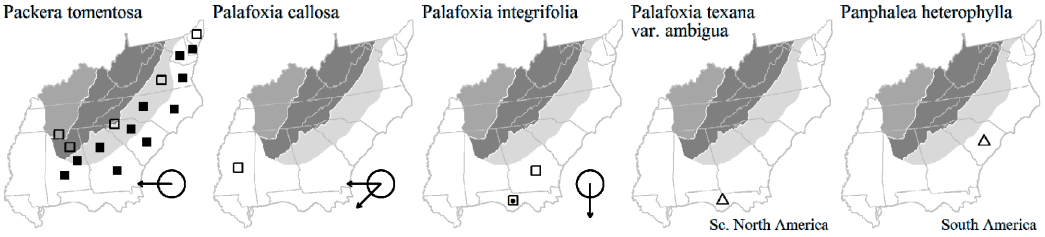
Palafoxia integrifolia (Nuttall) Torrey & A. Gray, Coastal Plain Palafoxia. Sandhills. Sc. GA (Carter, Baker, & Morris 2009) south to s. FL. [= FNA, K, SE, WH, Z; = *Polypteris integrifolia* Nuttall – S]

* ***Palafoxia texana*** deCandolle *var.* ***ambigua*** (Shinners) B.L. Turner & M.I. Morris, Texas Palafoxia. Dry, disturbed areas; native of TX and Tamaulipas. [= K, WH, Z; < *P. texana* – FNA]

Panphalea Lagasca y Segura 1811

A genus of 9 species, herbs, of n. South America. Sometimes spelled *Pamphalea* (Hind in Kadereit & Jeffrey 2007). References: Pruski (2004); Hind in Kadereit & Jeffrey (2007).

* ***Panphalea heterophylla*** Lessing. Waste areas around wool-combing mill; perhaps merely a waif, native of South America. April. See Pruski (2004) and Nesom (2004d).



Parthenium Linnaeus 1753 (Wild Quinine)

A genus of about 16 species, herbs and shrubs, of North America and the West Indies. Mears (1975) does not seem to me to be a fully satisfactory explanation of the variation within the genus. Morphologically and ecologically, *P. auriculatum* seems worthy of specific status, and I have not followed Mears's reduction of it to varietal status. *P. integrifolium* var. *henryanum*, var. *mabryanum*, and var. *integrifolium* serve to describe real patterns of variation, but are disturbingly confluent morphologically, ecologically, and geographically. References: Mears (1975)=Z; Cronquist (1980)=SE; Strother in FNA (2006c).

1 Leaves pinnatifid to bipinnatifid, the primary sinuses extending 9/10 or more of the way to the midrib; leaves thin in texture; pappus of 2 petaloid scales; [alien annual] ..... ***P. hysterophorus***
1 Leaves toothed (pinnatifid in forms of *P. integrifolium* var. *mabryanum*, the sinuses extending up to 3/4 of the way to the midrib); leaves somewhat thick in texture; pappus of 2-3 weak awns; [native perennials].
2 Stems with coarse, spreading pubescence 1-3 mm long; cauline leaves all auriculate-clasping, the upper cauline leaves sessile and auriculate-clasping, the lower cauline leaves with winged petioles, the wings expanded at the base; blades of basal leaves 11-18 (-20) cm long, 5-8 cm wide ..... ***P. auriculatum***
2 Stems glabrous or with short, appressed pubescence <1 mm long; cauline leaves only rarely auriculate-clasping, the upper cauline leaves sessile or petiolate, the lower cauline leaves petiolate, the petioles winged or not; blades of basal leaves (4-) 6-21 (-27) cm long, (1.4-) 2-12 (-13.5) cm wide.
3 Blades of basal leaves ovate-lanceolate, (4-) 6-12 (-20) cm long, (3-) 4-8 (-9.5) cm wide, never undulately lobed; heads (18-) 90-180 (-400) per inflorescence ..... ***P. integrifolium*** *var.* ***integrifolium***
3 Blades of basal leaves linear-lanceolate to ovate-lanceolate, (6-) 7-12 (-13.5) cm long, (1.4-) 2-4 (-4.5 cm) wide, sometimes undulately lobed throughout their length; heads (30) 40-75 (-85) per inflorescence ..... ***P. integrifolium*** *var.* ***mabryanum***

Parthenium auriculatum Britton, Glade Wild Quinine. In shallow, xeric, circumneutral soil of glades, barrens, and woodlands, over calcareous rocks (such as dolostone) or mafic rocks (such as diabase). Mid May-August. Ne. WV south to c. NC and n. AL, west to c. TN. As indicated by the confusion over its taxonomy, the relationships and appropriate taxonomic treatment of this taxon are unclear. It is clearly a close relative of the Ozarkian *P. hispidum* Rafinesque, and perhaps not readily distinguished from it; some, at least, of our material has creeping rhizomes and heads over 7 mm in diameter, supposed to be distinguishing features of *P. hispidum*. [= C, G, K, SE; = *P. integrifolium* var. *auriculatum* (Britton) Cornelius ex Cronquist – RAB, Z; = *P. hispidum* Raf. var. *auriculatum* (Britton) Rollins – F, WV; < *P. integrifolium* – FNA, S; < *P. hispidum* Rafinesque – W]

* ***Parthenium hysterophorus*** Linnaeus, Santa Maria, Feverfew. Disturbed areas; native of tropical America, including the West Indies. July-November. [= C, F, FNA, G, K, S, SE, WH]

Parthenium integrifolium Linnaeus *var.* ***integrifolium***, Common Wild Quinine. Various dryish habitats, mainly open or sparsely wooded. Late May-August. VA west to MN, south to SC, GA, ne. MS, and nw. AR. Var. *henryanum* Mears appears to be merely a form of var. *integrifolium*. [= K; < *P. integrifolium* var. *integrifolium* – RAB; < *P. integrifolium* – C, F, FNA, G, S, SE, W, WV; > *P. integrifolium* var. *integrifolium* – Z; > *P. integrifolium* var. *henryanum* Mears – Z]

Parthenium integrifolium Linnaeus *var.* ***mabryanum*** Mears, Mabry's Wild Quinine. Sandhills and other dry soils, in forest openings or woodlands. Late May-November (blooming strongly in response to fire). Nc. SC, e. NC, and se. VA, barely extending into the e. Piedmont of NC in dry sandy soils around granitic flatrocks or in (formerly) fire-maintained communities. Var. *mabryanum* is the characteristic variety of *P. integrifolium* in the Sandhills of NC. Mears named a new species, *P. radfordii* Mears, to accomodate sinuate-lobed *Parthenium* from the fall-line sandhills of NC and SC, which he also believed to be later-blooming (August-November) than other *Parthenium*. Extensive observations in the Sandhills of NC show that "*P. radfordii*" consistently co-occurs in mixed populations with *P. integrifolium* var. *mabryanum*, and that flowering is triggered by fire. These sinuate-lobed plants are best considered a form of var. *mabryanum*. [= K; < *P. integrifolium* var. *integrifolium* – RAB; < *P. integrifolium* – C, F, FNA, G, S, SE, W; > *P. integrifolium* var. *mabryanum* – Z; > *P. radfordii* Mears – Z]

Pascalia Ortega 1797

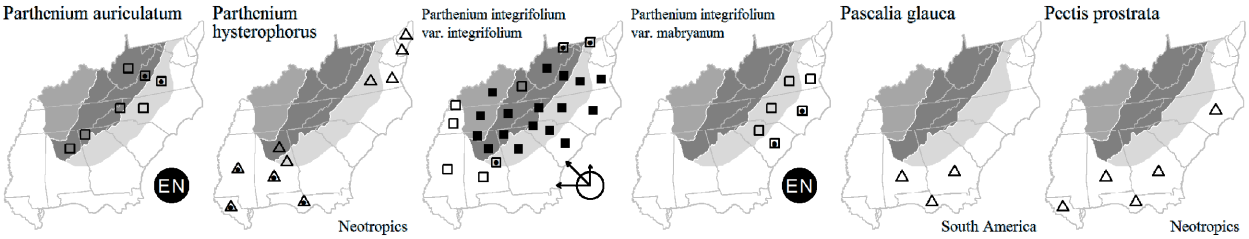
A genus of 2 species, perennial herbs, of South America. References: Strother in FNA (2006c).

* ***Pascalia glauca*** Ortega, Beach Creeping Oxeye. Coastal dunes, disturbed areas; native of South America, perhaps only a waif. Reported for FL, GA, and AL. [= FNA, K, S, WH; = *Wedelia glauca* (Ortega) O. Hoffmann – SE]

Pectis Linnaeus 1759

A genus of about 90 species, herbs, of s. North America, Mexico, Central America, West Indies, South America, and Pacific Islands. References: Keil in FNA (2006c).

* ***Pectis prostrata*** Cavanilles. Roadsides, mowed areas, other dry disturbed areas; native of tropical America (probably including s. FL). July-November. Reported for NC (Basinger, pers. comm. 2006) and GA (Carter, Baker, & Morris 2009); likely to be in AL and SC. Spreading northward along roadsides. [= FNA, WH]



Peripleura (N.T. Burbidge) Nesom 1994

* ***Peripleura arida*** (N.T. Burbidge) Nesom. Waste areas around wool-combing mill; perhaps only a waif, native of Australia. See Nesom (2004d). [= *Vittadinia arida* N.T. Burbidge]

Petasites P. Miller 1754 (Butterbur)

A genus of 15-18 species, perennial herbs, of Eurasia and boreal North America. References: Bayer, Bogle, & Cherniawsky in FNA (2006b).

* *Petasites hybridus* (Linnaeus) P.G. Gaertner, B. Meyer, & Scherbius, Butterbur, Butterfly-dock. Disturbed areas, frequently cultivated, rarely naturalized or persisting, native of Europe. Introduced and naturalizing south to DE, WV, and se. PA. [= C, F, FNA, G, K, SE]

Phoebanthus S.F. Blake 1916

A genus of 2 species, perennial herbs, of the Southeastern United States (FL and AL). References: Schilling in FNA (2006c).

1 Leaves 3-5 mm wide; phyllaries appressed; [of ne. FL south to s. peninsular FL].....***P. grandiflorus***
1 Leaves 1.2 mm wide; phyllaries spreading; [of Panhandle FL and s. AL] .....***P. tenuifolius***

Phoebanthus grandiflorus (Torrey & A. Gray) S.F. Blake. Sandhills. March-November. Ne. FL (Clay County) south to c. peninsular FL. [= FNA, K, SE, WH; = *P. grandiflora* – S, orthographic variant]

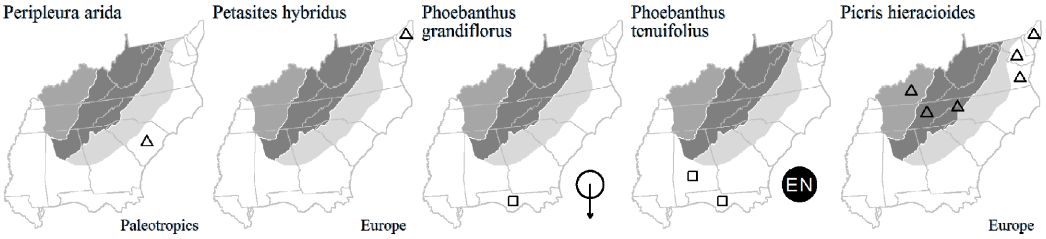
Phoebanthus tenuifolius (Torrey & A. Gray) S.F. Blake. Sandhills and flatwoods. May-September. Endemic to s. AL and Panhandle FL. [= FNA, K, SE, WH; = *P. tenuifolia* – S, orthographic variant]

Picris Linnaeus 1753 (Bitterweed, Oxtongue)

A genus of about 40 species, of the Old World, particularly the Mediterranean region. References: Strother in FNA (2006a); Cronquist (1980)=SE. [also see *Helminthotheca*]

1 Phyllaries in 2 series; phyllaries 3.5-8 mm wide; inner phyllaries 12-20 mm long; plant annual or biennial .....***[***see ***Helminthotheca echioides]***
1 Phyllaries imbricate; phyllaries <3 mm wide; inner phyllaries 11-13 mm long; plant biennial to perennial.....***P. hieracioides***

* ***Picris hieracioides*** Linnaeus, Hawkweed Oxtongue, Cat's-ear. Disturbed areas; native of Europe. May-October. [= RAB, C, F, FNA, G, SE, W; > *Picris hieracioides* Linnaeus ssp. *hieracioides* – K]



Pityopsis Nuttall 1840 (Grass-leaved Golden-aster)
(contributed by Bruce A. Sorrie)

A genus of about 8 species (and numerous infraspecific taxa), herbs, of se. North America south to Central America. *Pityopsis* is taxonomically and nomenclaturally a difficult genus. The problems include nomenclatural issues involving typification and application (and frequently misapplication) of a plethora of names at specific and varietal level, disagreement over whether to include *Pityopsis* within an inclusive *Chrysopsis*, whether then to include *Chrysopsis* within an even more inclusive *Heterotheca*, and differences in species concepts in a morphologically and cytologically diverse group. References: Semple in FNA (2006b); Semple & Bowers (1985)=Z; Ward (2004c)=Y; Cronquist (1980)=SE.

1 Basal leaves shorter than the stem leaves; middle and upper stem leaves similar in size to one another.
  2 Leaves and stem glabrate, not silky pubescent; leaves 0.8-1.5 mm wide; [of the fall line Sandhills, from sc. NC south to AL] ..... ***P. pinifolia***
  2 Leaves and stems silky pubescent; leaves 2-7 mm wide; [of se. TN, **or** of s. NJ northward, **or** of FL Panhandle].
    3 Peduncles and phyllaries moderately to densely stipitate-glandular; [plants of the Mountains of TN] ..... ***[P. ruthii]***
    3 Peduncles and phyllaries not stipitate-glandular (or only sparsely and minutely so); [plants of the Coastal Plain].
      4 Stems straight; involucres 5-8 mm high; [plants of sandy places, from s. NJ northward] ..... ***P. falcata***
      4 Stems flexuous; involucres (7-) 8-11 mm high, equaling the pappus; [plants of Panhandle FL] ..... ***P. flexuosa***
1 Basal leaves much longer than the stem leaves; stem leaves strongly reduced upward, the upper stem leaves much smaller than middle stem leaves.
  5 Heads < 10; cauline leaves few, generally 2-7; [of sw. GA westward and southward] ..... ***P. oligantha***
  5 Heads > 10; cauline leaves many; [collectively widespread in our area].
    6 Peduncles and upper stem densely glandular-hairy (stipitate-glandular); phyllaries densely glandular-hairy; involucres 4.5-8 mm high; lower leaves < 10 mm wide.
      7 All stem leaves silky pubescent; [widespread in our area] ..... ***P. aspera*** *var.* ***adenolepis***
      7 Lower leaves silky pubescent, the mid to upper stem leaves glabrate and evidently stipitate glandular along the margins; [of sc. GA south into Panhandle FL] ..... ***P. aspera*** *var.* ***aspera***
    6 Peduncles and upper stem eglandular to sparsely glandular; phyllaries eglandular, or the inner phyllaries sparsely to densely glandular, at least distally; involucres 5-14 mm high; lower leaves up to 20 mm wide.
      8 Involucres 8-14 mm high; disc florets > 30
        9 Involucres 8-12 mm high; ray florets 10-16; disc corolla throats and lobes glabrous to short pilose (never long pilose); [widespread] ..... ***P. graminifolia*** *var.* ***latifolia***
        9 Involucres 12-14 mm high; ray florets 13-25; disc corolla throats and lobes sometimes long-pilose; [of FL Panhandle] ..... ***P. graminifolia*** *var.* ***tracyi***
      8 Involucres 5-8 mm high; disc florets 15-29.
        10 Inner phyllaries densely stipitate-glandular, at least distally ..... ***P. graminifolia*** *var.* ***graminifolia***
        10 Inner phyllaries eglandular to sparsely glandular ..... ***P. graminifolia*** *var.* ***tenuifolia***

Pityopsis aspera (Shuttleworth ex Small) Small *var.* ***adenolepis*** (Fernald) Semple & Bowers. Dry woodlands, forests, and disturbed places, apparently in the NC Mountains only in the Escarpment. Late June-October. E. and c. VA south to n. FL and west to s. MS. Var. *adenolepis* includes 2 chromosome numbers (2n = 18 and 36), which "account, in part, for the range of variation in involucre, floret, and fruit size" (Semple & Bowers 1985). [= FNA, K, Z; > *Heterotheca adenolepis* (Fernald) Ahles – RAB; > *Heterotheca graminifolia* (Michaux) Shinners – RAB, misapplied; < *Chrysopsis graminifolia* (Michaux) Elliott var. *aspera* (Shuttleworth ex Small) A. Gray – C, G, SE, W; = *Chrysopsis graminifolia* (Michaux) Elliott – F, misapplied; = *P. adenolepis* (Fernald) Semple; < *Pityopsis aspera* – S, WH; < *Heterotheca aspera* (Shuttleworth ex Small) Shinners]

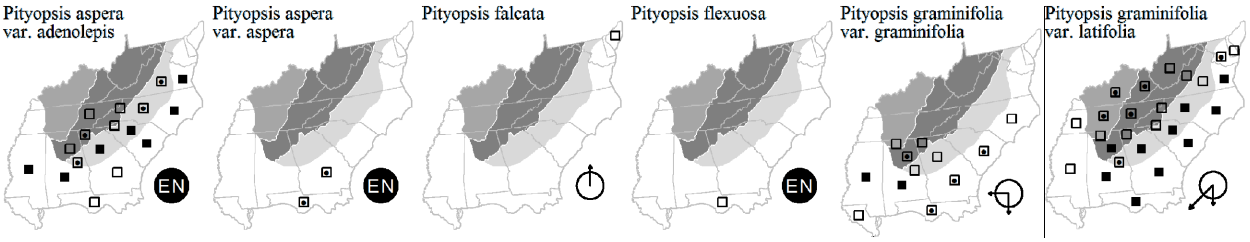
Pityopsis aspera (Shuttleworth ex Small) Small *var.* ***aspera***. Sandhills, dry flatwoods. Sc. GA south to Panhandle FL. [= FNA, K, Z; < *Pityopsis aspera* – S, WH; < *Chrysopsis graminifolia* (Michaux) Elliott var. *aspera* (Shuttleworth ex Small) A. Gray – SE]

Pityopsis falcata (Pursh) Nuttall. Stable dunes (NJ), further north in sandplain grasslands, coastal heathlands, pitch pine-scrub oak barrens. Se. MA south through RI, CT, and NY (Long Island) to s. NJ; found once as a rare introduction in wc. peninsular FL (Pinellas County – Wunderlin & Hansen 2003). [= FNA, K, Z; = *Chrysopsis falcata* (Pursh) Elliott – C, F, G]

Pityopsis flexuosa (Nash) Small. Sandhills. E. Panhandle FL. [= FNA, S, WH, Z; = *Chrysopsis flexuosa* Nash – SE]

Pityopsis graminifolia (Michaux) Nuttall *var.* ***graminifolia***. Sandhills. July-October. As interpreted here, *P. graminifolia* includes 5 varieties "that intergrade and hybridize, when the ploidy level is the same" (Semple & Bowers 1985). Var. *graminifolia* ranges from se. NC south to c. peninsular FL, and west to e. LA; in our area it is known only from the outer Coastal Plain. Two of the varieties do not reach our area, being restricted to peninsular FL: var. *aequilifolia* Bowers & Semple and the hexaploid (2n = 54) var. *tracyi* (Small) Semple. [= FNA, K, Z; < *Heterotheca nervosa* (Willdenow) Shinners var. *microcephala* (Small) Shinners ex Ahles – RAB; < *Chrysopsis graminifolia* (Michaux) Elliott var. *graminifolia* – C; < *Pityopsis microcephala* (Small) Small – S; < *Chrysopsis graminifolia* (Michaux) Elliott var. *microcephala* (Small) Cronquist – SE; < *Pityopsis graminifolia* – WH]

Pityopsis graminifolia (Michaux) Nuttall *var.* ***latifolia*** Fernald. Sandhills, dry woodlands and forests (such as ridgetop pine/heath communities in the Mountains), roadbanks. June-October. Var. *latifolia* is the most widely distributed variety of *P. graminifolia*, ranging from DE (formerly), s. OH, and c. AR south to s. FL and e. TX; Bahamas; and in Mexico (Tamaulipas, Vera Cruz, Oaxaca, Chiapas) and Central America (Belize, Guatemala, Honduras). [= FNA, K, Z; > *Heterotheca nervosa* (Willdenow) Shinners var. *nervosa* – RAB; > *Heterotheca correllii* (Fernald) Ahles – RAB; = *Chrysopsis graminifolia* (Michaux) Elliott var. *latifolia* Fernald – C, W; > *Chrysopsis nervosa* (Willdenow) Fernald var. *nervosa* – F; < *Chrysopsis graminifolia* (Michaux) Elliott – G; > *Chrysopsis nervosa* var. *virgata* Fernald – F; > *Chrysopsis nervosa* var. *stenolepis* Fernald – F; = *Pityopsis graminifolia* – S, misapplied; = *Chrysopsis graminifolia* (Michaux) Elliott var. *graminifolia* – SE, misapplied; < *Pityopsis graminifolia* – WH]



Pityopsis graminifolia (Michaux) Nuttall *var.* ***tenuifolia*** (Torrey) Semple & Bowers. Sandhills, sandy woodlands, savannas, pine flatwoods. July-October. Var. *tenuifolia* ranges from se. NC south to s. FL and west to e. TX (north inland to c. AR and e. OK); apparently disjunct in se. VA. [= FNA, K, Z; < *Heterotheca nervosa* (Willdenow) Shinners var. *microcephala* (Small) Shinners ex Ahles – RAB (also see *P. graminifolia* var. *graminifolia*); < *Pityopsis microcephala* (Small) Small – S (also see *P. graminifolia* var. *graminifolia*); < *Chrysopsis graminifolia* (Michaux) Elliott var. *microcephala* (Small) Cronquist – SE (also see *P. graminifolia* var. *graminifolia*); < *Pityopsis graminifolia* – WH; *? Pityopsis nervosa* var. *nervosa* – Y]

Pityopsis graminifolia (Michaux) Nuttall *var.* ***tracyi*** (Small) Semple. Sandhills. October-December. Endemic to Panhandle FL; reports of it in n. AL are probably based on aberrant individuals of *P. graminifolia*. [= FNA, K, Z; = *P. tracyi* Small – S; < *Chrysopsis graminifolia* – SE; < *Pityopsis graminifolia* – WH; = *Pityopsis nervosa* (Willdenow) Dress var. *tracyi* (Small) D.B. Ward]

Pityopsis oligantha (Chapman ex Torrey & A. Gray) Small, Narrow-leaved Goldenaster. Wet flatwoods and pitcherplant bogs. Sw. GA and Panhandle FL west to s. AL (alleged reports from further west seem to be in error). [= FNA, K, S, WH, Z; = *Chrysopsis oligantha* Chapman ex Torrey & A. Gray – SE; = *Heterotheca oligantha* (Chapman ex Torrey & A. Gray) Harms]

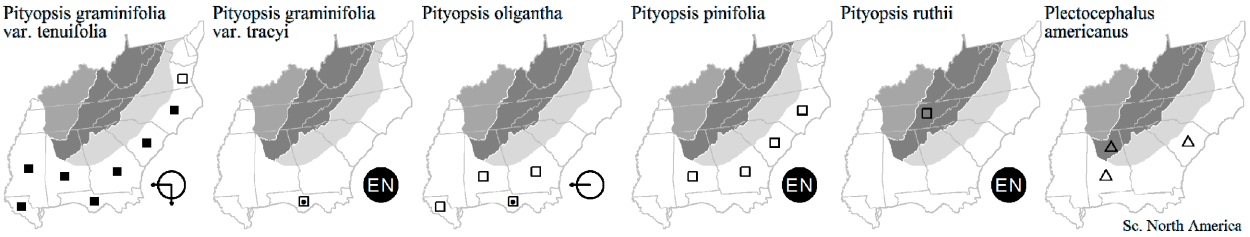
Pityopsis pinifolia (Elliott) Nuttall, Sandhill Goldenaster. Sandhills, sandy roadsides. August-October. This species is locally abundant (and often weedy) but very local in distribution, limited to (apparently) scattered counties in the Sandhills (rarely middle Coastal Plain) of s. NC, SC, GA, and c. AL. [= FNA, K, S, Z; = *Heterotheca pinifolia* (Elliott) Ahles – RAB; = *Chrysopsis pinifolia* Elliott – SE]

Pityopsis ruthii (Small) Small. Flood-scoured rocks along rivers. Restricted to rocks within the flood zone of the Hiwassee and Ocoee rivers, Polk County, TN; it should be sought in adjacent sw. NC. [= FNA, K, S, Z; = *Chrysopsis ruthii* Small – SE; = *Heterotheca ruthii* (Small) V.L. Harms]

Plectocephalus D. Don in R. Sweet 1830 (Basketflower)

A genus of 4 species, annual herbs, of midwestern North America, Mexico, South America, and Africa. References: Keil in FNA (2006a).

* ***Plectocephalus americanus*** (Nuttall) D. Don in R. Sweet, American Basketflower. Waste ground around wool-combing mills; Native of sc. North America (Nesom 2004d). [= FNA; = *Centaurea americana* Nuttall – C, F, G, K, SE]



Pluchea Cassini 1817 (Marsh-fleabane)

A genus of about 40 species, herbs and shrubs, of tropical, subtopical, and warm temperate regions. References: Nesom in FNA (2006a); Godfrey (1952)=Z, Nesom (1989, 2004a)=Y; Arriagada (1998)=X; Pruski (2005)=V; Cronquist (1980)=SE. Key based on FNA and other sources.

1 Stems winged by decurrent leaf bases ..... ***P. sagittalis***
1 Stems not winged by decurrent leaf bases.
  2 Leaves petiolate or narrowly cuneate at the base; [section *Pluchea*].

3 Phyllaries glandular on the outer surface (the outer bracts also somewhat pubescent); inflorescence paniculiform, the lateral branches not reaching or exceeding the central branches; plants to 20 dm tall; [in freshwater habitats, widespread in the Coastal Plain and Piedmont] ..... ***P. camphorata***

3 Phyllaries short-pubescent with several-celled glandular-tipped hairs; inflorescence more-or-less cymiform and flat-topped, some of the lower lateral branches elongate and reaching or exceeding the central branches; plants to 10 (-15) dm tall; [mainly in salty or brackish habitats, restricted to the outer Coastal Plain] ..... ***P. odorata***

2 Leaves sessile, and either rounded, truncate, or clasping at the base; [section *Amplectifolium*].

4 Leaves mostly 8-20 cm long and 3-7 cm wide; involucre 9-12 mm high; middle phyllaries 2.5-3 mm wide ..... ***P. longifolia***

4 Leaves mostly 3-10 cm long and 1-3 cm wide; involucre 5-10 mm high; middle phyllaries 1-1.5 mm wide.

5 Stems and leaves glandular, otherwise nearly glabrous; involucre 4-5 mm wide ..... ***P. yucatanensis***

5 Stems and leaves puberulent or arachnose as well as glandular; involucre 5-12 mm wide.

6 Corollas pink or purple; heads 4-6 mm high, 5-9 mm wide; phyllaries usually arachnoid and commonly also with dense, thick, viscid hairs; outer phyllaries acuminate; nutlets black, 0.5-1 mm long, densely pubescent; [flowering June-July] ..... ***P. baccharis***

6 Corollas creamy white; heads 6-10 mm high, 6-12 mm wide; phyllaries thinly arachnoid, with sessile glands; outer phyllaries obtuse or obtuse-apiculate; nutlets pinkish, ca. 1 mm long, pubescent on the angles; [flowering late July-October].

7 Plants 3-11 dm tall; inner phyllaries 4-6 mm long; [widespread in our area] ..... ***P. foetida*** *var.* ***foetida***

7 Plants 9-25 dm tall; inner phyllaries 6-7 mm long; [of the Coastal Plain of SC southward] ..... ***P. foetida*** *var.* ***imbricata***

Pluchea baccharis (P. Miller) Pruski, Marsh Fleabane. Wet savannas, natural ponds, marshes, ditches. June-July. E. NC south to s. FL, west to se. TX; Bahamas, Cuba, Mexico, and Central America. Pruski (2005) established that *P. baccharis* is the correct name for the taxon known in recent decades as *P. rosea*. Godfrey (1952) recognized two varieties of *P. rosea*, var. *rosea* of se. United States and var. *mexicana* R.K. Godfrey of gypsum plains in San Luis Potosí, Mexico; Nesom (1989) recognized the latter taxon at the species level, *P. mexicana* (R.K. Godfrey) Nesom. [= FNA, V. WH; = *P. rosea* R.K. Godfrey – RAB, K, WH, X, Y; = *P. rosea* var. *rosea* – GW, SE]

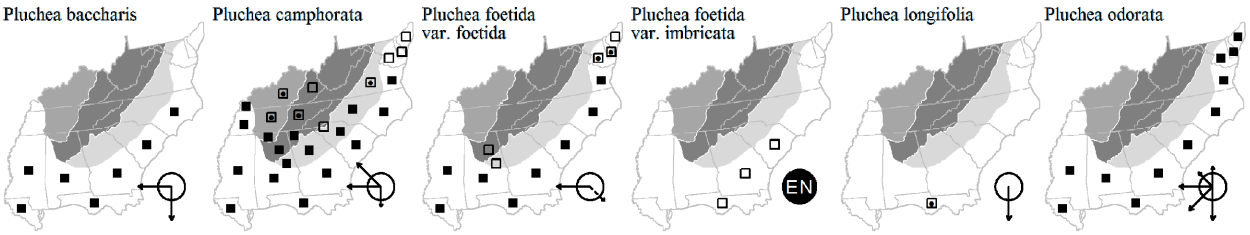
Pluchea camphorata (Linnaeus) A.P. de Candolle, Camphorweed, Camphor Pluchea. Bottomland sloughs, clay flatwoods, other freshwater wetlands. August-October. DE (formerly) and MD south to n. peninsular FL, west to TX and OK, north in the interior to s. OH and e. KS. [= RAB, C, F, FNA, G, GW, K, SE, WH, X, Y; = *P. petiolata* Cassini – S]

Pluchea foetida (Linnaeus) A.P. de Candolle *var.* ***foetida***, Stinking Fleabane. Seasonally wet areas, ditches, various other freshwater wetlands. Late July-October. S. NJ south to s. FL, west to e. TX; West Indies (?). [= K; < *P. foetida* – RAB, C, F, FNA, G, GW, SE, WH, X, Y; > *P. foetida* – S; > *P. tenuifolia* Small – S]

Pluchea foetida (Linnaeus) A.P. de Candolle *var.* ***imbricata*** Kearney. Freshwater wetlands. Late July-October. SC south to FL Panhandle. The validity and distribution of this taxon need additional study. [= K; < *P. foetida* – RAB, C, FNA, GW, SE, WH, X, Y; = *P. imbricata* (Kearney) Nash – S]

Pluchea longifolia Nash. Brackish and freshwater marshes and swamps, ditches, canals. Ne. FL and eastern FL Panhandle (Wakulla and Taylor counties) south to c. peninsular FL (Wunderlin & Hansen 2008). [= FNA, GW, S, WH]

Pluchea odorata (Linnaeus) Cassini, Saltmarsh Fleabane. Salt and brackish marshes. August-October. MA and MI south to s. FL and TX (mostly on the Coastal Plain), also in w. United States, Central America, and South America. Two varieties are sometimes recognized, the widespread and more robust, but small headed var. *odorata* (involucre 4-6 (-7) mm across the disk, with 6-13 (19) functionally staminate flowers; plants 2-8 (-20) dm tall; of VA southward), and the northeastern North American and less robust but large-headed var. *succulenta* (involucre 7-8 (-10) mm across the disk, with (14-) 21-34 functionally staminate flowers; plants 2-6 dm tall; of NC northward). Additional study is needed to warrant recognition of the varieties. [= GW, WH, X, Y; = *P. purpurascens* (Swartz) A.P. de Candolle – RAB; > *P. odorata* var. *odorata* – C, FNA, K, SE; > *P. odorata* (Linnaeus) Cassini var. *succulenta* (Fernald) Cronquist – C, FNA, K, SE; > *P. purpurascens* (Swartz) A.P. de Candolle var. *purpurascens* – F, G; > *P. purpurascens* (Swartz) A.P. de Candolle var. *succulenta* Fernald – F, G; > *P. camphorata* – S, misapplied]



* ***Pluchea sagittalis*** (Lamarck) Cabrera, Wing-stem Camphorweed. Disturbed areas, probably only a waif, known from old collections (1891-1901) from Pensacola, FL, and Mobile, AL; native of South America. July-August. [= FNA, WH; = *P. quitoc* de Candolle – S; = *P. suaveolens* (Vell.) Kuntze – SE] {synonymy incomplete}

* ***Pluchea yucatanensis*** Nesom, Yucatan Camphorweed. Brackish marshes; native of Mexico and Belize. Introduced in s. AL and s. MS. [= FNA]

Polymnia Linnaeus 1753

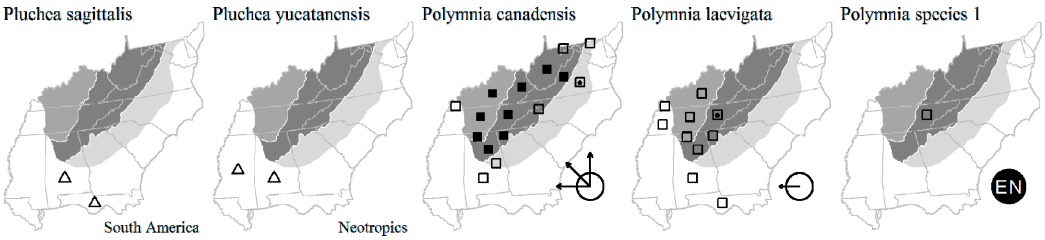
A genus of 4 species, herbs, of e. North America. References: Wells (1965)=Z; Strother in FNA (2006c); Cronquist (1980)=SE. [also see *Smallanthus*]

1 Cypselas 3-ribbed; leaves of the lower and middle stem with 2-3 lobes on either side of the midvein; stem obviously and usually densely long-pubescent (rarely glabrous or glabrescent except the upper stem) ..... ***P. canadensis***
1 Cypselas 4-6-ribbed; leaves of the lower and middle stem with > 5 lobes on each side of the midvein; stem glabrous or nearly so (except sometimes short-hairy in the inflorescence) ..... ***P. laevigata***

Polymnia canadensis Linnaeus, White-flowered Leafcup. Moist forests, particularly over calcareous rocks. July-October. VT and ON west to MN, south to NC, nw. GA, AL, and AR. [= C, F, FNA, G, K, RAB, SE, W, WV, Z; > *P. canadensis* – S; > *P. radiata* (A. Gray) Small – S]

Polymnia laevigata Beadle, Tennessee Leafcup. Bouldery slopes, coquina outcrops and rubble (in FL). W., c., and se. TN (Chester, Wofford, & Kral 1997), AL, Panhandle FL (Jackson County), nw. GA, and MO. [= FNA, K, S, SE, WH, Z]

Polymnia species 1. Limestone boulders and outcrops. Under research by Dwayne Estes. {not yet keyed}



Prenanthes Linnaeus 1753 (Rattlesnake-root)

A genus of about 30 species, herbs, of north temperate parts of the New and Old World. Molecular and morphological studies suggest that *Prenanthes* includes disparate components, and North American taxa are best treated in the segregate genus *Nabalus*. References: Bogler in FNA (2006a); Johnson (1980)=Z; Fusiak & Schilling (1984)=Y; Cronquist (1980)=SE. Key adapted from C and SE, in part.

Identification notes: The species cannot be reliably identified in sterile condition. "Principal phyllaries" are the inner, well-developed, excluding the few smaller and poorly-developed outer phyllaries.

1 Principal phyllaries 12-15; florets 15-38 per head; [entering our area in WV from the north and west] ..... ***P. crepidinea***
1 Principal phyllaries 4-10; flowers mostly 4-19 per head; [collectively widespread in our area].
  2 Phyllaries evidently (though sometimes sparsely) pubescent with long coarse hairs (1.5-3 mm long).
    3 Inflorescence corymbiform to paniculiform, many of the branches well-developed.
      4 Phyllaries densely setose; leaves usually merely toothed, sinuate, or shallowly lobed ..... ***P. barbata***
      4 Phyllaries sparsely setose; principal leaves usually evidently lobed ..... ***P. serpentaria***
    3 Inflorescence cylindric, thyrsoid, the branches very short.
      5 Heads ascending or nearly erect; principal phyllaries (6-) 8 (-10); flowers (8-) 11-14 (-19) per head; [WV, KY, TN, nw. AL, MS and westwards] ..... ***P. aspera***
      5 Heads nodding; principal phyllaries 4-7 (-9); flowers 5-8 (-13) per head; [of the Southern Appalachians] ..... ***P. roanensis***
  2 Phyllaries glabrous or with few cilia or inconspicuous fine short pubescence at the tip.
    6 Principal phyllaries (4-) 5 (-6); flowers 4-6 per head ..... ***P. altissima***
    6 Principal phyllaries 7-10; flowers 8-15 per head.
      7 Inflorescences narrow and elongate (virgate); flowers pink to purple ..... ***P. autumnalis***
      7 Inflorescences open, corymbiform to paniculiform, with some elongate branches; flowers white, cream, yellowish, pink, or purple.
        8 Pappus cinnamon-brown; corolla whitish to pinkish ..... ***P. alba***
        8 Pappus straw-colored to light brown; corolla pale yellow ..... ***P. trifoliolata***

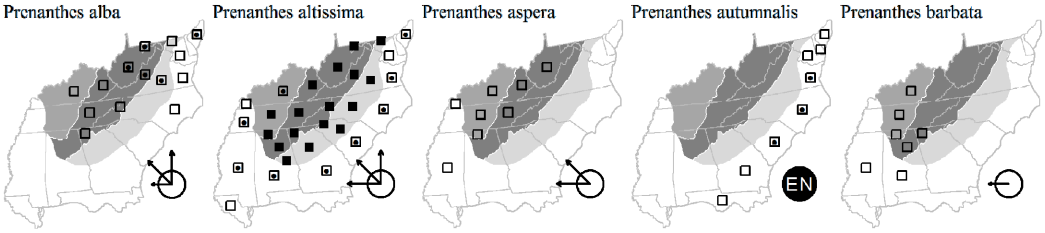
Prenanthes alba Linnaeus, Northern Rattlesnake-root. Forests. August-November. ME west to MB, south to ne. NC, w. NC, WV, and MO. Reported for GA (GANHP). Reports of *P. alba* from the Coastal Plain of NC and perhaps VA are based on *P. alba* ssp. *pallida*, which is invalidly published; additionally, specimens attributed to this taxon appear to be better attributed to *P. trifoliolata*. [= C, F, FNA, G, K, SE, W, Z; = *P. alba* ssp. *alba* – RAB; = ***Nabalus albus*** (Linnaeus) Hooker – S]

Prenanthes altissima Linnaeus, Tall Rattlesnake-root. Forests. August-November. NL (Newfoundland) west to MI, south to GA, LA, and AR. [= FNA, G, K, RAB, W, WV, Y, Z; > *P. altissima* var. *altissima* – C, F, SE; = ***Nabalus altissimus*** (Linnaus) Hooker – S]

Prenanthes aspera Michaux, Rough Rattlesnake-root. Prairies, glades, and barrens. August-September. PA, OH, WI, MN, and SD south to c. TN, MS, LA, and OK. [= C, F, G, K, SE; = ***Nabalus asper*** (Michaux) Torrey & A. Gray – S; = *Nabalus asperus*, orthographic variant]

Prenanthes autumnalis Walter, Slender Rattlesnake-root. Pocosins, pine savannas, forest edges. September-November. NJ south to ne. FL, a Southeastern Coastal Plain endemic. [= C, F, FNA, G, K, RAB, SE, WH, Z; = *Nabalus virgatus* (Michaux) A.P. de Candolle – S; = ***Nabalus species 1***]

Prenanthes barbata (Torrey & A. Gray) Milstead, Barbed Rattlesnake-root, Flatwoods Rattlesnake-root. Limestone glades and barrens. C. TN (Western Highland Rim) (Chester, Wofford, & Kral 1997), nw. GA, and n. AL west to se. AR, e. TX and w. LA. [= FNA, K, SE; < *Nabalus integrifolius* Cassini – S, misapplied; = *P. serpentaria* Pursh var. *barbata* Torrey & A. Gray; = ***Nabalus barbatus*** (Torrey & A. Gray) A. Heller]

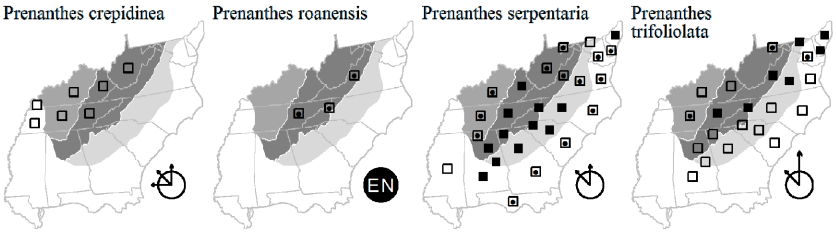


Prenanthes crepidinea Michaux, Midwestern Rattlesnake-root. Rich forests. August-October. A midwestern species, ranging east to NY, sw. PA, e. WV, and c. TN (Western Highland Rim) (Chester, Wofford, & Kral 1997). [= C, F, FNA, G, K, SE, WV; = ***Nabalus crepidineus*** (Michaux) A.P. de Candolle – S]

Prenanthes roanensis (Chickering) Chickering, Roan Rattlesnake-root, Appalachian Rattlesnake-root. Mountain forests, grassy balds, at high elevations. August-October. Sw. VA south to w. NC and e. TN. Fusiak & Schilling (1984) studied *P. roanensis* and related species. Additional characters (other than those explicitly used in the key above) useful in separating *P. roanensis* from *P. altissima* are: phyllary tips usually black (vs. usually green), flowers 5-8 per head (vs. 4-6), and inflorescence usually narrow and thyrsoid (vs. usually conspicuously branched). [= C, FNA, K, RAB, SE, W, Y, Z; > *P. cylindrica* (Small) Braun – G; > ***Nabalus roanensis*** Chickering – S; > *Nabalus cylindricus* Small – S]

Prenanthes serpentaria Pursh, Lion's-foot, Gall-of-the-earth. Forests. August-October. MA south to GA, ne. FL, Panhandle FL, and MS. [= C, F, FNA, G, K, RAB, SE, W, WH, WV, Y, Z; > ***Nabalus serpentarius*** (Pursh) Hooker – S; >< *Nabalus integrifolius* Cassini – S (also see *Prenanthes barbata*)]

Prenanthes trifoliolata (Cassini) Fernald, Gall-of-the-earth. Forests. August-November. NL (Newfoundland) south to e. NC, n. GA, and TN. [= C, FNA, G, K, SE, W, Z; > *P. trifoliolata* – RAB; > *P. alba* ssp. *pallida* Milstead – RAB, not validly published; *?* *P. trifoliolata* var. *trifoliolata* – F; = *Nabalus trifoliatus* – S, orthographic variant; = ***Nabalus trifoliolatus*** Cassini]



Pseudognaphalium Kirpicznikov 1950 (Rabbit-tobacco)

A genus of about 100 species, herbs, nearly cosmopolitan, especially of American temperate regions. References: Nesom in FNA (2006a); Mahler (1975)=Z; Arriagada (1998)=Y; Cronquist (1980)=SE; Nesom (2001a)=X; Anderberg (1991). Key based, in part, on SE.

1 Involucre 2-3 mm high; plants 3-15 (-25) cm tall; inflorescence of many, small, axillary and terminal clusters overtopped by subtending leaves ..... ***[see Gnaphalium uliginosum]***
1 Involucre 3-7 mm high; plants 15-100 cm tall; inflorescence terminal, elongate, clustered, or corymbiform.
2 Leaves distinctly (but shortly) decurrent 1-10 mm and adnate-auriculate on the stem.
3 Upper surface of the leaves coarsely glandular-hairy; heads in corymbiform arrays ..... ***Ps. macounii***
3 Upper surface of the leaves loosely tomentose, not glandular; heads in terminal glomerules
4 Involucres 3-4 mm high; bisexual florets 5-10 (corollas red-tipped); cypselae with papilliform hairs ..... ***Ps. luteoalbum***
4 Involucres 4-6 mm high; bisexual florets mostly 18-28 (corollas evenly yellowish, not red-tipped); cypselae glabrous..... ***Ps. stramineum***
2 Leaves sessile, not decurrent or adnate-auriculate.
5 Stem white-woolly or arachnoid with matted white hairs, the stem surface generally obscured (sometimes glandular-pubescent at the base of the stem only)..... ***Ps. obtusifolium***
5 Stem glandular-pubescent or glandular-puberulent, the hairs at right angles to the stem, the stem surface plainly visible.
6 Stems glandular-villous, the stipitate glands (0.1-) 0.3-1.0 mm high, prominently variable in height on any portion of the stem, with a stalk broadened toward the base and about equal the gland width; pistillate florets 83–107, bisexual florets 9–15; leaves mostly oblong-lanceolate, 2.5–7 cm long, 4–20 mm wide, 4–8 times longer than wide; plant 4-10 dm tall ..... ***Ps. helleri***
6 Stems glandular-puberulent, the stipitate glands 0.1–0.2 mm high, relatively even in height on any portion of the stem, with a filiform stalk of even width and narrower than the gland width; pistillate florets 47–78, bisexual florets (7–) 11–20; leaves linear to linear-lanceolate or linear-oblanceolate, 1.5–5.5 cm long, 1.5–10 mm wide, 6–10 times longer than wide; plant 3-7 dm tall..... ***Ps. micradenium***

Pseudognaphalium helleri (Britton) A. Anderberg, Heller's Rabbit Tobacco. Dry woodlands and openings (especially over mafic rocks), sandhills. September-October. Sc. VA south to Panhandle FL, s. AL, west to AR, LA, and ne. TX. [= FNA, X; = *Gnaphalium helleri* Britton var. *helleri* – Z; < *Gnaphalium helleri* – C, G, RAB, S, SE, W (also see *Ps. micradenium*); = *Gnaphalium obtusifolium* var. *helleri* (Britton) Blake – F, Y; = *Pseudognaphalium helleri* (Britton) A. Anderberg ssp. *helleri* – K; < *Pseudognaphalium helleri* – WH]

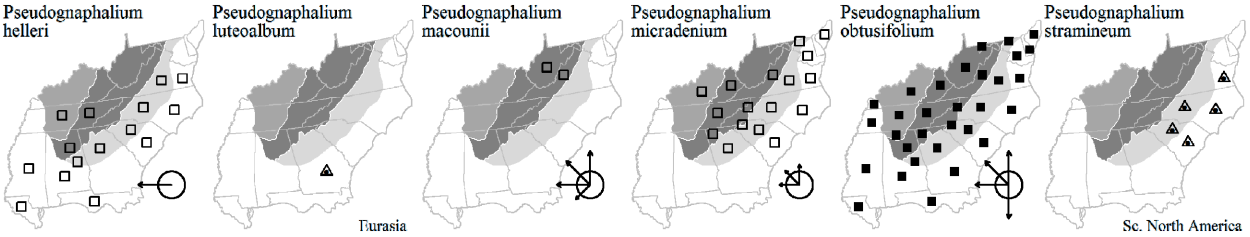
* ***Pseudognaphalium luteoalbum*** (Linnaeus) Hilliard & B.L. Burtt, Red-tipped Rabbit Tobacco. Mowed rights-of-way; native of Eurasia. April-June. [= FNA, K] {add synonymy}

Pseudognaphalium macounii (Greene) Kartesz, Clammy Cudweed, Winged Cudweed, Clammy Everlasting. Dry fields, pastures, and woodland edges at high elevations. July-September. QC west to BC, south to w. VA, WV, TN, and Mexico. [= FNA, K; = *Gnaphalium macounii* Greene – C, F, S, WV; < *Gnaphalium viscosum* – SE, Y, misapplied; < *Pseudognaphalium viscosum* (Kunth) W.A. Weber, misapplied]

Pseudognaphalium micradenium (Weatherby) Nesom, Small Rabbit Tobacco. Dry woodlands and openings. September-October. Se. ME west to WI, south to e. SC, c. GA, se. TN, and s. MO. Nesom (2001a) discusses the distinctiveness of this taxon and its treatment as a species, rather than variety. [= FNA, X; = *Gnaphalium helleri* Britton var. *micradenium* (Weatherby) Mahler – Z; < *Gnaphalium helleri* – C, G, RAB, S, SE, W; = *Gnaphalium obtusifolium* var. *micradenium* Weatherby – F, Y; = *Pseudognaphalium helleri* (Britton) A. Anderberg ssp. *micradenium* (Weatherby) Kartesz – K]

Pseudognaphalium obtusifolium (Linnaeus) Hilliard & Burtt, Fragrant Rabbit Tobacco. Openings, woodlands, coastal dunes, sandy pinelands. disturbed areas. August-October. NL (Newfoundland) west to ON, south to s. FL and TX. [= FNA, WH, X; = *Gnaphalium obtusifolium* Linnaeus – RAB, S, SE, W, WV; > *G. obtusifolium* var. *obtusifolium* – F; > *Gnaphalium obtusifolium* Linnaeus *var. praecox* Fernald – F; = *Gnaphalium obtusifolium* var. *obtusifolium*– C, G, Y; > *Pseudognaphalium obtusifolium* ssp. *obtusifolium* – K; > *Pseudognaphalium obtusifolium* ssp. *praecox* (Fernald) Kartesz – K; *? Gnaphalium polycephalum* Michaux]

* ***Pseudognaphalium stramineum*** (Kunth) A. Anderberg. Sandy fields, roadsides, disturbed places; native of TX south through Mexico and into South America. Late May-August. [= FNA, K; = *Gnaphalium stramineum* Kunth – C; *? G. chilense* Sprengel – RAB, SE, Y]



Pterocaulon Elliott 1823 (Blackroot)

A genus of about 18 species, herbs, of tropical, subtropical, and warm temperate America, and of Oceania and se. Asia. References: Nesom in FNA (2006a); Arriagada (1998)=Z; Cronquist (1980)=SE.

Identification notes: *Pterocaulon* is an unmistakable plant, the stems and leaf undersurfaces creamy-white floccose-tomentose, the leaf bases decurrent down the stem, the heads in oblong, terminal spikes, the tip nodding before anthesis.

Pterocaulon pycnostachyum (Michaux) Elliott, Blackroot, Wingstem. Sandhills, dry pinelands, pine flatwoods. May-June. Se. NC south to s. FL and west to s. AL. [= RAB, FNA, GW, K, SE, WH, Z; = *P. undulatum* (Walter) C. Mohr – S]

Pulicaria Gaertner 1791 (False-fleabane)

A genus of 100 or more species, herbs (rarely shrubs), of Europe, Asia, and Africa. References: Preston in FNA (2006a).

* ***Pulicaria arabica*** (Linnaeus) Cassini. Disturbed areas (on ballast); perhaps just a waif (not recently collected), native of Africa. [= FNA, SE, WH; = *Vicoa auriculata* Cassine – S (misapplied)] {not keyed}

Pyrrhopappus A.P. de Candolle 1838 (False-dandelion)

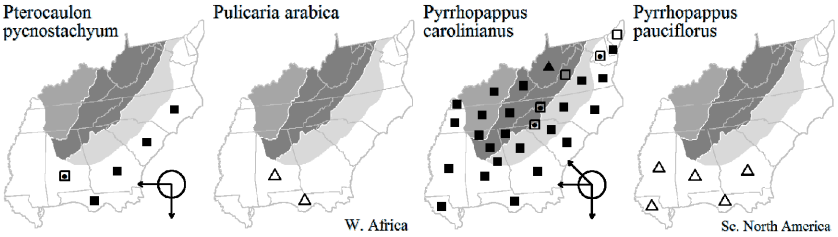
A genus of 3-5 species, herbs, of sw. and se. North America. References: Strother in FNA (2006a); Cronquist (1980)=SE.

1 Outer phyllaries mainly 1/3-2/3 as long as the inner phyllaries; lower and middle stem usually glabrous; leaf margins usually glabrous; upper cauline leaves usually pinnately (3-) 5-7 (-9)-lobed ..... ***P. carolinianus***

1 Outer phyllaries mainly < 1/3 as long as the inner phyllaries; lower and middle stem usually sparsely to densely pilose; leaf margins usually ciliate; upper cauline leaves usually unlobed or pinnately 1-5-lobed..... ***P. pauciflorus***

Pyrrhopappus carolinianus (Walter) A.P. de Candolle, False-dandelion. Dry and moist forests, roadsides, meadows, fields. March-June (and sometimes later). DE, se. PA, and MD south to c. peninsular FL, west to IL, MO, and TX; he pre-Columbian range is uncertain. [= C, F, FNA, G, K, W, WH, WV; > *P. carolinianus* var. *carolinianus* – RAB, SE; > *P. carolinianus* var. *georgianus* (Shinners) Ahles – RAB, SE; = *Sitilias caroliniana* (Walter) Rafinesque – S; > *Pyrrhopappus georgianus* Shinners]

Pyrrhopappus pauciflorus (D. Don) A.P. de Candolle, Small-flowered Desert-Chicory. Disturbed areas. (Feb.) April-May. Probably merely adventive in our area from a native distribution from TX south to Coahuila, Nuevo Léon, and Tamaulipas. [= FNA; < *P. pauciflorus* – K; = *Sitilias multicaulis* (A.P. de Candolle) Greene – S; = *P. multicaulis* A.P. de Candolle – SE]



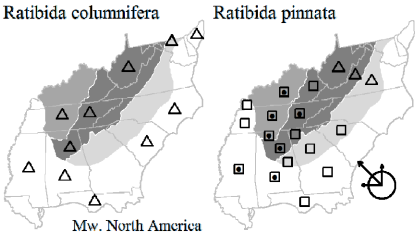
Ratibida Rafinesque 1817 (Prairie Coneflower)

A genus of about 7 species, herbs, of North America. References: Urbatsch & Cox in FNA (2006c); Richards (1968)=Z; Cronquist (1980)=SE. Key adapted from SE.

1 Disks columnar, 2-4.5× as long as thick; plant a tap-rooted perennial; rays < 2 (-2.5) cm long; achenes ciliate and winged, crowned by a pappus consisting of 1 or more awn-teeth ..... ***R. columnifera***
1 Disks ellipsoid-globular, 1-1.6× as long as thick; plant a fibrous-rooted perennial from a woody rhizome or caudex; rays 2.5-3.5 (-4.5) cm long; achenes smooth, lacking a pappus ..... ***R. pinnata***

* ***Ratibida columnifera*** (Nuttall) Wooton & Standley, Columnar Prairie Coneflower. Dry disturbed areas, established around nurseries or plantings, waste areas near wool-combing mills; introduced from further west. May-August. ON west to AB, south to TX, Mexico, and AZ; introduced at scattered sites eastward, including e. NC, e. SC, and c. TN (Chester, Wofford, & Kral 1997). [= C, F, FNA, G, K, SE, WH, WV, Z; = *R. columnaris* (Sims) D. Don – S]

Ratibida pinnata (Ventenat) Barnhart, Globular Prairie Coneflower, Grey-headed Coneflower. Prairie-like glades and oak savannas over gabbro (usually in Iredell soils) or calcareous rocks, cedar glades, calcareous (black belt or chalk) prairies, disturbed areas (naturalized from cultivation). June-August. S. ON west to MN and SD, south to w. PA, e. TN, nw. GA, Panhandle FL, MS, OK, and ne. TX (Singhurst, Mink, & Holmes 2010); disjunct in nc. SC. A characteristic plant of midwestern prairies and limestone glades, remarkably disjunct to "Piedmont prairie" remnants in SC (Nelson 1993). [= C, F, FNA, G, K, S, SE, W, WH, WV, Z]



Rudbeckia Linnaeus 1753 (Yellow Coneflower, Black-eyed Susan)

A genus of about 15 species, herbs, of North America. References: Urbatsch & Cox in FNA (2006c); Cronquist (1980)=SE; Perdue (1957)=Z. Key adapted in part from SE and FNA.

Identification notes: This treatment needs considerable additional work in the herbarium, and will likely be substantially modified.

1 Leaves grasslike, linear-lanceolate, > 10× as long as wide, the basal with blade 10-20 cm long and < 1 cm wide; [of Coastal Plain, of s. GA southward and westward].
  2 Plant with 1 head; rays red, orange, or maroon, 1.0-1.5 cm long; plant pubescent ..... ***R. graminifolia***
  2 Plant with several heads; rays yellow, 1.5-3.5 cm long; plant glabrous ..... ***R. mohrii***
1 Leaves broader, lanceolate, ovate, or pinnately-cleft, < 10× as long as wide; [collectively widespread].
  3 Leaves (at least some of the largest and generally more basal) 3-lobed or more divided.
    4 Disc flowers yellow or yellowish-green; achenes 3.5-6.0 mm long.
      5 Basal and lower stem leaves 1-5-lobed; plants 0.5-2 m tall.
        6 Heads small, the disc mostly 1.0-1.5 cm wide; rays usually 5 or 8; [of the Coastal Plain and Piedmont, VA south to FL, west to LA] ..... ***R. laciniata*** *var.* ***digitata***
        6 Heads larger, the disc mostly 1.5-2.0 cm wide; rays usually 8 or 13; [of high elevations of the Appalachians, VA and KY south to NC and TN] ..... ***R. laciniata*** *var.* ***humilis***
      5 Basal and lower stem leaves 1-2-pinnatifid, with 5-many lobes; plants 1-3 m tall.
        7 Achenes 3.5-4.0 mm long; pappus > 0.7 mm long; [of DE, MD, and PA northward] ..... ***R. laciniata*** *var.* ***bipinnata***
        7 Achenes 4.2-6.0 mm long; pappus < 0.7 mm long; [widespread in our area] ..... ***R. laciniata*** *var.* ***laciniata***
    4 Disc flowers purple-brown; achenes 1.9-3.5 mm long.
      8 Pales acute, hairy near the tip; rays 20-40 mm long ..... ***R. subtomentosa***
      8 Pales cuspidate, with awn-like tips ca. 1.5 mm long, glabrous; rays 8-30 mm long.

9 Cauline leaves 1-3-lobed (at least some on a plant 3-lobed).
10 Ray blades 8-17 mm long; discs 10-15 mm across; [widespread in our area] ... ***R. triloba*** *var.* ***triloba***
10 Ray blades 18-30 mm long; discs 15-20 mm across; [at moderate to high elevations in the Appalachians] ... ***R. triloba*** *var.* ***rupestris***
9 Cauline leaves 1-7-lobed (at least some on a plant 5-7-lobed).
11 Phyllaries > 9 mm long; [of the Mountains of NC, VA, and TN] ... ***R. triloba*** *var.* ***beadlei***
11 Phyllaries < 7 mm long; [of the Coastal Plain of s. AL and Panhandle FL] ... ***R. triloba*** *var.* ***pinnatiloba***
3 Leaves simple, unlobed, toothed (or not).
12 Pales (bracts of the receptacle) glabrous or nearly so (except sometimes for a minutely cilate margin).
13 Pales cuspidate, with awn-like tips ca. 1.5 mm long ... [go to key lead 8b, above]
13 Pales obtuse to acute.
14 Larger leaves < 2 cm wide ... ***[R. missouriensis]***
14 Larger leaves > 2 cm wide.
15 Plants 2-3 m tall; stem leaves strongly auriculate-clasping ... ***R. auriculata***
15 Plants 0.5-1.3 m tall; stem leaves petiolate or sessile, but not auriculate-clasping.
16 Basal leaves with bases cuneate to broadly cuneate.
17 Basal leaves with blades 2.5-3.5× as long as wide; plants villous-hirsute ... ***R. fulgida*** *var.* ***fulgida***
17 Basal leaves with blades < 2× as long as wide; plants glabrous to sparsely hairy.
18 Basal leaves attenuate-cuneate at the base; rays 15-25 mm long; upper stem leaves notably reduced in size from the lower stem leaves ... ***R. fulgida*** *var.* ***spathulata***
18 Basal leaves broadly cuneate at the base; rays 20-40 mm long; upper stem leaves not typically reduced in size from the lower stem leaves ... ***R. fulgida*** *var.* ***speciosa***
16 Basal leaves with bases rounded to cordate.
19 Upper stem leaves notably reduced in size from the lower stem leaves ... ***R. fulgida*** *var.* ***sullivantii***
19 Upper stem leaves not typically reduced in size from the lower stem leaves.
20 Basal leaves with bases rounded; rays 20-40 mm long ... ***R. fulgida*** *var.* ***speciosa***
20 Basal leaves with bases broadly rounded to cordate; rays 10-30 mm long ... ***R. fulgida*** *var.* ***umbrosa***
12 Pales densely pubescent near the tip.
21 Plants glabrous or with scattered inconspicuous hairs.
22 Stem very sparsely spreading-villous (to more conspicuously hairy, and then keyable under 21b); disc to 15 mm high ... ***R. heliopsidis***
22 Stem glabrous; disc elongating in fruit, ultimately 12-60 mm high.
23 Leaves strongly blue-green and glaucous; flowering plants 1-2.5 m tall; largest leaves 7-16 cm wide; [cultivated in our area and rarely persisting or spreading] ... ***R. maxima***
23 Leaves green; flowering plants 0.5-1.3 m tall; largest leaves < 6.5 cm wide; [native of pitcherplant bogs and wet flatwoods of e. GA and ne. FL west to s. AL] ... ***R. nitida***
21 Plants conspicuously hirsute or pilose.
24 Plants perennials from a woody rhizome; pappus a low crown; style appendages short, blunt.
25 Disc 10-15 mm across; rays 6-12, mostly spreading, 15-25 mm long; leaves not folded longitudinally ... ***R. heliopsidis***
25 Disc 15-25 mm across; rays 12-25, mostly reflexed, 30-50 mm long; leaves folded longitudinally.
26 Stem hairy only on the upper stem, the hairs ascending and < 0.5 mm long ... ***[R. grandiflora*** *var.* ***alismaefolia]***
26 Stem hairy throughout, the hairs spreading on the lower stem, ascending on the upper stem and ca. 1.0 mm long ... ***R. grandiflora*** *var.* ***grandiflora***
24 Plants annuals, biennials, or perennials from fibrous roots; pappus lacking **or** a low crown to 0.1 mm high; style appendages elongate, subulate (*R. hirta*) or short, acute to obtuse (*R. mollis*).
27 Stems and leaves softly pilose to woolly; style branches short, acute to obtuse; [plants of dry sands of the Coastal Plain of SC southward] ... ***R. mollis***
27 Stems and leaves with coarse and stiffish hairs; style branches elongate, subulate; [plants collectively widespread in our area].
28 Stems leafy mainly towards the base, branched mainly near the middle; peduncles usually ½ the height of the plants; [of the Coastal Plain] ... ***R. hirta*** *var.* ***angustifolia***
28 Stems leafy throughout, branched mainly well above the middle; peduncles < 1/3 the height of the plants; [collectively widespread].
29 Basal leaves broadly elliptic to ovate, 2.5-7 cm wide, mostly ca. 2× as long as wide, with coarsely serrate margins; [primarily Appalachian and westward, mostly of undisturbed habitats] ... ***R. hirta*** *var.* ***hirta***
29 Basal leaves lanceolate to oblanceolate 1-2.5 (-5) cm wide, mostly 3-5× as long as wide, with entire to serrate margins; [widespread and weedy] ... ***R. hirta*** *var.* ***pulcherrima***

Rudbeckia auriculata (Perdue) Kral, Swamp Black-eyed Susan. Cp (FL, GA): pitcherplant bogs, wet roadsides and powerline rights-of-way, seepages; rare (GA Special Concern). Sw. GA and Panhandle FL (Walton County) west to c. and s. AL. See Diamond & Boyd (2004) for detailed information. [= FNA, K, SE, WH; = *R. fulgida* Aiton var. *auriculata* Perdue]

Rudbeckia fulgida Aiton *var.* ***fulgida***, Common Eastern Coneflower. Mt (WV), Pd (DE) {FL?, GA, NC, VA}: dry to wet meadows; uncommon in WV (rare in DE). August-October. NY and IL south to FL and AL. [= C, FNA, G, K, SE; < *R. fulgida* – RAB, GW, W, WH; = *R. fulgida* Aiton – F; > *R. fulgida* – S; > *R. acuminata* C.L. Boynton & Beadle – S; > *R. foliosa* C.L. Boynton & Beadle – S; > *R. truncata* Small – S] {add to synonymy, esp. F, Z}

Rudbeckia fulgida Aiton *var.* ***spathulata*** (Michaux) Perdue. Cp (VA), {FL?, GA, NC, SC, VA}; bottomlands, bogs; uncommon? August-October. VA, WV, and TN south to FL and AL. [= FNA; < *R. fulgida* – RAB, WH; = *R. spathulata* Michaux – F, S; < *R. fulgida* var. *fulgida* – K]

Rudbeckia fulgida Aiton *var.* ***speciosa*** (Wendroth) Perdue. Mt (WV), Cp* (DE*) {GA, VA}: moist forests and woodlands; uncommon (rare in GA and WV). August-October. QC and WI south to GA, AL, and AR. [= C, FNA, K, Z; < *R. fulgida* – RAB, GW, W; = *R. speciosa* Wenderoth var. *speciosa* – F; = *R. speciosa* Wenderoth – WV]

Rudbeckia fulgida Aiton *var.* ***sullivantii*** (C.L. Boynton & Beadle) Cronquist. Mt (WV): {habitats}; rare. August-October. NY, MI, and MO south to PA, WV, and AR. [= F, FNA, G, SE; = *R. speciosa* Wenderoth var. *sullivantii* (C.L. Boynton & Beadle) B.L. Robinson – F; < *R. fulgida* var. *speciosa* – K; = *R. sullivantii* C.L. Boynton & Beadle – S]

Rudbeckia fulgida Aiton *var.* ***umbrosa*** (C.L. Boynton & Beadle) Cronquist, Appalachian Coneflower. Mt (VA), {GA, NC, SC} Rich calcareous slopes, bottomlands; rare? August-October. VA, OH, IN, and MO south to GA, MS, and AR. [= FNA, G, K, SE, Z; < *R. fulgida* – RAB, GW, W; = *R. umbrosa* C.L. Boynton & Beadle – F; > *R. umbrosa* – S; > *R. chapmanii* C.L. Boynton & Beadle – S]

Rudbeckia graminifolia (Torrey & A. Gray) C.L. Boynton & Beadle. Cp (FL): wet savannas and "wet prairies;" rare. Endemic to the Apalachicola region, FL. [= FNA, K, S, SE, WH]

Rudbeckia grandiflora (Sweet) A.P. de Candolle *var.* ***grandiflora***, Largeflower Coneflower. Mt (GA): limestone glades and barrens; rare. MO and KS south to LA and TX; disjunct in nw. GA. [= FNA, K, SE, Z; = *R. grandiflora* – S]

Rudbeckia heliopsidis Torrey & A. Gray, Sunfacing Coneflower, Pineywoods Coneflower. Cp (NC, VA), Mt (GA), {SC}: limestone or sandstone streambanks and barrens, pinelands, roadsides; rare. July-September. VA south to GA and AL. [= RAB, C, F, FNA, G, K, S, SE, W, Z]

Rudbeckia hirta Linnaeus *var.* ***angustifolia*** (T.V. Moore) Perdue, Coastal Plain Black-eyed Susan. Cp (FL?, GA, NC, SC): May-July. SC south to FL, west to TX. [= FNA, K, SE, Z; < *R. hirta* – RAB, WH; *? R. divergens* T.V Moore – S]

Rudbeckia hirta Linnaeus *var.* ***hirta***, Woodland Black-eyed Susan. Mt (WV), {GA, NC, SC, VA}: common in WV. May-July. ME and MI south to GA and MS. [= C, FNA, K, SE, WV, Z; < *R. hirta* – RAB, G, W; > *R. hirta* var. *hirta* – F; > *R. hirta* var. *brittonii* (Small) Fernald – F; > *R. hirta* – S; > *R. amplectens* T.V. Moore – S; > *R. brittonii* Small – S; > *R. monticola* Small – S]

Rudbeckia hirta Linnaeus *var.* ***pulcherrima*** Farwell, Weedy Black-eyed Susan. Mt (WV), Cp (DE), Pd (DE), {FL, GA, NC, SC, VA}: roadsides, fields; common. May-July. NL (Newfoundland) and BC south to FL, TX, CA, and beyond. [= C, FNA, K, SE, WV; < *R. hirta* – RAB, G, W, WH; > *R. serotina* Nuttall var. *serotina* – F; > *R. serotina* var. *corymbifera* (Fernald) Fernald & Schubert – F; > *R. serotina* var. *sericea* (T.V. Moore) Fernald & Schubert – F; > *R. bicolor* Nuttall – S; > *R. longipes* T.V. Moore – S; > *R. sericea* T.V. Moore – S; > *R. hirta* var. *corymbifera* Fernald – Z; > *R. hirta* var. *pulcherrima* – Z]

Rudbeckia laciniata Linnaeus *var.* ***digitata*** (Miller) Fiori, Coastal Plain Cutleaf Coneflower. Cp (FL, GA, NC, SC, VA): bottomlands, streamsides; common (uncommon in VA). July-October. VA south to FL, west to LA. [= C, F, K, SE; < *R. laciniata* – RAB, GW, S, W, WH; < *R. laciniata* var. *humilis* A. Gray – FNA; < *R. laciniata* var. *laciniata* – G]

Rudbeckia laciniata Linnaeus *var.* ***humilis*** A. Gray, Blue Ridge Cutleaf Coneflower. Mt (NC, SC?, VA): seeps, bog edges, brookbanks, moist forests; common (uncommon in VA). July-October. VA and KY south to NC. [= C, F, G, K, SE; < *R. laciniata* – RAB, GW, S, W; < *R. laciniata* var. *humilis* A. Gray – FNA]

Rudbeckia laciniata Linnaeus *var.* ***laciniata***, Common Cutleaf Coneflower, Goldenglow. Cp (DE, FL?, GA, NC, SC, VA), Pd (DE, GA, NC, SC, VA), Mt (GA, NC, SC, VA): moist forests, bottomlands, streambanks; common (uncommon in DE Coastal Plain). July-October. NB, ON, and MB south to FL and TX. [= FNA, K, SE; < *R. laciniata* – RAB, GW, S, W, WH; < *R. laciniata* var. *laciniata* – C, G; > *R. laciniata* var. *laciniata* – F, WV; > *R. laciniata* var. *hortensia* L.H. Bailey – F, misspelling > *R. laciniata* var. *hortensis* L.H. Bailey – WV]

* ***Rudbeckia maxima*** Nuttall, Giant Coneflower. Cp (SC): disturbed ground; rare, cultivated and rarely persistent, native of sc. United States (AR and OK south to LA and TX). [= F, FNA, K, S, SE]

Rudbeckia mohrii A. Gray, Mohr's Coneflower. Cp (FL, GA): wet pine savannas; common. Ec. GA to Panhandle FL. [= FNA, K, S, SE, WH]

Rudbeckia mollis Elliott, Woolly Coneflower. Cp (FL, GA, SC): longleaf pine / turkey oak sandhills; uncommon (rare in SC). Late August-October. SC south to n. peninsular FL, FL Panhandle, west to s. AL. [= RAB, FNA, K, S, SE, WH, Z]

Rudbeckia nitida Nuttall, St. John's Black-eyed Susan. Cp (FL, GA): wet pine savannas; uncommon. E. GA and ne. FL south to c. peninsular FL, west to s. AL. [= FNA, K, WH; > *R. nitida* – S; > *R. glabra* A.P. de Candolle – S; = *R. nitida* var. *nitida* – SE]

Rudbeckia subtomentosa Pursh. Pd* (NC*): moist to dry woodlands, prairies, disturbed areas; rare. Nc. TN (Chester, Wofford, & Kral 1997). MI, IA, and OK south to TN, MS and TX; eastwards as introductions or possibly disjuncts. Known for NC only from a single 1897 specimen from Hollow Rock, Orange Co. NC; probably an introduction. [= F, FNA, K, S, SE, Z]

Rudbeckia triloba Linnaeus *var.* ***beadlei*** (Small) Fernald, Chauncey's Coneflower. Mt (NC, VA): seepy mafic or limestone cliffs; rare. July-October. A Southern Appalachian endemic: sw. VA and KY south to w. NC and TN. It is not at all clear that this taxon is distinct. [< *R. triloba* var. *beadlei* – F; < *R. triloba* var. *pinnatiloba* Torrey & A. Gray – C, FNA, G, K, SE, Z (defined broadly to include "*R. beadlei*"); < *R. triloba* – RAB, W; = *R. beadlei* Small – S]

Rudbeckia triloba Linnaeus *var.* ***pinnatiloba*** Torrey & A. Gray, Pinnate-leaf Coneflower. Cp (FL): calcareous soil, {additional habitat}; rare. S. AL and Panhandle FL. July-October. [< *R. triloba* var. *pinnatiloba* Torrey & A. Gray – C, FNA, G, K, SE, Z (defined broadly to include "*R. beadlei*"); = *R. pinnatiloba* (Torrey & A. Gray) Beadle – S; < *R. triloba* – WH] {synonymy incomplete, etc.}

Rudbeckia triloba Linnaeus *var.* ***rupestris*** (Chickering) A. Gray, Blue Ridge Three-lobed Coneflower. Mt (NC): moist forests and rock outcrops; common. July-October. A Southern Appalachian endemic: KY south to NC and TN. [= F, FNA, K, SE, Z; < *R. triloba* – RAB, W; = *R. rupestris* Chickering – S]

Rudbeckia triloba Linnaeus *var.* ***triloba***, Common Three-lobed Coneflower. Mt (GA, VA, WV), Pd (DE, GA, VA), Cp (DE, VA), {NC}: moist forests and rock outcrops; common (uncommon in DE). July-October. VT, ON, MN, and NE south to GA and TX; westward in CO and UT (as introductions?). [= C, F, FNA, G, K, SE; < *R. triloba* – RAB, W, WV; = *R. triloba* – S]

Rudbeckia grandiflora (Sweet) A.P. de Candolle var. *alismifolia* (Torrey & A. Gray) Cronquist. Cp: prairies, open woodlands. MS west to AR, LA, and TX; disjunct in KY. [= K; = *R. grandiflora* var. *alismaefolia* – FNA, SE, orthographic variant; = *R. alismaefolia* Torrey & A. Gray – S]

Rudbeckia laciniata Linnaeus var. *bipinnata* Perdue. NH and NY south to DE, MD, and PA. [= FNA, K; < *R. laciniata* var. *laciniata* – C, F, G]

Rudbeckia missouriensis Engelmann ex C.L. Boynton & Beadle, Missouri Coneflower. KY, IL, MO, and OK south to LA and TX. [= FNA, C, F, K, S, SE; = *R. fulgida* var. *missouriensis* (Engelmann) Cronquist – G]

Rugelia Shuttleworth ex Chapman 1860 (Rugelia, Rugel's Ragwort)

A monotypic genus, an herb, endemic to the Great Smoky Mountains of w. North Carolina and e. Tennessee. Treated variously as *Senecio* or *Cacalia* in most recent North American floras (see synonymy), this species is anomalous in both and is best treated as a monotypic genus (Bremer 1994). References: Barkley in FNA (2006b); Bremer (1994)=Z; Barkley (1999)=Y; Pippen (1978)=X; Cronquist (1980)=SE.

Rugelia nudicaulis Shuttleworth ex Chapman, Rugelia, Rugel's Ragwort, Winter-well. High elevation forests and openings, primarily in spruce-fir forests, but extending in places downslope into northern hardwood forests. June-August. The genus and species is endemic to the Great Smoky Mountains of w. NC and e. TN, all known populations within Great Smoky Mountains National Park. Where it occurs, it is usually locally abundant, often even the dominant herb. The basal rosettes are evergreen, and are conspicuous in all seasons. [= FNA, K, Y, Z; = *Senecio rugelia* Gray – RAB, S; = *Cacalia rugelia* (Gray) Barkley & Cronquist – SE, W, X]

Santolina Linnaeus 1753

A genus of about 8-18 species, shrubs, of the Mediterranean region. References: Watson in FNA (2006a).

* ***Santolina chamaecyparissus*** Linnaeus, Holy-flax, Lavender-cotton, Cypress Lavender-cotton. Disturbed areas; native of Mediterranean Europe. March-October. This species is introduced in e. and w. NC (Fox, Godfrey, & Blomquist 1952). Graetz (1973) recommended it for planting in barrier island areas of the Carolinas. [= C, K]

Sclerolepis Cassini 1816 (Sclerolepis)

A monotypic genus, a perennial herb, of se. North America. References: Lamont in FNA (2006c); Cronquist (1980)=SE.

Sclerolepis uniflora (Walter) Britton, Sterns, & Poggenburg, Sclerolepis. In shallow water (later sometimes stranded on shore by dropping water levels) of clay-based Carolina bays, natural lake shores, blackwater stream shores and swamps, in seepage wetlands including sea-level fens. May-August; July-October. NH south to c. peninsular FL, west to sw. AL (very rare north of NC); slightly disjunct in s. MS and se. LA (Sorrie & LeBlond 2008). [= RAB, C, F, FNA, G, GW, K, SE, WH]

Scolymus Linnaeus 1753 (Golden Thistle)

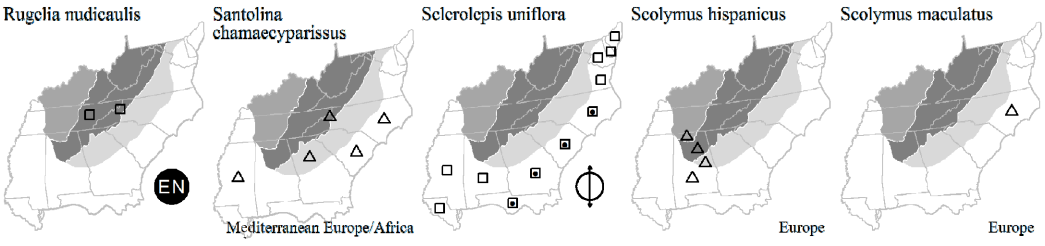
A genus of 3 species, herbs, of the Mediterranean region. References: Strother in FNA (2006a).

1 Stem wings and leaf blades with margins little or not whitened and thickened; pappus of several scales; plant a biennial or perennial ..... ***S. hispanicus***

1 Stem wings and leaf blades with margins white and thickened; pappus absent; plant an annual ..... ***S. maculatus***

* ***Scolymus hispanicus*** Linnaeus, Golden Thistle, Spanish Salsify. On ballast at seaports (at least formerly); native of Europe. AL. [= FNA, K]

* ***Scolymus maculatus*** Linnaeus, Golden Thistle. On ballast at seaports (formerly); native of Europe. Small (1933) states that *Scolymus* "has been found on ballast on the seacoast of N.C."; the site was likely the port of Wilmington. [= FNA, K, S]



Senecio Linnaeus 1753 (Ragwort, Groundsel)

A genus of very uncertain circumscription, if treated broadly with as many as 1500-2000 species, trees, shrubs, herbs, and vines. The trend is to divide *Senecio* into smaller, more natural genera. Most species traditionally treated as "*Senecio*" in our flora are

not even part of a broadly defined core group, and have been transferred to *Packera* and *Rugelia*. *Hasteola* (*Synosma*) has been treated as a small genus of perennial herbs (consisting of *Hasteola suaveolens* and the FL peninsular endemic, *H. robertiorum* L.C. Anderson), but Pelser et al. (2007) demonstrate that *Hasteola* is deeply embedded in *Senecio* and closely related to a group of New World *Senecio*; it is so included here. References: Barkley in FNA (2006b); Pelser et al. (2007); Bremer (1994); Cronquist (1980)=SE; Barkley (1999)=Z; Barkley (1978)=Y; Anderson (1994)=X; Pippen (1978)=V. [also see *Ligularia, Packera, Rugelia*]

1 Leaves ovate, hastate at the base, merely toothed, 10-30 (-40) cm long, 4-20 cm wide.....***S. suaveolens***
1 Leaves ovate to oblanceolate, tapered at the base, pinnatifid (or at least strongly toothed), 2-10 cm long, 0.5-2 (-4) cm wide .....***S. vulgaris***

* ***Senecio brasiliensis*** (Sprengel) Lessing *var.* ***tripartitus*** (A.P. de Candolle) Baker, Hempleaf Ragwort. Disturbed areas (on ballast); rare (not collected since 1894, Pensacola, Escambia County, FL), native of South America. [= FNA, WH; = *S. cannabinaefolius* Hooker & Arnott] {not keyed}

Senecio suaveolens (Linnaeus) Elliott, Sweet Indian-plantain. Sandy bottomlands and riverbanks. MA, NY, n. OH, n. IN, c. WI and se. MN, south to n. VA, sw. VA, sw. NC, wc. TN (Chester, Wofford, & Kral 1997), and se. MO; apparently rare through much of its range. This species has not been seen in NC in recent years. [= *Hasteola suaveolens* (Linnaeus) Pojarkova – FNA, K, X; = *Cacalia suaveolens* Linnaeus – RAB, C, F, G, GW, SE, V, W, WV, Y; = *Synosma suaveolens* (Linnaeus) Rafinesque ex Britton – S]

* ***Senecio vulgaris*** Linnaeus, Common Groundsel. Roadsides, fields, disturbed areas; native of Eurasia. March-June. [= RAB, C, F, FNA, G, K, S, SE, W, WH, WV, Y, Z]

Sericocarpus Nees 1832 (White-topped Aster)

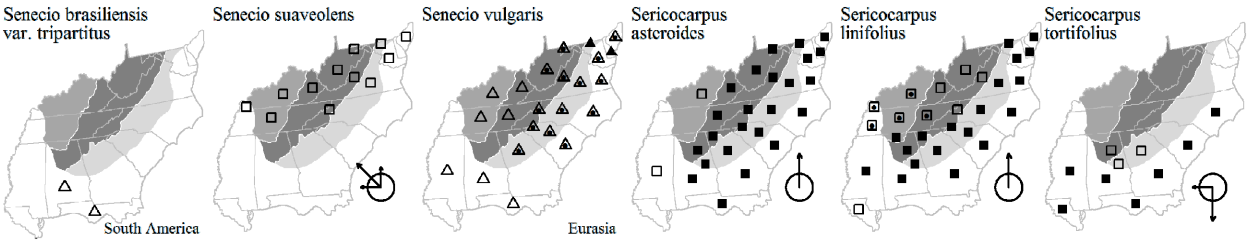
A genus of 5 species, herbs, of North America. This group of species, traditionally treated as *Sericocarpus*, was transferred to *Aster* by Cronquist, a treatment followed by most (but not all) recent floristic works. It now appears, based on morphological and molecular studies, that the traditional treatment as a separate genus is far superior. Nesom (1993a) argues that a variety of characters indicate that *Sericocarpus* is more closely allied to *Solidago*, *Euthamia*, *Bigelowia*, *Chrysoma*, and *Gutierrezia* than it is to *Aster*. Noyes & Rieseberg (1999) provide strong support for this contention, based on molecular evidence. See Nesom (1993a), Jones (1980), Semple & Brouillet (1980), and Noyes & Rieseberg (1999) for further discussion about the affinities of this group. References: Semple & Leonard in FNA (2006b); Leonard, Cook, & Semple (2005)=Y; Nesom (1993a)=Z; Cronquist (1980)=SE.

1 Leaves basally disposed, leaves of the basal rosette much larger than the cauline leaves; leaves (at least the basal) toothed..... ***S. asteroides***
1 Leaves cauline, basal rosette lacking, the mid-cauline leaves the largest; leaves entire (or with 1-2 teeth in *S. tortifolius*).
  2 Leaves (2-) 4-8 cm long, 0.2-1.2 cm wide, linear to oblanceolate, 6-12× as long as wide, not twisted at the base (the leaf blade in a more-or-less horizontal plane); leaves glabrous (but with a ciliate margin), glandular-punctate; involucres glabrous.....***S. linifolius***
  2 Leaves 1.5-4 cm long, 0.6-1.5 (-2.0) cm wide, obovate, 1.5-4× as long as wide, twisted at the base (bringing the leaf blade into a more-or-less vertical plane); leaves puberulent, glandular-punctate, and with prominent resin globules (at 10× magnification); involucres puberulent .....***S. tortifolius***

Sericocarpus asteroides (Linnaeus) Britton, Sterns, & Poggenburg, Toothed White-topped Aster. Dry woodlands, thin soils around rock outcrops, sandhills, dry pinelands. June-July. S. ME and s. VT west to c. OH, south to e. SC, c. GA, w. Panhandle FL, s. AL, and s. MS. Coastal Plain populations are rhizomatous, while inland populations are not; some taxonomic distinction may be warranted (Nesom, pers. comm.). [= F, FNA, K, S, WH, WV, Y, Z; = *Aster paternus* Cronquist – RAB, C, G, SE, W]

Sericocarpus linifolius (Linnaeus) Britton, Sterns, & Poggenburg, Narrow-leaf White-topped Aster. Dry woodlands, sandhills. June-July. MA west to s. OH and s. IN, south to se. SC, c. GA, s. AL, s. MS, and e. LA (Florida parishes). [= F, FNA, K, S, WV, Y, Z; = *Aster solidagineus* Michaux – RAB, C, G, SE, W]

Sericocarpus tortifolius (Michaux) Nees, Twisted-leaf White-topped Aster. Dry to mesic sandhills. August-October. E. NC south to s. FL, west to e. LA (Florida parishes), more or less restricted to the Coastal Plain, but inland onto hard-rock provinces in nc. GA and nc. AL. [= FNA, K, WH, Y, Z; = *Aster tortifolius* Michaux – RAB, SE, W; = *Sericocarpus bifoliatus* (Walter) Porter – S]



Silphium Linnaeus 1753 (Rosinweed)

A genus of 20-30 species, herbs, of e. North America. References: Sweeney (1970)=Z; Perry (1937)=Y; Clevinger in FNA (2006c); Clevinger (2004)=X; Cronquist (1980)=SE; Cruden (1962); Medley (1989); Steyermark (1951).

Identification notes: The number of ray flowers per head is a useful taxonomic character in *Silphium*; since only ray flowers are fertile, the number of ray flowers can also be determined by the number of achenes in freshly fruiting material. The key and taxonomic treatment is provisional.

1 Leaves basally disposed, the basal leaves large and persistent, the stem with very few to many leaves, but these definitely reduced upward in size; leaves entire to toothed, to deeply cut; plants with definite taproots (except *S. brachiatum, S. mohrii,* and *S. wasiotense*).
2 Stem relatively leafy, with 4-5 nodes or more, the stem leaves smaller than the basal, but not merely bracteal.
3 Leaves deeply pinnatifid to bipinnatifid ..... ***S. laciniatum***
3 Leaves merely nearly entire to coarsely toothed (but not pinnatifid).
4 Leaves cuneate to rounded at the base; rays pale (sulphur) yellow; phyllaries acuminate, hispid ..... ***S. mohrii***
4 Leaves subcordate, cordate, to truncate-sagittate at the base; phyllaries glabrous, obtuse to acute.
5 Stem glabrous; pedicel glabrous; phyllaries acute; leaves truncate-sagittate at the base ..... ***[S. brachiatum]***
5 Stem hispid; pedicel hispidulous with hairs ca. 1 mm long; phyllaries obtuse; leaves cordate to subcordate at the base ..... ***[S. wasiotense]***
2 Stem nearly naked, bearing only a few bracteal (very reduced) leaves.
6 Heads relatively large (involucre 13-25 mm high, disk 15-25 mm wide), with 14-40 ray flowers; [of calcareous or mafic glades or woodlands].
7 Principal leaves deeply pinnatifid (or, if entire, definitely lanceolate and with the base tapering to the petiole) ..... ***S. pinnatifidum***
7 Principal leaves toothed (or subentire), cordate or truncate at the base (rarely abruptly narrowed) ..... ***S. terebinthinaceum***
6 Heads relatively small (involucre 6-11 mm high, disk 8-15 mm wide), with 6-12 ray flowers; [of a wide range of mostly dry, often acidic habitats].
8 Blades of basal leaves unlobed (or with a single obscure basal lobe on each side), reniform, usually wider than long, often > 25 cm wide; leaves usually puberulent beneath; achenes shorter than the phyllaries at maturity; [of the upper Piedmont and Mountains] ..... ***S. reniforme***
8 Blades of basal leaves divided or shallowly to deeply lobed, with several lobes on each side, about as wide as long, or longer than wide, < 25 cm wide; leaves usually glabrous (or sparsely scabrous) beneath; achenes longer than (or as long as) the phyllaries at maturity; [collectively widespread].
9 Involucre mostly 1.0-1.5 cm wide; achenes 6-9 mm long at maturity; achene wings < 1 mm wide, the wing tips long acute to acuminate, the sinus between the wing tips V-shaped; [of the Coastal Plain and lower Piedmont from se. VA south to extreme e. GA] ..... ***S. compositum*** *var.* ***compositum***
9 Involucre mostly 1.5-3.0 cm wide; achenes 8-14 mm long at maturity; achene wings 1-2 mm wide, the wing tips either acute to acuminate or obtuse, the sinus between the wing tips either V-shaped or narrowly U-shaped.
10 Achene wing tip obtuse, the sinus between the wing tips narrowly U-shaped; leaf blade usually longer than wide; petiole short, as long as or shorter than the leaf blade (midrib); [of se. SC south to c. peninsular FL and FL Panhandle] ..... ***S. compositum*** *var.* ***ovatifolium***
10 Achene wing tip acute to acuminate, the sinus between the wing tips V-shaped; leaf blade usually as long as wide; petiole long, as long as or longer than the leaf blade (midrib); [of se. NC south to se. GA and FL Panhandle] ..... ***S. compositum*** *var.* ***venosum***

1 Leaves primarily on the stem, basal leaves usually absent or soon withering, the stem with many leaves, these similar in size; leaves entire or toothed; plants fibrous-rooted from a crown, rhizome, or caudex.
11 Stem square; upper leaves connate, fused basally, the stem thus perfoliate.
12 Stem spreading-hispid (rarely nearly glabrous); heads with usually ca. 8 or ca. 13 rays; hairs on lower leaf surface or veins 1-2 mm long ..... ***S. connatum***
12 Stem glabrous or glabrescent; heads with usually ca. 21 or ca. 34 rays; hairs on lower leaf surface absent or < 1 mm long ..... ***S. perfoliatum***
11 Stem terete; leaves not connate.
13 Basal and lower cauline leaf blades cordate, sagittate, or truncate at the base, **and** on well-developed petioles ..... ***[S. brachiatum]***
13 Basal and lower cauline leaf blades either rounded or cuneate at the base, **or** sessile.
14 Stems, leaves, and phyllaries densely stipitate-glandular (in addition to the eglandular pubescence).
15 Plants mostly 8-15 dm tall, with usually 6 or 7 nodes below the inflorescence; glandular hairs of the stems and leaves longer than the eglandular hairs; rays (8-) 12-14 (-16) per head; [of dolomite or limestone in Bibb County, c. AL] ..... ***S. glutinosum***
15 Plants mostly 15-20 dm tall, with usually 9-12 nodes below the inflorescence; stems and leaves ; glandular hairs of the stems and leaves about as long as the eglandular hairs; rays (17-) 19-23 (-33) per head; [of chalk in c. AL] ..... ***S. perplexum***
14 Stems, leaves, and phyllaries not stipitate-glandular, either smooth, scabrous, or hispid.
16 Leaves **both** strictly opposite throughout **and** clasping the stem.
17 Ray flowers 12-22 per head; phyllary surfaces scabrous, hirsute, or hispid ..... ***S. integrifolium***
17 Ray flowers 20-36 (or more) per head; phyllary surfaces glabrous ..... ***S. speciosum***
16 Leaves alternate, opposite, whorled, or combinations of those states (if strictly opposite then not clasping the stem).
18 Ray flowers 20-30 per head (or more) ..... ***[S. radula]***
18 Ray flowers 12-20 per head.
19 Leaf surfaces glabrous.
20 Cauline leaves predominately in whorls of 3 ..... ***S. asteriscus*** *var.* ***trifoliatum***
20 Cauline leaves opposite ..... ***S. asteriscus*** *var.* ***latifolium***
19 Leaf surfaces scabrous to hispid.
21 Basal leaves persistent at flowering ..... ***S. asteriscus*** *var.* ***simpsonii***
21 Basal leaves caducous at flowering.
22 Pales stipitate-glandular ..... ***S. asteriscus*** *var.* ***dentatum***
22 Pales eglandular, scabrous to puberulent ..... ***S. asteriscus*** *var.* ***asteriscus***

Silphium asteriscus Linnaeus *var.* ***asteriscus***. Cp (FL), {Mt, Pd, Cp (GA, NC, SC, VA)} VA, KY, and MO south to FL and TX. [= C, FNA, K1, K2; > *S. asteriscus* – RAB; > *S. dentatum* var. *gatesii* (Mohr) Ahles – RAB; = *S. asteriscus* – F, G, W; > *S. asteriscus*

– S, Y; > *S. asteriscus* var. *asteriscus* – SE; > *S. asteriscus* var. *scabrum* Nuttall – SE; > *S. scaberrimum* Elliott – S; < *S. asteriscus* – WH; > *S. gatesii* C. Mohr – Y]

Silphium asteriscus Linnaeus *var.* ***dentatum*** (Elliott) Chapman. Cp (FL, GA, SC), Pd (GA, SC), Mt (GA) {NC}: NC and TN south to FL and AL. [= FNA, K2; = *S. dentatum* var. *dentatum* – RAB; = *S. dentatum* – F, W; > *Silphium asteriscus* Linnaeus var. *angustatum* A. Gray – K1, SE; > *S. asteriscus* Linnaeus var. *laevicaule* DC – K1; > *S. dentatum* Elliott – SE; > *S. elliottii* Small – S; > *S. incisum* Greene – S; > *S. nodum* Small – S; < *S. asteriscus* – WH; > *S. dentatum* var. *dentatum* – Y; > *S. dentatum* var. *angustatum* (A. Gray) L.M. Perry – Y]

Silphium asteriscus Linnaeus *var.* ***latifolium*** (A. Gray) J.A. Clevinger. {Cp, Pd, Mt (GA, NC, SC, VA)}: VA, WV, and KY south to GA and LA. [= FNA, K2; = *Silphium trifoliatum* Linnaus var. *latifolium* A. Gray – C, F, G, K1; > *Silphium trifoliatum* Linnaus var. *latifolium* A. Gray – SE, Y; = *S. laevigatum* Pursh – RAB; > *S. confertifolium* Small – S, SE, Y; > *S. glabrum* Eggert ex Small – S; < *S. trifoliatum* – W]

Silphium asteriscus Linnaeus *var.* ***simpsonii*** (Greene) J.A. Clevinger. Cp (FL, GA, SC): SC south to FL, west to MS. [= FNA, K2, X; = *S. simpsonii* Greene – K1; = *S. gracile* A. Gray – S, SE; < *S. asteriscus* – WH; = *S. simpsonii* var. *simpsonii* – Y]

Silphium asteriscus Linnaeus *var.* ***trifoliatum*** (Linnaeus) J.A. Clevinger. Pd (NC, SC, VA), Mt, Cp (NC, VA, WV): {hábitats}; uncommon. June-September. NY, OH, and IL south to GA and AL. [= FNA, K2; = *Silphium trifoliatum* Linnaeus var. *trifoliatum* – C, G, K1, SE; = *S. trifoliatum* – RAB, WV; > *S. atropurpureum* Retz. ex Willdenow – F, Y; > *S. trifoliatum* var. *trifoliatum* – F, Y; < *S. trifoliatum* – W]

Silphium compositum Michaux *var.* ***compositum***. Cp (GA, NC, SC, VA), Pd (NC, SC, VA), Mt (NC, SC): sandhills, other xeric forests; common. May-September. VA south to GA. Perhaps worth dividing further into two taxa: *S. compositum* sensu stricto, restricted to the Coastal Plain and extreme lower Piedmont, and distributed from se VA through the Carolina Coastal Plain to extreme e. GA, a distribution very similar to those of *Carphephorus bellidifolius, Cirsium repandum,* and *Vaccinium crassifolium*; and *S. collinum* Greene, with less deeply lobed leaves, and distributed from se. and sc. VA, nc. NC, sw. NC and ne. AL south to sc. SC, c. GA, and ec. AL. [= K1, Y; = *C. compositum* – F; < *S. compositum* var. *compositum* – RAB; > *C. compositum* – S; > *S. orae* Small – S; < *S. compositum* – C, FNA, G, K2, SE, W; = *S. compositum* ssp. *compositum* – Z; > *S. collinum* Greene]

Silphium compositum Michaux *var.* ***ovatifolium*** Torrey & A. Gray. Cp (FL, GA, SC): sandhills; rare. May-September. Se. SC south to c. peninsular FL and FL Panhandle. [= K1; = *Silphium ovatifolium* (Torrey & A. Gray) Small – S, Y; < *S. compositum* – FNA, K2, SE, WH; = *S. compositum* ssp. *ovatifolium* (Torrey & A. Gray) Sweeney & Fisher – Z]

Silphium compositum Michaux *var.* ***venosum*** (Small) Kartesz & Gandhi. Cp (FL, GA, NC, SC), Pd (SC): sandhills, xeric forests. May-September. Se. NC south to se. GA and FL Panhandle. [= K1; = *Silphium venosum* Small – Y; < *S. compositum* var. *compositum* – RAB; > *S. lapsuum* Small – S; > *S. venosum* Small – S; < *S. compositum* – FNA, K2, SE, WH; = *S. compositum* ssp. *venosum* (Small) Sweeney & Fisher – Z]

Silphium connatum Linnaeus, Virginia Cup-plant. Mt (NC, VA, WV), Pd (NC, VA): floodplain forests and openings; uncommon. June-August. VA and WV south to nw. NC. [= RAB, F, WV, Y; = *S. perfoliatum* var. *connatum* (Linnaeus) Cronquist – C, FNA, K1, K2, SE; < *S. perfoliatum* – G, W]

Silphium glutinosum J. Allison, Sticky Rosinweed. Mt (AL): dolomite glades; rare. Known only from calcareous Ketona glades in Bibb County, c. AL (Allison & Stevens 2001). [= FNA, K2]

Silphium integrifolium Michaux, Prairie Rosinweed. Prairies, calcareous glades and barrens. July-September. MI, WI, and se. SD south to c. TN, se. AL, s. MS, s. LA, and OK. [= *S. integrifolium* Michaux var. *integrifolium* – C, FNA, G, K2, SE; > *S. integrifolium* var. *integrifolium* – F, K1, Y; > *S. integrifolium* var. *deamii* L.M. Perry – F, K1; > *S. integrifolium* var. *gattingeri* L.M. Perry – K1, Y]

Silphium laciniatum Linnaeus, Compass-plant. Prairies, limestone barrens, calcareous glades, also sometimes cultivated (including outside of its native distribution). July-September. S. ON, MI. WI, s. MN, and e. SD south to se. TN, s. AL, c. MS, s. LA, c. TX, and n. NM. [= C, FNA, G, K2, SE; > *S. laciniatum* var. *robinsonii* L.M. Perry – F, K1, Y]

Silphium mohrii Small, Shaggy Rosinweed. Mt (GA): prairies; rare. Endemic to c., sc., and se. TN (Chester, Wofford, & Kral 1997) south to nw. GA (Jones & Coile 1988) and nc. AL. [= C, FNA, K1, K2, S, SE, Y]

Silphium perfoliatum Linnaeus, Common Cup-plant. Mt (NC, VA, WV), Pd (NC): floodplain forests and openings, sometimes escaped from cultivation; uncommon (rare in DE and WV). June-August. VT, ON, and ND south to sc. NC, AL, and TX. [= RAB, F, S, WV, Y; = *S. perfoliatum* var. *perfoliatum* – C, FNA, K1, K2, SE; < *S. perfoliatum* – G, W]

Silphium perplexum J. Allison, Old Cahaba Rosinweed. Mt (AL): dolomitic glades and woodlands; rare. Endemic to c. AL (Allison & Stevens 2001). [= FNA; = *S. ×perplexum* – K2]

Silphium pinnatifidum Elliott. Mt (GA): limestone glades and woodlands; rare. C. and se. TN south to nw. GA and AL. [= K1, S, SE; = *S. terebinthinaceum* Jacquin var. *pinnatifidum* (Elliott) A. Gray – F, FNA, K2, Y; < *S. terebinthinaceum* – G; > *S. chickamaugense* Canby]

Silphium reniforme Rafinesque ex Nuttall. Mt (NC, SC, VA, WV), Pd (NC, SC, VA): dry forests; uncommon. Sc. VA, e. WV, and e. TN, south to c. SC, c. GA, and e. AL. Plants with shallowly lobed leaves, with nearly the same distribution as typical *S. reniforme*, have been variously interpreted. [= S; = *S. compositum* Michaux var. *reniforme* (Rafinesque ex Nuttall) Torrey & A. Gray – RAB, F, K1, Y; < *S. compositum* – C, FNA, G, SE, W; < *S. compositum* – K2; = *S. compositum* ssp. *reniforme* (Rafinesque ex Nuttall) Sweeney & Fisher – WV, Z]

Silphium speciosum Nuttall. Prairies, calcareous glades and barrens. July-September. MO west to NE, south to OK; disjunct in c. TN. [= F, Y; = *S. integrifolium* Michaux var. *laeve* Torrey & A. Gray – C, FNA, G, K1, K2, SE]

Silphium terebinthinaceum Jacquin, Prairie-dock. Mt (GA, VA), Pd (NC, SC): mafic glades, barrens, woodlands, and roadsides (NC, SC), calcareous glades, barrens, and woodlands (GA, VA); rare. July-=September. NY, ON, WI, and NE south to nw. GA, MS,and AR; disjunct eastwards in Piedmont of NC and n. SC. *S. rumicifolium* Small refers to plants of limestone in the Ridge and Valley province of e. TN and extreme sw. VA, alleged to differ from *S. terebinthinaceum* in the leaf bases cuneate at the base (vs. cordate or truncate), smaller leaf blades (only to 15 cm long), smaller plants (to 8 dm tall vs. to 30 dm tall), and

outer phyllaries broader than long (vs. longer than broad). The distinction of var. *luciae-brauniae* Steyermark, with leaf blades glabrous above vs. scabrous, is dubious and needs additional study. [= RAB, SE; = *S. terebinthinaceum* var. *terebinthinaceum* – F, FNA, K2; < *S. terebinthinaceum* – G; > *S. terebinthinaceum* var. *terebinthinaceum* – K1, Y; > *S. terebinthinaceum* var. *luciae-brauniae* Steyermark – K1; > *S. terebinthinaceum* – S; > *S. rumicifolium* Small – S, Y]

Silphium wasiotense M. Medley, Appalachian Rosinweed. Open forests. July-September. E. KY and ne. TN (Risk & Wyrick 1996, Chester, Wofford, & Kral 1997). [= C, FNA, K1, K2; = *S. wasiotensis*, orthographic variant]

Silphium brachiatum Gattinger, Cumberland Rosinweed. Endemic to sc. and se. TN (Chester, Wofford, & Kral 1997) and n. AL. And GA? [= F, FNA, G, K1, S, SE, Y]

Silphium radula Nuttall. Mt (GA): rocky hardwood forests; rare (GA Rare). East to nw. GA (Jones & Coile 1988). Not given credence as in our area in FNA and other sources. [= K1, SE; ? *S. asperrimum* Hooker – Y, misapplied; ? *S. gatesii* Mohr – Y?]

Silybum Adanson 1763 (Milk-thistle)

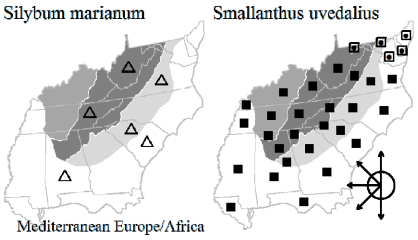
A genus of 2 species, herbs, of the Mediterranean region. References: Keil in FNA (2006a); Cronquist (1980)=SE.

* ***Silybum marianum*** (Linnaeus) Gaertner, Milk-thistle, Blessed-thistle. Disturbed areas; native of s. Europe. May-July. Reported for NC by FNA; documentation unknown. [= C, F, FNA, G, K, SE; = *Mariana mariana* (Linnaeus) Hill – S]

Smallanthus Mackenzie ex Small 1933 (Bearsfoot)

A genus of about 20 species, of tropical, subtropical, and warm temperate America. Robinson (1978) describes the morphological and karyological differences warranting recognition of *Smallanthus* as a genus separate from *Polymnia*. References: Strother in FNA (2006c); Robinson (1978)=Z; Wells (1965)=Y; Cronquist (1980)=SE.

Smallanthus uvedalius (Linnaeus) Mackenzie ex Small, Bearsfoot, Leafcup. Moist forests, bottomland forests, and disturbed places. July-October. NY and IL south to c. peninsular FL and TX; possibly extending through e. Mexico and Central America to Panama, depending on circumscription. [= FNA, K, S, WH, Z; = *Polymnia uvedalia* Linnaeus – RAB, C, SE, W, WV; > *Polymnia uvedalia* var. *uvedalia* – F, G, Y; > *Polymnia uvedalia* var. *densipilis* Blake – F, G, Y; > *Polymnia uvedalia* var. *floridana* Blake – F, Y]



Solidago Linnaeus 1753 (Goldenrod)

A genus of 90-110 species, herbs, primarily North American, but with a few species in South America, Macaronesia, and Eurasia. The placement of the flat-topped goldenrods has been controversial; they are here included in *Solidago* rather than being treated as the separate genus *Oligoneuron*. References: Semple & Cook in FNA (2006b); Nesom (1990); Cronquist (1980)=SE; Morton (1973, 1974); Zhang (1996); Cook & Semple (2004); Nesom (1993b)=Z; Heard & Semple (1988)=Y; Brouillet & Semple (1981)=X; Cronquist (1980)=SE; Braun (1942). Portions of the key adapted (in part) from various sources, especially FNA and SE. [also see *Brintonia, Chrysoma*, and *Euthamia*]

Identification notes: Several related genera readily mistaken for (and/or sometimes included in) *Solidago* are included here as keying "failsafes."

1 Inflorescence corymbiform, flat-topped or broadly rounded and about as broad as long, or broader; [section *Ptarmicoideae*, and section *Solidago*, subsection *Multiradiatae*] ..... **Key A**

1 Inflorescence a panicle, raceme, thyrse, or in axillary clusters, usually longer than broad, or with either the central branch well-developed and elongate, or with numerous branches elongate and more-or-less secund heads; [section *Solidago*].

2 Leaves basally disposed, the basal and lower cauline leaves larger, petiolate, and usually persistent, the middle and upper cauline leaves smaller and less petiolate.

3 Inflorescence cylindrical, of axillary clusters subtended by well-developed stem leaves, **or** a terminal thyrse or raceme, the branches not secund (unless the stem is arching and the heads become oriented to the side of the axis); [subsections *Glomeruliflorae*, *Humiles*, *Maritimae*, *Squarrosae*) ..... **Key B**

3 Inflorescence paniculiform, the major branches (at least) recurved with the heads borne secundly; [subsections *Argutae*, *Junceae*, *Maritimae*, *Nemorales*] ..... **Key C**

2 Leaves chiefly cauline, the basal and lower cauline leaves (when not early withering) the same size as or smaller than the middle and upper cauline leaves.
4 Inflorescence predominantly axillary, with well-developed leaves in at least the lower part of the inflorescence; [subsections *Argutae*, *Glomeruliflorae*, *Squarrosae*, *Thyrsiflorae*] ..... **Key D**
4 Inflorescence a well-developed panicle; [subsections *Triplinervae*, *Venosae*] ..... **Key E**

Key A – goldenrods with corymbiform inflorescences (section *Ptarmicoideae*, and section *Solidago*, subsection *Multiradiatae*)

1 Plant a woody shrub; leaves with a markedly pebbled surface ..... ***[see Chrysoma]***
1 Plant an herb; leaves variously smooth or rugose, but not pebbled.
2 Inflorescence flat-topped; disk flowers 2-12, usually fewer than the ray flowers ..... ***[see Bigelowia]***
2 Inflorescence corymbose (rounded); disk flowers 17-60, more than the ray flowers.
3 Rays white; leaves linear-lanceolate to linear-oblanceolate, the longer (10-) 15-20× as long as wide; pappus bristles slightly to strongly clavellate-thickened; [section *Ptarmicoideae*] ..... ***S. ptarmicoides***
3 Rays yellow; leaves oblong, elliptic, obovate, or spatulate, 2-8× as long as wide; pappus bristles not clavellate thickened.
4 Larger leaves obovate, 5-10 cm long, 1.5-4 cm wide, with prominent teeth; plants small, 0.5-4 dm tall; [of high elevation rock outcrops on Grandfather Mountain, Roan Mountain, and Hanging Rock Mountain (Avery, Watauga, and Mitchell counties), NC]; [section *Solidago*, subsection *Multiradiatae*] ..... ***S. spithamaea***
4 Larger leaves elliptic-oblong, 6-25 cm long, 2-10 cm wide, wiith small, obscure teeth; plants robust, 4-15 dm tall; [of dry, prairie-like sites at low elevations]; [section *Ptarmicoideae*]
5 Larger leaves 3-6 cm wide, ca. 2-8× as long as wide, acute to obtuse, serrate to crenate with numerous teeth (sometimes the teeth very obscure), with many pinnate-netted veins; leaves, stems, and peduncles moderately to densely pubescent.
6 Outer series of phyllaries glabrous on the back (glabrous to short-ciliate on the margin); leaf undersurface glabrous to somewhat hispid (0-20 hairs per mm^2) (the margins and midrib beneath often more densely pubescent); stems glabrous to somewhat hispid (0-25 hairs per mm^2) ..... ***S. rigida* *var.* *glabrata***
6 Outer series of phyllaries pubescent on the back (short-ciliate on the margin); leaf undersurface hispid (7-50 hairs per mm^2); stems slightly to strongly hispid (10-70 hairs per mm^2) ..... ***S. rigida* *var.* *rigida***
5 Larger leaves 0.4-1.6 cm wide, ca. 12-25× as long as wide, acuminate to acute, entire or serrate with a few salient teeth on either side, with 3+ parallel veins.
7 Rays 1-4 per head; cypselas 2-3 mm long; leaves acute to obtuse, rarely folded along the midvein; [of prairies and longleaf pine savannas from MS westward on the Coastal Plain] ..... ***S. nitida***
7 Rays 7-9 per head; cypselas 1.5-2.2 mm long; leaves acuminate, often folded along the midvein; [of wet prairies and fens of interior physiographic provinces] ..... ***S. riddellii***

Key B – goldenrods with basally disposed leaves and elongate, non-secund inflorescences (section *Solidago*, subsections *Glomeruliflorae*, *Humiles*, *Maritimae*, *Squarrosae*)

1 Heads very large, involucre 8-13 mm high; fresh leaves noticeably thick and rubbery in texture; [subsection *Glomeruliflorae*]; [plants of high elevations of NC and TN] ..... ***S. glomerata***
1 Heads smaller, involucre < 8 mm high; fresh leaves not thick or rubbery in texture; [plants collectively widespread].
2 Phyllaries and often also vegetative parts with minute sticky glands; stem leaves petiolate; [subsection *Humiles*].
3 Leaves, peduncles, and phyllaries copiously glandular; [plants of Coastal Plain sandhills] ..... ***S. kralii***
3 Leaves, peduncles, and phyllaries slightly glandular; [plants of rocky glades, cliffs, barrens, and river-scoured outcrops, primarily on mafic or calcareous rocks)].
4 Involucres 7-12 mm high; basal leaves 15-40 mm wide; [of n. AL, e. TN, and e. KY] ..... ***S. arenicola***
4 Involucres 3-7 mm high; basal leaves (2-) 3-22 (-31) mm wide; [of sc. NC, w. VA, and n. VA northward].
5 Achenes glabrous (even when young); flowering plants (3-) 4-10 (-13) dm tall; inflorescence broadly cylindrical, averaging 5-6 cm in diameter; [of rocky, flood-scoured riversides, known only from the Yadkin River in sc. NC] ..... ***S. plumosa***
5 Achenes pubescent (even when mature); flowering plants 1.5-6 (-8.5) dm tall; inflorescence narrowly cylindrical, averaging 2-4 cm in diameter.
6 Lower cauline leaves 7-15× as long as wide, (2.5-) 4.6-9.4 (-11.2) cm long, (2-) 3-9 (-17) mm wide, generally obscurely toothed; [of rocky, flood-scoured riversides, from e. KY, e. TN, and n. VA northward] ..... ***S. racemosa***
6 Lower cauline leaves 3-8× as long as wide, (4.2-) 6.2-11.3 (-15.9) cm long, (5-) 10-22 (-31) mm wide, generally sharply toothed; [of cliffs and barrens, primarily over mafic rocks, from w. VA northward] ..... ***S. randii***
2 Phyllaries and vegetative parts lacking minute sticky glands; stem leaves sessile.
7 Petioles of lower stem leaves sheathing the stems; [of bog and marsh habitats, growing in soils which are permanently or at least seasonally saturated]; [subsection *Maritimae*].
8 Basal leaves 0.7-8 cm wide; plants short, 4-10 (-15) dm tall, typically fairly stout; [of the Mountains and northward].
9 [of seepage over sloping rock on granitic domes, of sw. NC, nw. SC, and ne. GA] ..... ***S. simulans***
9 [of peaty bogs, of w. NC and e. TN northward]
10 Basal leaves 0.7-2.5 cm wide; [south to PA and WV] ..... ***[S. uliginosa* *var.* *linoides]***
10 Basal leaves 3-8 cm wide; [south to NC and TN] ..... ***S. uliginosa* *var.* *uliginosa***
8 Basal leaves 0.7-2.5 (-5) cm wide; plants short to tall, 3-20 dm tall, typically very slender; [of the Coastal Plain and lower Piedmont and southward].
11 Leaf margins smooth, entire; ray flowers 8-13 per head; disk flowers 14-25 per head; pappus (2.5-) 3.0-3.5 mm long ..... ***S. pulchra***
11 Leaf margins (of the basal leaves at least) scabrous-margined, also often toothed; ray flowers 2-7 per head; disk flowers 6-16 per head; pappus (3.0-) 3.5-4.5 (-5.0) mm long.

12 Leaf margins scabrous (or at least tuberculate) throughout; panicle branches often spreading-erect with recurved-secund tips; pappus 2.2-4.0 mm long ..... ***S. gracillima***
12 Leaf margins tending to become smooth on the upper stem; panicle branches usually stiffly erect; pappus 4.0-4.5 (-5.0) mm long ..... ***S. stricta***
7 Petioles of lower stem leaves not sheathing the stems; [of mesic or drier habitats]; [subsection *Squarrosae*].
13 Phyllaries spreading or with squarrose tips ..... ***S. squarrosa***
13 Phyllaries appressed.
14 Phyllaries sparsely to moderately finely stipitate-glandular; [of the Outer Coastal Plain of se. NC] ..... ***S. villosicarpa***
14 Phyllaries and peduncular bracts not glandular; [collectively widespread].
15 Phyllaries linear-lanceolate, attenuate, tapering to pointed or minutely rounded tip.
16 Proximal to mid stem glabrous; rays mostly 6-9; inner phyllaries usually striate with 2 prominent secondary veins ..... ***S. roanensis***
16 Stems and leaves finely hairy throughout with minute strigillose hairs; rays mostly 9-16; inner phyllaries not striate.
17 Leaves 20-50 (-60) per stem; midstem leaves usually 4-5 cm long; phyllaries attenuate; [of the Mountains and Piedmont (rarely Coastal Plain), of GA northward] ..... ***S. puberula*** *var.* ***puberula***
17 Leaves (20-) 50-120 per stem; midstem leaves usually 1-4 cm long; phyllaries acute to acuminate; [of the Coastal Plain from se. VA southward] ..... ***S. puberula*** *var.* ***pulverulenta***
15 Phyllaries ovate to lanceolate, acute to obtuse or rounded.
18 Rays white ..... ***S. bicolor***
18 Rays yellow (may turn pale yellow with age).
19 Leaves and stems sparsely to densely hairy with spreading to appressed hairs ..... ***S. hispida***
19 Leaves and upper stems glabrous.
20 Inflorescence either very narrowly thyrsiform and often interrupted or branches well spaced; mid cauline leaves 0.5-2.0 cm wide; [of MA to se. IN, south to GA and MI, mostly avoiding the Coastal Plain southward] ..... ***S. erecta***
20 Inflorescence usually denser, broader, and crowded, sometimes more open in robust plants, or narrow in plants outside range of *S. erecta*; mid cauline leaves often > 20 mm wide; [of MA to GA, west to SD and scattered south in CO to ne. NM].
21 Mid-stem leaves 0.4-1.5 (-2.0) cm wide; basal leaves 0.8-2.0 cm wide, entire or slightly serrate, present or absent at flowering ..... ***S. speciosa*** *var.* ***rigidiuscula***
21 Mid-stem leaves usually > 2 cm wide; basal leaves (2.0-) 3.0-5.5 cm wide, coarsely serrate, present at flowering ..... ***S. speciosa*** *var.* ***speciosa***

Key C – goldenrods with basally disposed leaves and elongate, secund inflorescences (section *Solidago*, subsections *Argutae*, *Junceae*, *Maritimae*, *Nemorales*)

1 Basal and lower cauline leaves petiolate with a cordate or subcordate blade and/or a cordate-clasping petiole; [subsection *Argutae*].
2 Pappus > ½× as long as the disc corollas; rays 1-3 ..... ***S. auriculata***
2 Pappus < ¼× as long as the disc corollas; rays 3-6 ..... ***S. sphacelata***
1 Basal and lower cauline leaves with cuneate leaf blades and petioles not cordate-clasping (though leaves may have petioles which sheath the stem).
3 Blades of lower leaves ovate to elliptic to oblanceolate, their bases truncate, abruptly tapering, or gradually tapering to petiole; lower leaves including petioles mostly less than 4× as long as wide (sometimes longer in *S. brachyphylla* with densely puberulent leaf surfaces and stems, and in *S. arguta* var. *boottii* and *S. arguta* var. *caroliniana* with blades sharply serrate and heads lacking phyllary-like bracts interior to ray florets); [subsection *Argutae*].
4 Leaves definitely scabrous or moderately to densely soft-villous or puberulent.
5 Leaves scabrous on the upper surface.
6 Basal and lower cauline leaves 8-30 cm long, 4-10 cm wide, mostly 2-3× as long as wide; upper stem leaves few, somewhat reduced, sharply toothed; [of the Mountains and rarely Piedmont] ..... ***S. patula*** *var.* ***patula***
6 Basal and lower cauline leaves 6-24 cm long, 2-6 cm wide, mostly 3-5× as long as wide; upper stem leaves many, strongly reduced, mostly entire; [of the Coastal Plain and lower Piedmont] ..... ***S. patula*** *var.* ***strictula***
5 Leaves moderately to densely soft-villous or puberulent.
7 Leaves puberulent; rays 0 (-2); flowering September-November; [of SC (NC?) south to FL and AL] ..... ***S. brachyphylla***
7 Leaves soft-villous; flowering May-June; rays 7-12; [of Coastal Plain of e. NC and e. SC] ..... ***S. verna***
4 Leaves glabrous (or nearly so) **or** strigose or strigillose.
8 Plants with slender, stoloniferous rhizomes (in addition to the main, more deeply-seated rhizomes) ..... ***S. tarda***
8 Plants lacking slender, stoloniferous rhizomes.
9 Phyllaries striate, with several nerves prominent; involucres 4.5-6 (-7) mm high ..... ***S. faucibus***
9 Phyllaries not striate, only the midvein prominent; involucres 2.5-5.6 mm high.
10 Basal leaves truncate at the base; leaves thick in texture ..... ***S. harrisii***
10 Basal leaves cuneate to rounded at the base; leaves of normal herbaceous texture.
11 Achenes glabrous ..... ***S. arguta*** *var.* ***arguta***
11 Achenes strigillose, at least towards the apex.
12 Leaves strigose or strigillose ..... ***S. arguta*** *var.* ***boottii***
12 Leaves glabrous ..... ***S. arguta*** *var.* ***caroliniana***
3 Blades of lower leaves oblanceolate to narrowly ovate, gradually tapering to petiole; lower leaves including petioles mostly more than 4× as long as wide (sometimes shorter in *S. juncea* with at least a few phyllary-like bracts interior to ray florets).
13 Petiole bases of basal and lower cauline leaves not sheathing the stem; [of mesic or dry habitats].
14 Stems obviously densely and loosely puberulent; [subsection *Nemorales*] ..... ***S. nemoralis*** *var.* ***nemoralis***
14 Stems glabrous or nearly so; [subsection *Junceae*].

15 Rhizomes thin, elongated, creeping; stem leaves usually 3-nerved; [disjunct from west to glades and barrens] ..... ***S. missouriensis*** *var.* ***fasciculata***
15 Rhizomes thick, short; stem leaves not 3-nerved; [collectively of various habitats].
16 Rays 7-13; disc florets 8-12 ..... ***S. juncea***
16 Rays 3-7; disc florets 5-9
17 Upper stem leaves ascending to appressed, usually lacking axillary fascicles; [west of the Blue Ridge] ..... ***S. gattingeri***
17 Upper stem leaves spreading or reflexed, with axillary fascicles of reduced leaves; [east of the Blue Ridge] ..... ***S. pinetorum***
13 Petiole bases of basal and lower cauline leaves sheathing the stem; [of seasonally saturated habitats]; [subsection *Maritimae*].
18 Leaves somewhat fleshy, the stem leaves reduced but not very markedly so; inflorescence almost always with lower branches strongly recurved with second heads; [of coastal or otherwise saline habitats].
19 Involucres 3-4 mm high; rays 7-11; disc flowers ca. 10-16; [of MA south to FL, west to TX and beyond] ..... ***S. sempervirens*** *var.* ***mexicana***
19 Involucres 4-7 mm high; rays 12-17; disc flowers ca. 17-22; [of VA northward] ..... ***S. sempervirens*** *var.* ***sempervirens***
18 Leaves not fleshy (rarely so in *S. stricta* of near coastal situations), the stem leaves much reduced relative to the basal; inflorescence showing only relatively weak tendency to recurved branches with second heads; [of inland habitats, except rarely *S. stricta*].
20 Basal leaves 0.7-2.5 (-5) cm wide; plants short to tall, 3-20 dm tall, typically very slender; [of the Coastal Plain and lower Piedmont and southward].
21 Leaf margins smooth, entire; ray flowers 8-13 per head; disk flowers 14-25 per head; pappus (2.5-) 3.0-3.5 mm long; plants to 1 m tall ..... ***S. pulchra***
21 Leaf margins (of the basal leaves at least) scabrous-margined, also often toothed; ray flowers 2-7 per head; disk flowers 6-16 per head; pappus 2.2-4.5 (-5.0) mm long; plants to 2 m tall.
22 Leaf margins scabrous (or at least tuberculate) throughout; panicle branches often spreading-erect with recurved-secund tips; pappus 2.2-4.0 mm long ..... ***S. gracillima***
22 Leaf margins tending to become smooth on the upper stem; panicle branches usually stiffly erect; pappus 4.0-4.5 (-5.0) mm long ..... ***S. stricta***
20 Basal leaves 0.7-8 cm wide; plants short, 4-10 (-15) dm tall, typically fairly stout; [of the Mountains, e. VA, and northward].
23 [of seepage over sloping rock on granitic domes, of sw. NC, nw. SC, and ne. GA] ..... ***S. simulans***
23 [of peaty bogs, of w. NC and e. TN northward].
24 Basal leaves 0.7-2.5 cm wide; [south to PA and WV] ..... ***S. uliginosa*** *var.* ***linoides***
24 Basal leaves 3-8 cm wide; [south to NC and TN] ..... ***S. uliginosa*** *var.* ***uliginosa***

Key D – goldenrods with cauline leaves and axillary inflorescences (section *Solidago*, subsections *Argutae*, *Glomeruliflorae*, *Squarrosae*, *Thyrsiflorae*)

1 Leaves entire or obscurely few-toothed; achenes glabrous at maturity; outer phyllaries with squarrose tips (tips appressed in *S. speciosa* var. *rigidiuscula*).
2 Outer phyllaries appressed; [subsection *Squarrosae*] ..... ***S. speciosa*** *var.* ***rigidiuscula***
2 Outer phyllaries with squarrose tips.
3 Leaves oblanceolate-obovate, often short acuminate at the apex; mid-cauline leaves 8-14 cm long, 18-40 mm wide, the margins sharply serrate on at least the upper 2/3; [subsection *Argutae*] ..... ***[S. buckleyi]***
3 Leaves narrowly to broadly elliptic (or less commonly slightly oblanceolate), acute at the apex; mid-cauline leaves 3-8 (-10) cm long, 8-25 mm wide, margins entire to shallowly serrate on only the upper 1/2 to 2/3; [subsection *Thyrsiflorae*] ..... ***S. petiolaris*** *var.* ***petiolaris***
1 Leaves generally many- and sharp-toothed; achenes persistently pubescent; outer phyllaries with appressed tips; [subsection *Glomeruliflorae*].
4 Stem terete, glaucous.
5 Lower midstem leaves narrowly lanceolate, 5-15 cm long, 0.8-3 cm wide, 5-6× as long as wide; stems strongly arching; [plants widespread in our area] ..... ***S. caesia*** *var.* ***caesia***
5 Lower midstem leaves broadly lanceolate to rhombic, 5-9 cm long, 1.3-2.4 cm wide, 3-4× as long as wide; stems weakly arching; [plants of the Gulf Coastal Plain of GA westward] ..... ***S. caesia*** *var.* ***zedia***
4 Stem striate-angled, green.
6 Larger leaf blades on a plant 2-6 cm long; stems with spreading white hairs; [endemic to sandstone rockhouses in the Red River Gorge in Menifee, Powell, and Wolfe counties, KY] ..... ***S. albopilosa***
6 Larger leaf blades on a plant 8-20 cm long; stems glabrous or sparsely pubescent; [of various dry and mesic habitats, collectively widespread in our area].
7 Leaves 1-3 (-3.5)× as long as wide.
8 Leaves (2.2-) 2.5-3 (-3.5)× as long as wide, cuneate to a sessile base; teeth of the leaf margins not notably elongate and narrow, mostly 1-2 (-3) mm long (as measured on the upper side of the teeth) ..... ***S. flaccidifolia***
8 Leaves 1-2.2 (-2.5)× as long as wide, abruptly contracted to a winged petiole; teeth of the leaf margins elongate and narrow, acuminate, mostly (2-) 3-8 mm long (as measured on the upper side of the teeth) ..... ***S. flexicaulis***
7 Leaves 3-10× as long as wide.
9 Involucre (2.5-) 3-5 (-6) mm high; phyllaries 0.7-1 mm wide, 1-nerved; stems 4-9 (-10) dm tall; ray flowers 2-4 (-6); [broadly Appalachian] ..... ***S. curtisii***
9 Involucre 4.5-7 mm high; phyllaries 1-1.5 mm wide, 3-10-nerved; stems 6-16 dm tall; ray flowers 5-8; [apparently restricted to high elevations in the Blue Ridge of NC and TN] ..... ***S. lancifolia***

Key E – goldenrods with cauline leaves and well-developed paniculate inflorescences (section *Solidago*, subsections *Nemorales, Triplinervae* and *Venosae*)

1 Mid-stem leaves 3-nerved (obscurely so in *S. tortifolia*); leaves elliptic, lanceolate, oblanceolate, or linear.
2 Rays 2-6; larger leaves linear to lance-linear, 2-7 (-10) mm wide, twisted at base; plants (3-) 7-13 dm tall; [subsection *Triplinervae*] ..... ***S. tortifolia***
2 Rays 4-17 (-24); larger leaves 5-30 mm wide, not twisted at base; plants 5-20 dm tall.
3 Rays 4-10 (-11); plants 3-15 dm tall.
4 Rays 4-7; plants 3-9 dm tall; stems scabrous to loosely puberulent below; cauline leaves oblanceolate, 7-20 (-30) mm wide, faces slightly to strongly scabrous; involucres 3-5 mm long; ray floret laminae 2-3.5 × 0.2-0.7 mm; disc floret corolla lobes 1 mm long; pappi 3 mm long [of Piedmont and Mountains of KY, NC, SC, GA, and AL, and from IL and KS south to LA and TX]; [subsection *Nemorales*] ..... ***S. radula***
4 Rays 7-11; plants 5-15 dm tall; stems glabrous below; cauline leaves linear-elliptic, 6-12 mm wide, faces glabrous (or puberulent on abaxial midnerve); involucres 2-3 mm long; ray floret laminae 1-2 × 0.1-0.2 mm; disc floret corolla lobes 0.4-0.6 mm long; pappi 2-2.5 mm long [of MD and PA south to VA, and IN, KY, and TN]; [subsection *Triplinervae*] ..... ***S. rupestris***
3 Rays (7-) 9-17 (-24); plants (5-) 10-20 dm tall; [collectively widespread]; [subsection *Triplinervae*].
5 Stems glabrous and usually also glaucous ..... ***S. gigantea***
5 Stems pubescent (at least the upper portion).
6 Leaves glabrous above and below, or pubescent only on the main veins beneath; midstem leaves serrulate, with 1-10 teeth per side, the largest < 0.5 mm long; [of the Coastal Plain, from NC south to FL and AL] ..... ***S. leavenworthii***
6 Leaves moderately to densely pubescent across the lower surface, and scabrous to puberulent above; midstem leaves entire, serrulate, or serrate; [collectively widespread].
7 Mid-stem leaves entire to serrulate; involucres (2.5-) 3-4.5 mm high ..... ***S. altissima*** *var.* ***altissima***
7 Mid-stem leaves serrate, the teeth 3-10 per side, the largest > 1.5 mm long; involucres 1.7-2.5 (-3.0) mm high.
8 Lower to mid-stem glabrous or sparsely pubescent ..... ***S. canadensis*** *var.* ***canadensis***
8 Lower to mid-stem moderately pubescent ..... ***S. canadensis*** *var.* ***hargeri***

1 Mid-stem leaves reticulate-nerved; leaves generally obovate, elliptic, lanceolate, or oblanceolate (if linear, then the fresh leaves anise-scented); [subsection *Venosa*].
9 Stems from branched caudices or short rhizomes, lacking elongated rhizomes.
10 Leaves serrate; leaves not translucent-punctate; fresh leaves not anise-scented
11 Stem spreading-hirsute; [of the Ozarks, disjunct in MS] ..... ***[S. ulmifolia*** *var.* ***palmeri]***
11 Stem glabrous or nearly so, except just below the inflorescence; [widespread] ..... ***S. ulmifolia*** *var.* ***ulmifolia***
10 Leaves entire; leaves translucent-punctate; fresh leaves anise-scented.
12 Main leaves ovate to lanceolate, 2-5 (-6)× as long as wide; stem pubescence general and circumferential; [of FL] ..... ***S. chapmanii***
12 Main leaves lanceolate to linear, (4-) 5-15× as long as wide; stem pubescence in lines decurrent down the stem from the margins of the leaf bases; [widespread] ..... ***S. odora***
9 Stems from elongated creeping rhizomes.
13 Mid-stem leaves sessile, somewhat clasping; leaf margins nearly entire to obscurely serrulate; leaves planar ..... ***S. fistulosa***
13 Mid-stem leaves subsessile, not clasping; leaf margins strongly serrate; leaves rugose.
14 Involucres 4-6 mm high; broader phyllaries 0.7-1.2 mm wide; stems glabrous below the inflorescence; mid-stem leaves elliptic (widest near the middle) ..... ***S. latissimifolia***
14 Involucres (2-) 2.5-3.5 (4.5) mm high; phyllaries mostly < 0.5 mm wide; stems hairy or glabrous below the inflorescence; mid-stem leaves lanceolate to ovate (widest below the middle).
15 Leaves relatively thin, not very rugose, usually sharply serrate, the apices acuminate, glabrous or soft-hairy on the surfaces.
16 Stems and leaves hairy ..... ***S. rugosa*** *var.* ***rugosa***
16 Stems and leaves glabrous ..... ***S. rugosa*** *var.* ***sphagnophila***
15 Leaves relatively thick and firm, strongly rugose, usually subentire to bluntly serrate, the apices often only acute, scabrous or stiffly-hairy on the surfaces.
17 Inflorescences narrow, the lower lateral branches only slightly exceeding the subtending leaves; leaves sparsely pubescent; [of the Southern Appalachians] ..... ***S. rugosa*** *var.* ***cronquistiana***
17 Inflorescences broad, the lower lateral branches generally much longer than the subtending leaves; leaves moderately to densely pubescent; [collectively widespread].
18 Upper cauline leaves lanceolate to elliptic, not much reduced relative to leaves lower on the stem ..... ***S. rugosa*** *var.* ***aspera***
18 Upper cauline leaves ovate, much reduced relative to leaves lower on the stem ..... ***S. rugosa*** *var.* ***celtidifolia***

Solidago albopilosa E.L. Braun, Rockhouse Goldenrod, Cave Goldenrod. Sandstone rockhouses. In the Red River Gorge of e. KY (Menifee, Powell, and Wolfe counties). September. See Esselman & Crawford (1997). [= C, F, FNA, G, K, SE]

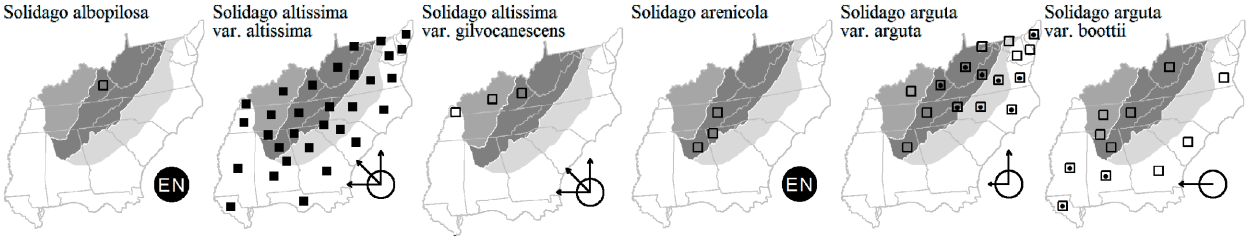
Solidago altissima Linnaeus *var.* ***altissima***, Tall Goldenrod. Fields, roadsides, disturbed areas. August-October. NS, QC, and SK south to c. peninsular FL, TX, and Mexico; introduced in w. North America. Var. *gilvocanescens* (Rydberg) Semple, with heads smaller (mainly 2-3 mm high vs. 3-4 mm high) is mainly distributed in the Great Plains. [= FNA; = *S. altissima* – F, K, WV; = *S. canadensis* Linnaeus var. *scabra* Torrey & Gray – C, G, SE, WH; < *S. altissima* Linnaeus – RAB, GW (including *S. canadensis* vars. and *S. rupestris*); = *S. hirsutissima* P. Miller – S; < *S. canadensis* – W; = *S. altissima* ssp. *altissima* – FNA]

Solidago altissima Linnaeus var. *gilvocanescens* (Rydberg) Semple, Great Plains Common Goldenrod. Attributed to VA by Kartesz (1999). [= *S. canadensis* Linnaeus var. *gilvocanescens* Rydberg – C, F, K; = *S. pruinosa* Greene – G; < *S. canadensis* – S, W; = *S. altissima* L. ssp. *gilvocanescens* (Rydberg) Semple – FNA] {not keyed}

Solidago arenicola B.R. Keener & Kral, Black Warrior Goldenrod. Riverside scour areas. September-October. Known from Blount County, AL (Black Warrior River) and on rivers in the Cumberland Plateau of TN and KY (notably Big South Fork of the Cumberland River). See Keener & Kral (2003) for additional information. [= FNA]

Solidago arguta Aiton *var.* ***arguta***, Forest Goldenrod. Woodlands, woodland borders, road margins. August-October. ME and s. ON west to MO, south to NC and TN. [= *S. arguta* ssp. *arguta* – C, SE, W; < *S. arguta* – RAB (also see *S. tarda* and *S. vaseyi*); = *S. arguta* – F, G, S; = *S. arguta* ssp. *arguta* var. *arguta* – FNA; < *S. arguta* var. *arguta* – K]

Solidago arguta Aiton *var.* ***boottii*** (Hooker) Palmer & Steyermark, Boott's Goldenrod. Dry open woodlands, dry slopes, often in sandy or rocky soils. September-October. C. SC south to s. AL, west to LA, AR, and s. MO, most common in the Ozarks. Reported for n. WV by Harmon, Ford-Werntz, & Grafton (2006), but it seems likely that this is based on different interpretations of the taxa. [= K, SE; < *S. arguta* – RAB (also see *S. tarda* and *S. vaseyi*); > *S. boottii* – F, S, WV; > *S. strigosa* – F, G, S; = *S. arguta* ssp. *caroliniana* (A. Gray) G.H. Morton var. *boottii* (Hooker) Palmer & Steyermark – FNA; > *S. boottii* var. *boottii* – G; = *S. arguta* Aiton ssp. *boottii* (Hooker) G.H. Morton]



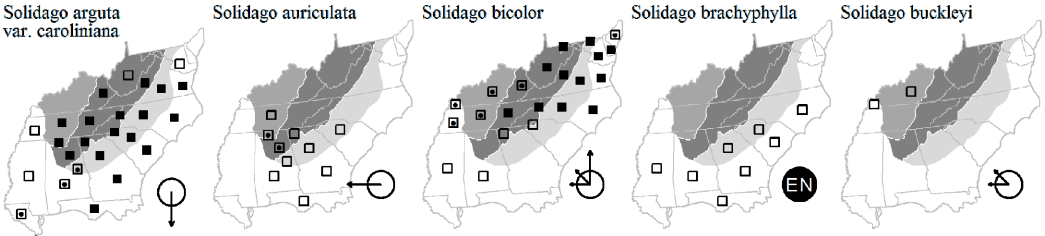
Solidago arguta Aiton *var.* ***caroliniana*** A. Gray, Vasey's Goldenrod. Forests, woodlands, grassy balds. September-October. WV west to c. TN and s. MO, south to ne. FL, Panhandle FL, s. MS, and c. AR. [= C, K, SE, W; < *S. arguta* – RAB, WV; = *S. yadkinensis* (Porter) Small – F, S, misapplied; = *S. arguta* ssp. *caroliniana* (A. Gray) G.H. Morton var. *caroliniana* – FNA; > *S. boottii* Hooker var. *caroliniana* (A. Gray) Cronquist – G; < *S. arguta* var. *caroliniana* – WH; *?* *S. vaseyi* (A. Gray) Heller; = *S. arguta* ssp. *australis*, nomen nudum; = *S. arguta* Aiton ssp. *pseudoyadkinensis* G.H. Morton; = *S. pseudoyadkinensis*, nomen nudum; = *S. arguta* Aiton ssp. *caroliniana* (A. Gray) G.H. Morton]

Solidago auriculata Shuttleworth ex Blake, Eared Goldenrod. Rocky forests over circumneutral rocks, bottomland forests, calcareous hammocks. August-September. Wc. SC, sc. TN (Chester, Wofford, & Kral 1997), AR, and OK south to GA, c. Panhandle FL, AL, MS, LA, and TX. [= FNA, K, SE, WH; = *S. notabilis* Mackenzie – RAB, S]

Solidago bicolor Linnaeus, Silverrod, White Goldenrod. Woodlands, roadbanks, pastures. August-October. NS and MB south to GA and LA. [= RAB, C, FNA, G, K, S, SE, W, WV; > *S. bicolor* var. *bicolor* – F; > *S. bicolor* var. *ovalis* – F]

Solidago brachyphylla Chapman, Dixie Goldenrod. Open woodlands, bluff forests. September-November. SC (NC?) south to ne. FL and Panhandle FL, west to s. AL (s. MS?). [= FNA, K, S, SE, WH]

Solidago buckleyi Torrey & A. Gray, Buckley's Goldenrod. Forests, open ridgetop and bluff woodlands. September. W. KY, s. IN, s. IL, s. MO; perhaps eastwards in GA and AL (these occurrences controversial as to identification). [= F, FNA, G, K, S, SE; < *S. petiolaris* – RAB]



Solidago caesia Linnaeus var. ***caesia***, Axillary Goldenrod. Moist forested slopes. August-October. ME and ON south to FL and LA. [= FNA; < *S. caesia* – RAB, C, F, G, K, S, SE, W, WH, WV]

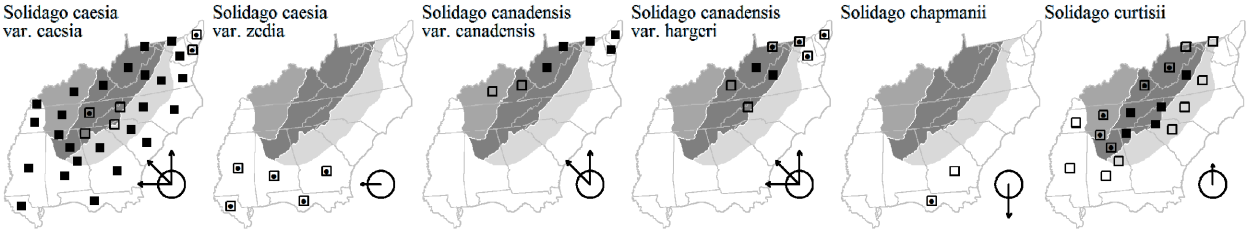
Solidago caesia Linnaeus *var.* ***zedia*** R.E. Cook & Semple, Gulf Coast Axillary Goldenrod. Moist forests. September-October. GA and Panhandle FL west to LA and AR. [= FNA; < *S. caesia* – K, S, SE, WH]

Solidago canadensis Linnaeus *var.* ***canadensis***, Northern Common Goldenrod. Old fields, pastures, roadesides. August-October. NL (Newfoundland) west to MN, south to VA, OH, and IL. See Fernald (1950), p. 1408. [= C, F, FNA, K, SE; < *S. canadensis* var. *canadensis* – G; < *S. canadensis* – S, WV]

Solidago canadensis Linnaeus *var.* ***hargeri*** Fernald, Harger's Common Goldenrod. Old fields, pastures, roadsides. August-October. VT and NH west to MN, south to VA, NC, KY, OH, IL, and IA. First reported for NC by Poindexter & Murrell (2008). Likely much more common than assumed, but misrepresented due to taxonomic confusion with *S. altissima*. [= C, F, FNA, K, SE; < *S. canadensis* var. *canadensis* – G; < *S. canadensis* – S, W, WV]

Solidago chapmanii A. Gray, Chapman's Goldenrod. Sandhills and dry, open hammocks. September-October. S. GA south to s. FL and Panhandle FL. [= S; = *Solidago odora* Aiton var. *chapmanii* (A. Gray) Chapman – K, WH; = *Solidago odora* Aiton var. *chapmannii* (A. Gray) Chapman – SE, orthographic error; = *S. odora* ssp. *chapmanii* (A. Gray) Semple – FNA]

Solidago curtisii Torrey & A. Gray, Curtis's Goldenrod. Moist forested slopes, and rarely in mafic woodlands in the Piedmont of VA. September-October. A Central and Southern Appalachian endemic: PA, WV, and MD south to n. GA and n. AL. Var. *curtisii*, with stem glabrous or slightly puberulent in the inflorescence, and var. *pubens* (M.A. Curtis) A. Gray, with stem densely puberulent, are sometimes distinguished. They do not appear to be worthy of taxonomic recognition. [= C, SE, W, WV; < *S. curtisii* var. *curtisii* – RAB (also see *S. lancifolia*); > *S. curtisii* var. *curtisii* – F, G; > *S. curtisii* var. *pubens* (M.A. Curtis) A. Gray – RAB, F, G; = *S. curtisii* var. *curtisii* – FNA; < *S. curtisii* – K (also see *S. lancifolia*); = *S. caesia* Linnaeus var. *curtisii* (Torrey & A. Gray) Wood; > *S. curtisii* – S; > *S. pubens* M.A. Curtis – S]



Solidago delicatula Small. Possibly east to AL, FL. August-October. [= FNA, SE; = *S. ulmifolia* Muhlenberg ex Willdenow var. *microphylla* A. Gray – K; < *S. ulmifolia* – S] {not keyed; not mapped}

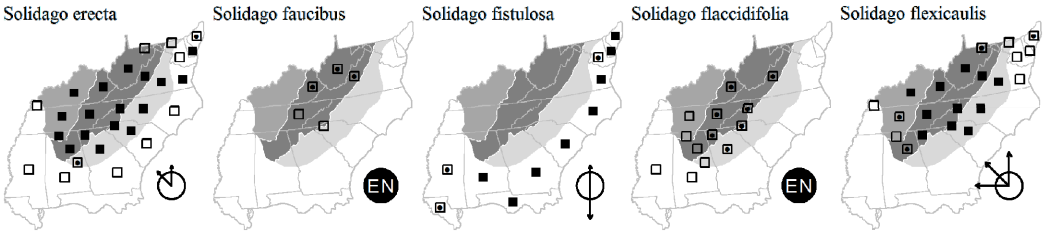
Solidago erecta Pursh. Woodlands, old fields, woodland borders, grassy balds. August-October. NY and CT south to GA, AL, and MS. [= RAB, C, F, FNA, G, K, S, SE, W, WV; < *S. erecta* – FNA (also see *S. porteri*); = *S. speciosa* Nuttall var. *erecta* (Pursh) MacMillan]

Solidago faucibus Wieboldt, Gorge Goldenrod. Moist forests. Late August-October. S. WV south to sw. VA, and se. KY; disjunct in nw. SC. See Wieboldt & Semple (2003) for additional information. [= FNA]

Solidago fistulosa P. Miller, Hairy Pineywoods Goldenrod. Pocosins, swamp forests, wet savannas, wet pine flatwoods, maritime forests. August-November. NS south to s. FL, west to LA. [= RAB, C, F, FNA, G, GW, K, S, SE]

Solidago flaccidifolia Small, Appalachian Goldenrod. Moist slopes. September-October. VA and KY south to GA and ne. AL; disjunct in nc. MS. [= C, G, K, SE, W; < *S. caesia* – RAB, F; = *S. latissimifolia* – S, misapplied; = *S. curtisii* Torrey & A. Gray var. *flaccidifolia* (Small) R.E. Cook & Semple – FNA; = *S. caesia* Linnaeus var. *paniculata* A. Gray]

Solidago flexicaulis Linnaeus, Zigzag Goldenrod. Moist wooded slopes, especially over calcareous or mafic rocks. August-October. NS, ON and ND south to GA, AL, MS, and KS. [= RAB, C, F, FNA, G, K, S, SE, W, WV]



Solidago gattingeri Chapman, Gattinger's Goldenrod. Cedar glades. AR, MO, c. TN (Chester, Wofford, & Kral 1997). [= F, FNA, G, K, S, SE]

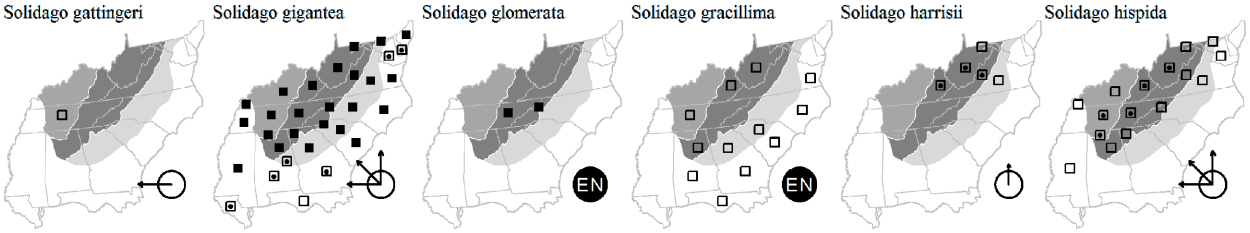
Solidago gigantea Aiton, Smooth Goldenrod. Old fields, roadsides, streamside meadows, bottomlands. August-September (-October). NS west to SK and MT, south to Panhandle FL (Liberty County), TX, and CO. [= RAB, C, GW, K, W, WH; > *S. gigantea* var. *gigantea* – F, G, SE, WV; > *S. gigantea* Aiton var. *serotina* (Kuntze) Cronquist – G, SE; > *S. gigantea* var. *leiophylla* Fernald – F, WV; = *S. serotina* – S]

Solidago glomerata Michaux, Skunk Goldenrod. High elevation situations, including grassy balds, rock outcrops, heath balds, northern hardwood forests, and spruce-fir forests. Mid August-October. A narrow Southern Appalachian endemic, restricted to w. NC and e. TN (perhaps reaching its northern limit on Elk Knob, Watauga County, NC). The basal rosettes are evergreen, and are a conspicuous component of the winter flora at high elevations. The plants have a distinctive skunky odor, easily smelled without touching or bruising the plant. [= RAB, FNA, K, S, SE, W]

Solidago gracillima Torrey & A. Gray, Southern Bog Goldenrod, Graceful Goldenrod. Wet pine savannas, seepage bogs. August-October. E. VA south to c. Panhandle FL, west to s. AL. Several distinct entities appear to have been referred to this taxon; the number of entities, and the appropriate names to apply to them, are presently obscure. The names *S. perlonga* Fernald, *S. austrina* Small, and *S. simulans* Fernald have been synonymized under *S. gracillima* (as by Cronquist 1980). Cronquist (1980) refers material from WV and high elevation granitic domes of sw. NC (*S. simulans*) to *S. gracillima*, a treatment which is not phytogeographically credible. The distinction between *S. gracillima* s.s and *S. austrina* may prove warranted. They are alleged to differ as follows: *S. austrina*: pappus 2.2-2.8 mm long, ray flowers 2-4, disc flowers 6-8; of the inner Coastal Plain and lower Piedmont; *S. gracillima*: pappus (3.0-) 3.5-4.0 mm long; ray flowers 3-7; disk flowers 9-13; of the Coastal Plain. [= RAB, K, W, WH; < *S. gracillima* – C, SE (also see *S. simulans*); > *S. austrina* Small – F, G, S; > *S. perlonga* Fernald – F; = *S. stricta* Aiton ssp. *gracillima* (Torrey & A. Gray) Semple – FNA; > *S. gracillima* – S]

Solidago harrisii Steele, Shale-barren Goldenrod. Limestone, dolostone, greenstone, shale, and calcareous siltstone woodlands, barrens, and cliffs. August-September. A Central Appalachian endemic: w. MD south to e. WV and w. VA. [= F, S, W, WV; = *S. arguta* Aiton var. *harrisii* (Steele) Cronquist – C, K, SE; = *S. arguta* ssp. *arguta* var. *harrisii* – FNA; < *S. boottii* var. *boottii* – G]

Solidago hispida Muhlenberg ex Willdenow, Hairy Goldenrod. Dry rocky forests and woodland edges. August-October. NL (Labrador) west to SK, south to nw. GA, AL, AR, IA, and SD. Widespread in e. and c. TN (Chester, Wofford, & Kral 1997) and in nw. GA (Jones & Coile 1988). Also reported for NC and SC by Kartesz (1999). [= C, FNA, S, SE, W, WV; > *S. hispida* var. *hispida* – F, G, K]



Solidago juncea Aiton, Early Goldenrod. Meadows, pastures, roadbanks, woodland borders. July-September. NS west to MN, south to GA, AL, MS, and LA. [= RAB, C, FNA, S, SE, W, WV; > *S. juncea* var. *juncea* – F, G, K; > *S. juncea* var. *neobohemica* Fernald – F, K; > *S. juncea* var. *ramosa* Porter & Britton – G]

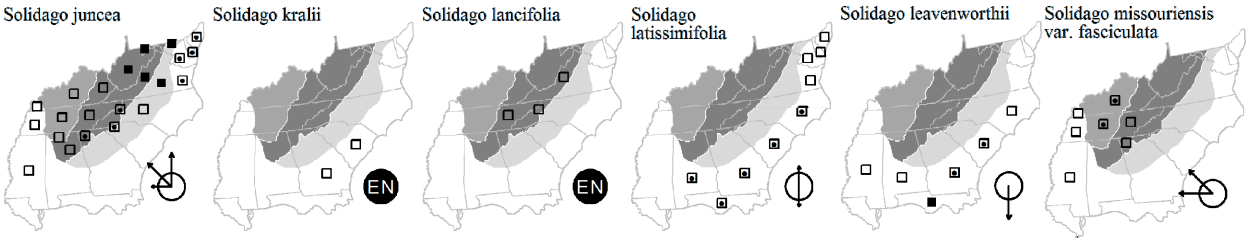
Solidago kralii Semple, Kral's Goldenrod. Longleaf pine sandhills. August-September. SC south to GA. See Semple (2003) for additional information. [= FNA]

Solidago lancifolia (Torrey & A. Gray) Chapman, Lanceleaf Goldenrod. Mountain slopes, mostly at high elevations. Late August-September. W. VA and e. WV south to w. NC and e. TN. [= C, FNA, S, SE, W; < *S. curtisii* var. *curtisii* – RAB; < *S. curtisii* – K]

Solidago latissimifolia P. Miller, Coastal Swamp Goldenrod. Pocosins, swamp forests, sandhill seepages, sandhill-pocosin ecotones. August-October. NS south c. peninsular FL, west to s. AL. [= FNA, K, WH; = *S. elliottii* Torrey & A. Gray – RAB, C, G, GW, S, SE; > *S. elliottii* var. *ascendens* Fernald – F; > *S. elliottii* var. *pedicellata* Fernald – F]

Solidago leavenworthii Torrey & A. Gray, Leavenworth's Goldenrod. Wet pine savannas, wet pine flatwoods, pond margins, marshes. August-November. Se. NC south to s. FL, west to s. AL. [= RAB, FNA, GW, K, S, SE, WH]

Solidago missouriensis Nuttall *var.* ***fasciculata*** Holzinger. Barrens, Coosa prairies. (July-) August-October. In nw. GA (T. Govus, pers. comm. 2009); in c. TN (Chester, Wofford, & Kral 1997). [= C, F, G, K, SE; < *S. missouriensis* – FNA; = *S. glaberrima* Martens – S]



Solidago nemoralis Aiton *var.* ***nemoralis***, Eastern Gray Goldenrod. Woodlands, glades, barrens, roadbanks. NS west to ND, south to Panhandle FL and TX. The more western var. *decemflora* (de Candolle) Fernald does not enter our area. [= K; > *S. nemoralis* var. *nemoralis* – C, F, G, SE, WV; > *S. nemoralis* var. *haleana* Fernald – C, F, G, SE, WV; < *S. nemoralis* – RAB, S, W, WH; = *S. nemoralis* ssp. *nemoralis* – FNA]

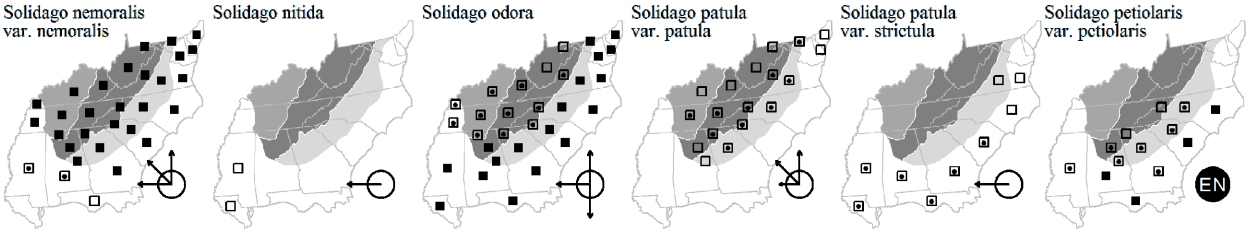
Solidago nitida Torrey & A. Gray, Shiny Goldenrod. Pine savannas, prairies. (July-) August-October. MS west to s. AR, se. OK, and TX. [= FNA, SE; = *Oligoneuron nitidum* (Torrey & A. Gray) Small – K, S, Z; = *Solidago nitida* Torrey & A. Gray – FNA, SE]

Solidago odora Aiton, Licorice Goldenrod. Dry forests and woodlands, especially in dry pinelands, such as sandhills, of the Coastal Plain, inland in dry, fire-maintained sites, such as glades, barrens, and ridgetop pine-oak woodlands. July-October. NH, VT, NY, OH, and MO south to FL and TX. [= RAB, F, G, S, W, WV; = *S. odora* var. *odora* – C, K, SE, WH; = *S. odora* ssp. *odora* – FNA]

Solidago patula Muhlenberg ex Willdenow *var.* ***patula***, Northern Roughleaf Goldenrod. Bogs, seepages over mafic rocks, grassy balds (as Whitetop Mountain). August-September (-October). NH and VT west to WI, WI, MI, and IA, south to GA, AL, MS, and MO. Some or all of the coastal records may actually represent ambiguous specimens of *S. patula* var. *strictula*. [= RAB, C, F, G, K, SE; = *S. patula* ssp. *patula* – FNA; < *S. patula* – GW, W, WV; = *S. rigida* – S, misapplied]

Solidago patula Muhlenberg ex Willdenow *var.* ***strictula*** Torrey & A. Gray, Southern Roughleaf Goldenrod. Streamhead pocosins, sandhill seepages, swamp edges. September-October. Se. VA south to Panhandle FL, west to MO, OK, and TX. Perhaps better treated as *S. salicina*. [= RAB, C, G, K, SE, WH; > *S. patula* var. *strictula* – F; > *S. salicina* – F; = *S. patula* ssp. *strictula* (Torrey & A. Gray) J.C. Semple – FNA; < *S. patula* – GW; = *S. salicina* Elliott – S]

Solidago petiolaris Aiton *var.* ***petiolaris*.** Upland forests and woodlands. Late August-November. The distribution of *S. petiolaris* (in the broad sense) is peculiar, with an eastern component (NC south to ne. FL and Panhandle FL, west to AL) and a western component (IL, MO, AR, and LA west to NE, CO, and NM). The eastern component is sometimes treated as *S. petiolaris* (sensu stricto) and the western as *S. angusta* Torrey & A. Gray. Alternatively these are recognized as the varietal rank (as here), or combined entirely. Var. *angusta* (Torrey & A. Gray) A. Gray and var. *wardii* (Britton) Fernald are Ozarkian and more western (Nesom 2008). [= C, F, K, SE; < *S. petiolaris* – RAB, W, WH (and also see *S. buckleyi*); = *S. petiolaris* var. *petiolaris* – C, F, K, SE; = *S. petiolaris* – G; > *S. milleriana* Mackenzie – S; > *S. harperi* Mackenzie in Small – S]



Solidago pinetorum Small, Pineywoods Goldenrod. Dry woodlands, woodland borders, roadbanks, dry pinelands. July-September. N. and wc. VA south through e., c, and nw. NC to nc. SC. [= RAB, C, F, FNA, G, K, S, SE, W]

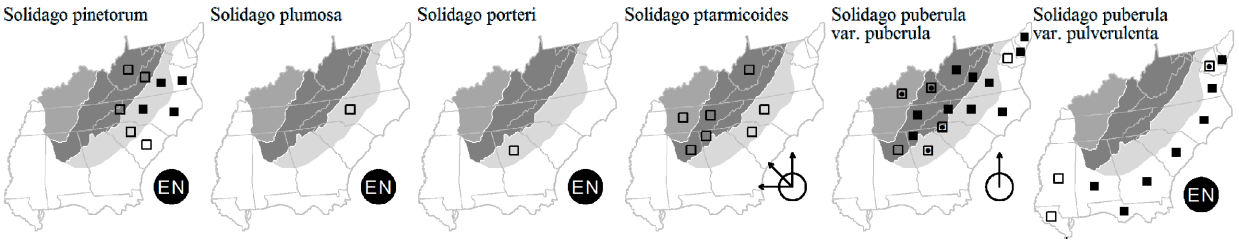
Solidago plumosa Small, Yadkin River Goldenrod. In crevices of outcrops in rocky, flood-scoured riverbanks. September. Known only from the type locality, the gorge of the Yadkin River in c. NC. Most of the population was lost by construction of two hydropower dams, one at each of the two ends of the gorge, and the flooding of the intervening area. This species is related to the more northern *S. racemosa* and the newly described and more western *S. arenicola*. [= FNA, K, S, SE]

Solidago porteri Small, Porter's Goldenrod. Upland forests. So far as known, this species is endemic to the Piedmont of GA; its taxonomic status is very uncertain. [= K, S, SE; < *S. erecta* – FNA] {not yet keyed}

Solidago ptarmicoides (Nees) Boivin, White Prairie-goldenrod, Upland White Aster. Prairie-like barrens over mafic, ultramafic, or calcareous rock, serpentine woodlands, prairies. August-October. VT and NY west to SK, south to e. TN (Rhea and Roane counties in the Ridge and Valley) (Chester, Wofford, & Kral 1997), nw. GA (Floyd County), AR, and CO; disjunct in nc. NC (Granville County, and historically in Rowan County) and nc. SC (York County). [= C, FNA, SE, W, X= ***Oligoneuron album*** (Nuttall) Nesom – K, Z; = *Aster ptarmicoides* (Nees) Torrey & A. Gray – F, G, S; = *Unamia alba* (Nuttall) Rydberg; > *Aster ptarmicoides* var. *georgianus* A. Gray (referring to plants of se. US); = *Solidago asteroides* Semple, superfluous name]

Solidago puberula Nuttall *var.* ***puberula***. Bogs, wet meadows, and wet pastures, in dry acid soils in VA and WV. August-October. NS west to ON, south to GA and TN. [= RAB, C, F, G, K, SE; = *S. puberula* ssp. *puberula* – FNA; = *S. puberula* – S; < *S. puberula* – W, WV]

Solidago puberula Nuttall *var.* ***pulverulenta*** (Nuttall) Chapman. Savannas, streamhead pocosins, flatwoods, swamps, seepages in pinelands, and disturbed areas. September-October. Se. VA south to Panhandle FL, west to LA. [= RAB, C, F, G, K, SE, WH; = *S. puberula* ssp. *pulverulenta* (Nuttall) Semple – FNA; = *S. pulverulenta* Nuttall – S]



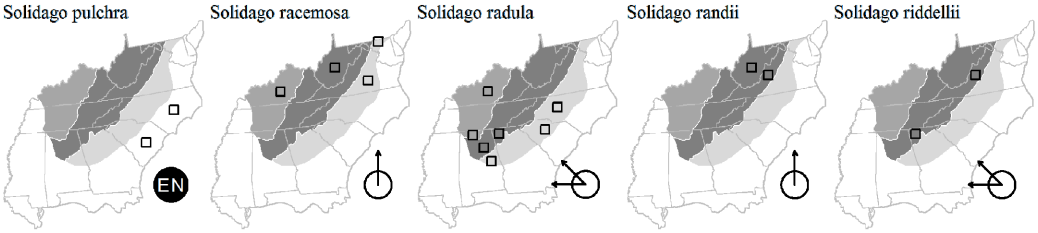
Solidago pulchra Small, Beautiful Goldenrod, Carolina Goldenrod. Wet pine savannas, seepage bogs. July-September. Endemic to a small part of the Coastal Plain of se. NC, where locally common in the few wet savannas remaining. Notable sites include Green Swamp (Brunswick County), Holly Shelter Game Land (Pender County), Camp Lejeune Marine Corps Base (Onslow County), and Croatan National Forest (Carteret County). There is no question of the distinctness of this species from *S. stricta* and *S. gracillima*. Once learned, the basal leaves are recognizable at a glance, the petiole very long (often twice as long as the leaf blade), the venation finely netted, the margins smooth and entire, the tip usually acute and prominently mucronate. Even following fire, sterile rosettes typically outnumber flowering plants 100 to 1. [= FNA, K, S, SE; < *S. stricta* – RAB, GW]

Solidago racemosa Greene, Sticky Goldenrod. Rocky, flood-scoured riversides. ME and QC south to n. VA and WV; plants in the Cumberland Plateau of KY and ne. TN (Churchill & Schell 1992; Chester, Wofford, & Kral 1997) placed here are problematic and may represent another taxon or taxa. This complex remains poorly understood. [= WV; = *S. simplex* Kunth ssp. *randii* (Porter) Ringius var. *racemosa* (Greene) Ringius – C, FNA, K; = *S. racemosa* Greene var. *racemosa* – F; = *S. spathulata* A.P. de Candolle ssp. *randii* (Porter) Cronquist var. *racemosa* (Greene) Cronquist – G, SE]

Solidago radula Nuttall, Rough Goldenrod. Dry woodlands over mafic rocks. August-October. IL west to KS, south to LA and TX; disjunct eastward in KY, NC, SC, GA, and AL. [= RAB, C, FNA, G, S, SE, W; > *S. radula* var. *radula* – K]

Solidago randii (Porter) Britton, Rand's Goldenrod. Cliffs and barrens, primarily over mafic (such as greenstone and hornblende) or calcareous rocks. NS west to ON and MI, south to w. VA and WV. [= WV; < *S. simplex* ssp. *randii* (Porter) Ringius var. *monticola* (Porter) Ringius – C, FNA; > *S. randii* – F; > *S. maxonii* Pollard – F; = *S. spathulata* A.P. de Candolle ssp. *randii* (Porter) Cronquist var. *randii* – G; = *S. simplex* Kunth ssp. *randii* (Porter) Ringius var. *randii* – K]

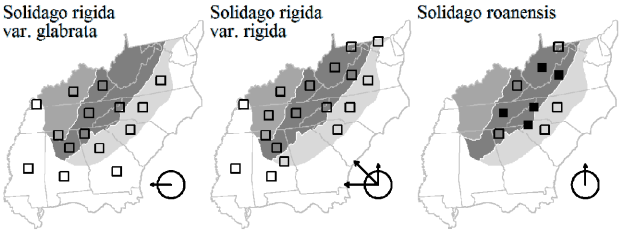
Solidago riddellii Frank ex Riddell, Riddell's Goldenrod. Wet, calcareous prairies; rare. ON and MB south to OH, IN, IL, AR, and KS; disjunct in w. VA and nw. GA. The specimen from Fort Monroe ("Fortress Monroe, Va." – Fernald 1950) is accurately identified but may be mislabeled. [= C, F, FNA, G; = ***Oligoneuron riddellii*** (Frank ex Riddell) Rydberg – K, Z]



Solidago rigida Linnaeus *var.* ***glabrata*** E.L. Braun, Southeastern Bold Goldenrod. Glades, barrens, and prairie-like areas, over mafic (such as diabase) or calcareous (such as calcareous shale) rocks, and in adjacent disturbed areas, such as roadbanks and powerline rights-of-way. Late August-October. Sc. VA, se. TN, c. OH, and e. MO south to c. SC, sw. GA, and e. TX. This taxon (variously treated as a species, subspecies, or variety) is rare and scattered throughout its range, restricted to prairie-like situations. Var. *glabrata* is apparently strictly diploid. [= C, G, SE; = ***Oligoneuron rigidum*** (Linnaeus) Small *var.* ***glabratum*** (E.L. Braun) Nesom – K, Z; < *Solidago rigida* Linnaeus – RAB, W; = *Solidago jacksonii* (Kuntze) Fernald – F; = *Solidago rigida* ssp. *glabrata* (E.L. Braun) Heard & Semple – FNA, Y; = *Oligoneuron jacksonii* (Kuntze) Small – S]

Solidago rigida Linnaeus *var.* ***rigida***, Midwestern Bold Goldenrod. Glades, barrens, and prairie-like areas, over mafic or calcareous rocks. August-October. RI and MA west to NY, s. ON, MI, WI, s. MN and c. NE, south to c. VA, sc. NC, w. NC, sc. TN, c. AR, and se. TX. Var. *rigida* is generally rare and restricted to relictual prairie-like situations east of MI, IN, IL, MO, and OK. Var. *rigida* is tetraploid through most of its range, including (apparently) all of our area. A third variety, var. *humilis* (T.C. Porter) Nesom, is more northern and western, ranging from ON west to AB, south to MI, IN, IL, MO, OK, n. TX, and NM. [= C, G, SE; = ***Oligoneuron rigidum*** (Linnaeus) Small *var.* ***rigidum*** – K, Z; < *Solidago rigida* Linnaeus – RAB, W; = *Solidago rigida* – F; = *Solidago rigida* ssp. *rigida* – FNA, Y; = *Oligoneuron grandiflorus* (Rafinesque) Small – S]

Solidago roanensis Porter, Roan Mountain Goldenrod. Mt (GA, NC, SC, VA, WV), Pd (NC, SC): forests, woodlands, roadbanks; common (rare in upper Piedmont). July-September. MD and WV south to AL and GA. [= RAB, C, FNA, G, K, S, SE, W; > *S. roanensis* var. *roanensis* – F; > *S. roanensis* var. *monticola* (Torrey & A. Gray) Fernald – F; > *S. roanesis* var. *monticola* – WV, misspelling]



Solidago rugosa P. Miller *var.* ***aspera*** (Aiton) Fernald. Mt (WV), Cp (DE, FL), Pd (DE), {GA, NC, SC, VA}: fields, forests, roadsides; common. August-November. ME west to MI, south to FL and TX. [= F, WV; < *S. rugosa* var. *rugosa* – RAB; < *S. rugosa* ssp. *aspera* – C, G, K, SE, W, WH; = *S. rugosa* ssp. *aspera* (Aiton) Cronquist var. *aspera* – FNA; < *S. rugosa* – GW; < *S. altissima* – S, misapplied]

Solidago rugosa P. Miller *var.* ***celtidifolia*** (Small) Fernald, Hackberry-leaf Goldenrod. Cp (FL), {GA, NC, SC, VA}: fields, forests, wetlands; uncommon. September-November. VA south to FL, west to OK and TX. [= RAB, F; < *S. rugosa* ssp. *aspera* (Aiton) Cronquist – C, G, K, SE, W, WH; = *S. rugosa* ssp. *aspera* (Aiton) Cronquist var. *celtidifolia* (Small) Fernald – FNA; < *S. rugosa* – GW; = *S. celtidifolia* Small – S]

Solidago rugosa P. Miller *var.* ***cronquistiana*** Semple, Cronquist's Goldenrod. Mt (GA, NC): high elevation balds and forests; uncommon. September-October. A Southern Appalachian endemic: w. NC and e. TN south to n. GA. See Semple (2003) for additional information. [= *S. rugosa* ssp. *aspera* (Aiton) Cronquist var. *cronquistiana* Semple – FNA; < *S. rugosa* var. *rugosa* – RAB; < *S. rugosa* ssp. *aspera* – K, SE, W; < *S. rugosa* – GW; < *S. altissima* – S]

Solidago rugosa P. Miller *var.* ***rugosa***, Wrinkle-leaf Goldenrod. Mt (WV), Cp (DE), Pd (DE), {GA, NC, SC, VA}: fields, forests, wetlands; common. August-October. NS west to ON, south to GA, AL, MS, LA, TX. [< *S. rugosa* var. *rugosa* – RAB; = *S. rugosa* ssp. *rugosa* var. *rugosa* – C, FNA, G, K, SE; > *S. rugosa* ssp. *rugosa* var. *villosa* – C, G, K, SE; > *S. rugosa* var. *rugosa* – F, WV; > *S. rugosa* var. *villosa* – F, WV; < *S. rugosa* – GW; < *S. rugosa* ssp. *rugosa* – W]

Solidago rugosa P. Miller *var.* ***sphagnophila*** Graves, Peat-loving Goldenrod. Cp (DE, NC, SC, VA): boggy habitats; common. August-October. NS and ME south to SC. [= F; < *S. rugosa* var. *rugosa* – RAB; = *S. rugosa* ssp. *rugosa* var. *sphagnophila* Graves – C, FNA, G, K; < *S. rugosa* – GW; < *S. rugosa* ssp. *rugosa* – W; = *S. aestivalis* E. Bicknell]

Solidago rupestris Rafinesque, Riverbank Goldenrod, Rock Goldenrod. Pd (VA), Mt (VA): crevices in rocky, flood-scoured riversides; rare. July-September. PA, OH, and IL south to n. VA and TN. [= C, F, FNA, K, SE; < *S. altissima* – RAB; = *S. canadensis* var. *rupestris* (Rafinesque) Porter – G; < *S. canadensis* – S]

Solidago sempervirens Linnaeus *var.* ***mexicana*** (Linnaeus) Fernald, Southern Seaside Goldenrod. Cp (DE?, FL, GA, NC, SC, VA): coastal dunes, dune slacks, maritime wet grasslands, tidal marshes; common (rare in VA). Late August-December (and sporadically until at least January in mild winters). DE (or allegedly MA) south to s. FL, west and south to TX and Mexico; west Indies. [= C, F, G, GW, K, SE; < *S. sempervirens* – RAB, WH; = *S. mexicana* Linnaeus – S; = *S. sempervirens* ssp. *mexicana* (Linnaeus) Semple – FNA]

Solidago sempervirens Linnaeus *var.* ***sempervirens***, Northern Seaside Goldenrod. Cp (DE, VA): coastal dunes, dune slacks, maritime wet grasslands, tidal marshes; common. Late August-November. NL (Newfoundland) south to se. VA along

the coast (and introduced inland in saline situations such as along salted roadways). [= C, F, G, K, SE; = *S. sempervirens* Linnaeus – S; = *S. sempervirens* ssp. *sempervirens* – FNA]

Solidago shortii Torrey & A. Gray. Endemic to nc. KY (Fleming, Jefferson, Nicholas, Robertson counties) and s. IN. August-October. See Smith et al. (2004) and Homoya & Abrell (2005) for additional, detailed information. [= C, F, FNA, G, K, SE] {not yet keyed}

Solidago simulans Fernald, Granite Dome Goldenrod, Cliffside Goldenrod. Mt (GA, NC, SC): in thin soil mats wetted by periodic seepage on granitic domes and lower elevation montane cedar hardwood woodlands; rare. August-September. Endemic to sw. NC, nw. SC, and ne. GA. [= K; < *S. uliginosa* – RAB, FNA; < *S. gracillima* – SE]

Solidago speciosa Nuttall *var.* ***rigidiuscula*** Torrey & A. Gray. Mt (GA): limestone barrens; rare. (August-) September-October. ON west to ND and WY, south to TN, LA, and TX; disjunct eastward in glade habitats to nw. GA (GANHP), TN (Chester, Wofford, & Kral 1997), and KY. [= C, G, K, SE; = *S. speciosa* var. *angustata* Torrey & A. Gray – F, misapplied; = *S. speciosa* ssp. *speciosa* var. *rigidiuscula* – FNA; = *S. rigidiuscula* (Torrey & A. Gray) Porter – S] {synonymy incomplete}

Solidago speciosa Nuttall *var.* ***speciosa***, Showy Goldenrod. Mt (GA, NC, SC, VA, WV), Pd (GA, NC, SC, VA), Cp (NC, SC, VA): pastures, forests, woodlands, roadbanks; uncommon (rare in VA Coastal Plain). September-October. NH, VT, NY, and WI south to GA, MS, LA, and OK. [= C, F, G, K, SE; < *S. speciosa* – RAB, W, WV; > *S. conferta* – S; > *S. harperi* Mackenzie – S; = *S. speciosa* ssp. *speciosa* var. *speciosa* – FNA]

Solidago sphacelata Rafinesque, Limestone Goldenrod, False Goldenrod. Mt (GA, NC, VA, WV), Pd (NC, VA): rock outcrops and dry rocky forests, usually over calcareous or mafic rocks; uncommon. (July-) August-September (-October). C. VA, s. WV, OH, IN, and IL south to GA, AL, and MS. [= RAB, C, F, G, K, SE, W, WV; = *Brachychaeta sphacelata* (Rafinesque) Britton – S]

Solidago spithamaea M.A. Curtis, Blue Ridge Goldenrod. Mt (NC): in crevices of sloping to nearly vertical outcrops of high elevation rocky summits on Grandfather Mountain, Hanging Rock Mountain, and Roan Mountain; rare. Mid August-October. Endemic to the three mountains named, the first two in NC, the third on the NC-TN border. *S. spithamaea* is a very restricted endemic, apparently related most closely to *S. multiradiata* Aiton and *S. leiocarpa* de Candolle. *S. multiradiata* is an arctic-alpine species (with several recognized varieties) of n. Canada and AK, ranging south in w. North America to CA and CO. *S. cutleri* occurs in alpine situations on the higher peaks of QC, ME, NH, VT, and NY. *S. spithamaea* is a part of the remarkable "pseudo-alpine" flora of high elevation rocky summits in nw. NC; it typically is found with *Liatris helleri, Huperzia appressa, Geum radiatum, Trichophorum caespitosum, Sibbaldiopsis tridentata, Polypodium appalachianum, Paronychia argyrocoma, Kalmia buxifolia, Stenanthium leimanthoides, Heuchera villosa* var. *villosa, Hydatica petiolaris, Solidago glomerata, Houstonia montana, Carex misera,* and *C. brunnescens.* [= RAB, FNA, K, S; = *S. spithamea* – SE, W, orthographic variant]

Solidago squarrosa Nuttall, Ragged Goldenrod, Stout Goldenrod, Squarrose Goldenrod. Mt (NC, VA, WV), Pd (DE, VA): upland forests; uncommon (rare in DE and NC, rare in VA Piedmont). August-September. NB and ON south to DE, w. NC, and OH. [= RAB, C, F, FNA, G, K, S, SE, W, WV]

Solidago stricta Aiton, Wand Goldenrod. Cp (DE, FL, GA, NC, SC, VA?): pine savannas, Coastal Plain bogs, pocosins; common (rare in DE). Late August-October. NJ and DE (formerly) south to s. FL, west to TX; West Indies and s. Mexico. [= C, F, G, K, SE, WH; < *S. stricta* – RAB, GW (also see *S. pulchra*); = *S. petiolata* P. Miller – S, misapplied; = *S. stricta* Aiton ssp. *stricta* – FNA]

Solidago tarda Mackenzie. Cp (DE, FL, GA, VA), Pd (GA, VA): sandhills, other dry pinelands, xeric fluvial sand ridges, Piedmont barrens; rare. September-October. NJ and e. PA south to e. VA, c. and s. GA, AL, and Panhandle FL, in our area primarily in the Coastal Plain; disjunct in Marion County, TN (Chester, Wofford, & Kral 1997). [= C, FNA, S, SE; < *S. arguta* – RAB; < *S. ludoviciana* – F, misapplied as to our area; < *S. arguta* var. *arguta* – K; < *S. arguta* var. *caroliniana* – WH]

Solidago tortifolia Elliott, Leafy Pineywoods Goldenrod. Cp (FL, GA, NC, SC, VA): sandhills and dry pinelands; uncommon (rare in NC and VA). August-November. Se. VA south to s. FL, west to AR and TX. [= RAB, C, F, FNA, G, K, S, SE, WH]

Solidago uliginosa Nuttall *var.* ***linoides*** (Torrey & A. Gray) Fernald. Mt (WV): bogs; rare. NS and NL (Labrador) west to MB, south to s. PA, e. WV, OH, IN, and IL. [= K; < *S. uliginosa* – C, FNA; > *S. uliginosa* var. *linoides* – F; > *S. purshii* Porter – F, WV; > *S. uliginosa* var. *peracuta* (Fernald) Friesner – G]

Solidago uliginosa Nuttall *var.* ***uliginosa***, Northern Bog Goldenrod. Mt (GA?, NC, VA, WV), Cp (DE, VA): bogs, wet meadows, mafic fens, acidic seepage swamps; rare. NL (Labrador) west to Keewatin, south to e. VA, w. NC, ne. TN, IL, and IA (reports from further south need additional evaluation; some material formerly identified as *S. uliginosa* is actually *S. simulans* or *S. gracillima*). [= F, G, K, WV; < *S. uliginosa* – RAB, C, FNA, SE, W; < *S. uniligulata* (A.P. de Candolle) Porter – S]

Solidago ulmifolia Muhlenberg ex Willdenow var. *palmeri* Cronquist. East to MS (and AL?). [= FNA, G, K, SE; < *S. ulmifolia* – S]

Solidago ulmifolia Muhlenberg ex Willdenow *var.* ***ulmifolia***, Elmleaf Goldenrod. Mt (GA, NC, SC, VA, WV), Pd (DE, NC, SC, VA), Cp (DE, FL, VA): rocky forests and woodlands, especially on mafic and calcareous substrates, moist hammocks (in FL); common (rare in DE, FL, GA, NC, SC, rare in VA Coastal Plain, where usually confined to coquina limestone). August-October. NS, ME, ON, and MN, south to FL and TX. [= C, FNA, G, K, SE; < *S. ulmifolia* – RAB, F, S, W, WH, WV]

Solidago verna M.A. Curtis, Spring-flowering Goldenrod. Cp (NC, SC): moist pine savannas, lower slopes of sandhills, pineland roadbanks; rare. May-June. Se. NC south to e. SC. [= RAB, FNA, K, S, SE]

Solidago villosicarpa LeBlond, Carolina Maritime Goldenrod. Cp (NC): dry-mesic and mesic hardwood forests (and related disturbed areas), in the outer Coastal Plain; rare. September. Endemic to se. NC (Onslow, Pender, Brunswick, and Craven counties). See LeBlond (2000) for additional information. [= FNA]

Soliva Ruiz & Pavón 1794 (Burweed)

A genus of about 8 species, herbs, of South America. References: Watson in FNA (2006a); Cronquist (1980)=SE; Arriagada & Miller (1997)=Z. [also see *Gymnostyles*]

1 Achenes (1.5-) 2.5-3.0 mm long, usually winged, the wings not transversely ribbed ..... ***S. sessilis***
1 Achenes 1.5-2.2 mm long, winged, transversely ribbed.
2 Leaves mostly basal; leaf blades 3-8 (-15) cm long, 2-3× pinnatifid ..... ***S. anthemifolia***
2 Leaves cauline and basal; leaf blades 1-2 (-3) cm long, 1 (-2)× pinnatifid ..... ***S. stolonifera***

* ***Soliva anthemifolia*** (Antoine Laurent de Jussieu) Sweet. Cp (FL): lawns, disturbed areas; rare, native of South America. February-April. [= FNA, SE, Z = *Gymnostyles anthemifolia* Antoine Laurent de Jussieu – K, S, WH]
* ***Soliva sessilis*** Ruiz & Pavón, Field Burweed, Lawn Burweed, Spurweed. Cp (FL, GA, NC, SC, VA), Pd (GA, NC): lawns, roadsides; uncommon (rare in GA, NC, SC, VA), native of South America. April-May. [= FNA, K, S, WH, Z; = *S. pterosperma* (Antoine Laurent de Jussieu) Lessing – RAB, SE]
* ***Soliva stolonifera*** (Brotero) Loureiro, Carpet Burweed. Cp (FL, GA, SC): lawns, roadsides, moist open areas; uncommon, native of South America. March-April. [= FNA, SE, Z; = *Gymnostyles stolonifera* (Brotero) Tutin – K, WH; *? Soliva nasturtiifolia* (Antoine Laurent de Jussieu) A.P. de Candolle – RAB, misapplied; *? Gymnostyles nasturtiifolia* Antoine Laurent de Jussieu – S, misapplied]

Sonchus Linnaeus 1753 (Sow-thistle, Milk-thistle)

A genus of about 50-60 species, herbs and shrubs, of the Old World. References: Hyatt in FNA (2006a); Cronquist (1980)=SE.

1 Heads 30-50 mm across in flower, the involucre (10-) 15-20 mm high; perennials from creeping rhizomes.
2 Phyllaries and peduncles densely pubescent with glandular hairs; longer phyllaries 14-17 mm long ..... ***S. arvensis*** *var.* ***arvensis***
2 Phyllaries and peduncles glabrous (but with sessile glands); longer phyllaries 10-15 mm long ..... ***S. arvensis*** *var.* ***glabrescens***
1 Heads 15-25 mm across in flower, the involucre 9-13 mm high; annuals.
3 Leaf base auricles rounded; mature achenes not transversely rugose ..... ***S. asper***
3 Leaf base auricles sagittate, the two lobes on either side of the stem coming to a point; mature achenes transversely rugose ..... ***S. oleraceus***

* ***Sonchus arvensis*** Linnaeus *var.* ***arvensis***, Perennial Sow-thistle. Mt (WV): disturbed areas; rare. Native of Europe, south to WV (Strausbaugh & Core 1978), MD, PA, TN, KY, and MS (Kartesz 1999). [= C, F, SE; = *S. arvensis* ssp. *arvensis* – FNA, K; = *S. arvensis* – G]
* ***Sonchus arvensis*** Linnaeus *var.* ***glabrescens*** (Günther) Grabowski & Wimmer, Perennial Sow-thistle. Mt (NC, VA, WV), Pd (VA): disturbed areas; uncommon (rare in NC), native of Europe. June-November. [= C, SE, WV; < *S. arvensis* – RAB, W; = *Sonchus arvensis* ssp. *uliginosus* (Bieberstein) Nyman – FNA, K; > *S. arvensis* var. *glabrescens* – F; > *S. uliginosus* Bieberstein – F; = *S. uliginosus* – G]
* ***Sonchus asper*** (Linnaeus) Hill, Spinyleaf Sow-thistle, Prickly Sow-thistle. Cp (DE, FL, GA, NC, SC, VA), Pd (DE, GA, NC, SC, VA), Mt (GA, NC, SC, VA, WV): roadsides, fields, pastures, disturbed areas; common, native of Europe. Late March-July. [= RAB, C, F, FNA, G, K, S, SE, W, WH, WV]
* ***Sonchus oleraceus*** Linnaeus, Common Sow-thistle. Cp (DE, FL, GA, NC, SC, VA), Pd (DE, GA, NC, SC, VA), Mt (GA, VA, WV): roadsides, fields, pastures, disturbed areas; common (uncommon in FL, GA, NC, SC, VA, and WV), native of Europe. Late March-July. [= RAB, C, F, FNA, G, K, S, SE, W, WH, WV]

Sphagneticola O. Hoffmann 1900

A genus of about 4 species, perennial herbs, of tropical America and Asia. References: Strother in FNA (2006c).

* ***Sphagneticola trilobata*** (Linnaeus) Pruski. Cp (FL): disturbed areas; rare, native of tropical America. Naturalized in FL (including several counties in the Panhandle adjacent to GA) (Wunderlin & Hansen 2003). [= FNA, K, WH; = *Wedelia trilobata* (Linnaeus) A.S. Hitchcock – S, SE]

Stokesia L'Héritier 1789 (Stokesia, Stokes Aster)

A monotypic genus, an herb, of se. North America. References: Strother in FNA (2006a); Jones (1982)=Z; Cronquist (1980)=SE.

Stokesia laevis (Hill) Greene, Stokesia, Stokes Aster, Blue Stokesia. Cp (FL, GA, SC), Pd* (NC*): native in pitcherplant bogs and moist pinelands of FL, GA, and SC, rather frequently grown as a garden plant and naturalized from cultivation at least in NC; rare. Late June-August. Native from e. SC south ne. FL, FL Panhandle, west to LA. There seems no reason to question the validity and native status of the early record from SC. A unique tetraploid population found by the Atlanta Botanical Garden in Omega, GA (near Tifton) in the 1990s was distinguished by having distinct upright and long scapes, up to 1 meter in length; the original population has been destroyed, but a selection derived from it was named 'Omega Skyrocket' and introduced into the commercial trade (D. Werner, pers. comm. 2006). [= RAB, FNA, K, S, SE, WH, Z]

Stuartina Sonder 1853

A genus of 2 species, endemic to Australia.

* ***Stuartina hamata*** Philipson. Cp (SC): waste area near wool-combing mill; rare, native of Australia. See Nesom (2004d).

Symphyotrichum Nees 1833 (American Aster)

A genus of about 90 species, of the Americas and e. Asia, most diverse in our area. References: Brouillet et al. FNA (2006b); Brouillet & Semple (1981); Cronquist (1980)=SE; Jones (1980a, 1980b, 1984); Jones & Young (1983); R. Jones (1983)=Z; R. Jones (1992); Lamboy (1987, 1992)=Y; Nesom (1994)=X; Nesom (2005b)=V; Nesom (1993a, 1993b, 1994, 1997); Noyes & Rieseberg (1999); Semple & Brouillet (1980a, 1980b); Semple, Chmielewski, & Lane (1989); Semple, Heard, & Xiang (1996); Sundberg (2004)=Q; Reveal & Keener (1981); Warners & Laughlin (1999); Xiang & Semple (1996). Key to subgenus *Astropolium* based on Nesom (2005b).

1 Basal and lower stem leaves **both** petiolate **and** with cordate blades; [subgenus *Symphyotrichum*, section *Heterophylli*] ..... **Key A**
1 Basal and lower stem leaves not **both** petiolate and cordate-bladed.
2 Annuals, from a taproot; [of moist, usually maritime, and usually saline habitats]; [subgenus *Astropolium*] ..... **Key B**
2 Perennials, from a caudex, rhizome, or crown; [collectively of various habitats].
3 Stem leaves fleshy, entire, linear; stems glabrous ..... **Key C**
3 Leaves not fleshy, usually toothed, stems usually variously pubescent.
4 Leaves **either** very numerous on the main stem, the internodes < 1 cm long (in some species the leaves of the lower and middle main stem withered or deciduous by flowering season, the internode length then reckonable by leaf scars), the leaves clasping or sessile, **or** leaves rather numerous on main stem, the internodes < 3.5 cm long, the leaves of the main stem strongly auriculate clasping (*S. georgianum*, *S. phlogifolium*); stem leaves entire, (often scabrous-margined); rays purple, lavender, rose, or blue (or characteristically white in *S. ericoides* and very rarely also in other species); [subgenus *Virgulus*] ..... **Key D**
4 Leaves less numerous on the main stem, the internodes averaging > 3.5 cm long, the leaves clasping, subclasping, or not clasping; stem leaves toothed (or rarely entire); rays blue, purple, lavender, pink, or white.
5 Stem leaves clasping to sheathing; rays blue, purple, or lavender ..... **Key E**
5 Stem leaves not clasping; rays blue, purple, lavender, rose, or white ..... **Key F**

Key A *Symphyotrichum* with petiolate, cordate-bladed lower leaves [of subgenus *Symphyotrichum*, section *Heterophylli*]

1 Disc florets 35-50 (or more); ray florets (13-) 20-30; involucre (6-) 7-10 mm high; phyllary tips spreading to squarrose ..... ***S. retroflexum***
1 Disc florets (8-) 10-25 (-30); ray florets 8-20 (-25); involucre 3.8-7 mm high (or to 8 mm high in *S. oolentangiense*); phyllary tips appressed (or the outer phyllaries spreading).
2 Cauline leaf blades sessile and cordate-clasping, or petiolate, the petiole strongly dilated to a cordate-clasping base, or both ..... ***S. undulatum***
2 Cauline leaves not cordate clasping; [collectively widespread].
3 Lower stems glabrous; upper stems sparsely hirtellous or pilose.
4 Basal leaves deeply cordate; phyllaries with lanceolate diamond shaped blaze (2-3× as long as wide), purple to greenish purple ..... ***S. cordifolium***
4 Basal leaves shallowly cordate to truncate; phyllaries with short diamond shaped blaze (1-1.5× as long as wide) or linear-lanceolate-shaped blaze (> 4× as long as wide), green.
5 Phyllaries with short diamond shaped green blaze (1-1.5× as long as wide) ..... ***S. lowrieanum***
5 Phyllaries with linear-lanceolate-shaped green blaze (> 4× as long as wide) ..... ***S. urophyllum***
3 Lower stems glabrous to sparsely hirsute; upper stems densely hirtellous to hirsute; [mainly west of the Appalachians].
6 Phyllaries with short diamond-shaped green blaze (1-1.5× as long as wide); basal and lower stem leaves mostly crenate to entire; upper stem leaves entire.
7 Plants with only the basal and lower stem leaves cordate or subcordate; phyllary faces glabrous; lower disc florets (15-) 20-25 (-30) ..... ***S. oolentangiense*** *var.* ***oolentangiense***
7 Plants with nearly all basal and stem leaves cordate or subcordate; phyllary faces short-pubescent; disc florets 16-23 ..... ***S. shortii***
6 Phyllaries with elongate green blaze (> 2× as long as wide); basal and lower stem leaves serrate or crenate; upper stem leaves serrate or crenate (to entire).
8 Plants 4-12 dm tall; cypselae glabrous ..... ***S. drummondii*** *var.* ***drummondii=S. drummondii***
8 Plants 3-8 dm tall; cypselae strigillose ..... ***[S. drummondii*** *var.* ***texanum]=[S. texanum]***

Key B – annual salt-marsh asters [of subgenus *Astropolium*]

1 Heads usually dense in an elongate, pyramidal-paniculate arrangement; inner phyllaries 6-7 mm long, phyllary apices linear-acuminate, distal margins often inrolled/involute, green zone of phyllaries narrowly lanceolate, usually extending the entire length of the phyllary, chartaceous bases short or absent; pappus accrescent, 4-5.5 mm long at maturity and usually longer than coiled ray corollas; [habitats wet, saline] ..... ***S. subulatum***

1 Heads corymbiform to thyrsiform, diffusely paniculate, or secund to subsecund and paniculiform arrangements or at the tips of long, bracteate branches; inner phyllaries 4-6.5 mm long, phyllary apices acute to acuminate, distal margins inrolled/involute or not, green zone of phyllaries lanceolate to elliptic, chartaceous bases usually conspicuous; pappus not accrescent, 3.5-4 (-5) mm long at maturity, longer or shorter than ray corollas; [habitats moist to wet, rarely saline].
2 Phyllary tips appressed, acute, flat, inner phyllaries with broadly lanceolate, distinctly demarcated, apical green zone, proximal ½ -1/3 white-chartaceous; ray floret laminae erect, often involute along the edges (curling inward lengthwise), rarely coiling back distally (if so, then only ca. 1/2 coil), usually shorter than mature pappus; disc florets (3-) 7-14 ..... ***S. squamatum***
2 Phyllary tips loose, linear-acuminate, distal margins often inrolled/involute, inner phyllaries with narrowly lanceolate, often weakly demarcated apical green zone, white-chartaceous bases short, ca. 1/3–1/2 the length of the phyllaries; ray floret laminae not involute along edges, usually coiling back distally in 1–4 or more coils, usually as long or longer than mature pappus; disc florets **either** (6-) 8-15 **or** 11-23 **or** (20-) 33-45 (-50).
3 Heads usually corymbiform to thyrsiform in arrangement (borne primarily on distal branches, distally clustered); inner phyllaries 4-5.5 (-6) mm long; phyllary apices acute to abruptly short-acuminate or long-acuminate, the distal margins inrolled/involute or not; ray florets in 1 (-2) series, corollas 2-3 mm long, the laminae 0.1-0.3 mm wide (dried), white to light pinkish or slightly blue, coiling back in 1-2 coils or less commonly remaining straight; disc florets (6-) 8-15; [of FL westward across the Gulf Coast] ..... ***S. expansum***
3 Heads diffusely paniculiform to pyramidal-paniculiform to corymbiform or second to subsecund and paniculiform; inner phyllaries 5-6.5 mm long; phyllary apices long-acuminate, the distal margins usually inrolled/involute; ray florets in 1-3 series, corollas 2-7 mm long, the laminae 0.2-0.8 mm wide (dried), white to blue or purple, coiling back in 2-5 coils; disc florets **either** 11-23 **or** (20-) 33-45 (-50).
4 Heads at first at ends of long, bracteate branches, then produced and maturing as axillary and nearly sessile or on very short lateral branches, commonly on one side of the main stem and appearing secund to subsecund, in paniculiform arrangements; ray florets in 2-3 series, corollas mostly 2–3.5 (-4) mm long, laminae 0.2-0.4 mm wide (dry), blue to purple, coiling back in 2-3 (-4) coils; disc florets 11-23; [e. GA southwards] ..... ***S. bahamense***
4 Heads often at ends of long, bracteate branches, axillary heads usually maturing on elongate lateral branches, the whole arrangement often diffusely paniculiform to pyramidal-paniculiform, or heads more distally disposed and the arrangement corymbiform to thyrsiform; ray florets in 1 series, corollas mostly 4-7 mm long, laminae 0.4-0.8 mm wide (dry), blue to white, coiling back in 3-5 coils; disc florets (20-) 33-45 (-50); [sc. United States east to AL and scattered eastward as an introduction] ..... ***S. divaricatum***

Key C – perennial asters with linear, fleshy leaves
[of *Symphyotrichum* subgenera *Astropolium* and *Chapmaniani*]

1 Leaves basally disposed; disc florets 47-57; ray floret laminae (10-) 14-15 (-20) mm long; [of FL]; [subgenus *Chapmaniani*] ..... ***S. chapmanii***
1 Leaves mainly cauline, the basal and lower stem lives typically withered by flowering season; disc florets (10-) 13-45 (-54); ray floret laminae (4.5-) 5-8.5 (-9.5) mm long; [collectively widespread]; [subgenus *Astropolium*]
2 Midstem leaves (1.0-) 1.5-2.7 mm wide; involucres 4.1-5.3 mm high; ray florets 10-16; disc florets (10-) 13-23; achenes 1.5-2.0 (-2.5) mm long; pappus 3.0-4.4 mm long; [of FL southward] ..... ***S. bracei***
2 Midstem leaves (1.5-) 3-6 mm wide; involucres 6-9.5 (-11) mm high; ray florets (12-) 17-25; disc florets 25-45 (-54); achenes 2.8-4.0 (-4.5) mm long; pappus 5.0-6.1 mm long; [widespread in our area] ..... ***S. tenuifolium***

Key D – perennial asters
[of *Symphyotrichum* subgenus *Virgulus*]

1 Mid and upper stem leaves > 8× as long as wide; phyllaries tipped with a small, white spine; rays white (to pale pink); involucre 2.5-4.5 (-5) mm high; disc florets 6-12 (-20) per head; [section *Ericoidi*] ..... ***S. ericoides* var. *ericoides***
1 Mid and upper stem leaves 2-7× as long as wide; phyllaries not spine-tipped; rays purple, lavender, rose, blue (rarely nearly white); involucre >5 mm high (except sometimes as short as 4 mm high in *S. adnatum* of s. GA and FL west to LA); disc florets (6-) 11-110 per head.
2 Disc florets yellow, cream, or white (with purplish corolla lobes), fading purple or brown; mid and upper stem leaves with bases rounded to cuneate (or slightly clasping in *S. plumosum* of FL Panhandle); phyllaries not stipitate-glandular; [section *Virgulus*].
3 Rays 13-15 (-36); cypselas glabrous ..... ***S. pratense***
3 Rays 7-12; cypselas densely strigose.
4 Phyllaries long-acuminate, spreading to recurved; phyllaries with woolly, tangled hairs; involucre 7-9 mm tall; [of Franklin County, FL Panhandle] ..... ***S. plumosum***
4 Phyllaries acute, appressed; phyllaries **either** with appressed, straight hairs (moderately to densely sericeous) **or** glabrous to sparsely pilose; involucre 5-7 mm high; [collectively widespread].
5 Phyllaries and upper stem leaves moderately to densely sericeous (silky-pubescent); [widespread] ..... ***S. concolor* var. *concolor***
5 Phyllaries and upper stem leaves glabrous or sparsely pilose; [of the Gulf Coastal Plain] ..... ***S. concolor* var. *devestitum***
2 Disc florets pink, fading purple; mid and upper stem leaves with bases clasping or auriculate clasping (except cuneate, rounded, or slightly clasping in *S. grandiflorum, S. oblongifolium*, and *S. fontinale*); phyllaries stipitate glandular (or sometimes or always lacking stipitate glands in *S. fontinale* and *S. walteri* (of the Coastal Plain from e. NC southward), and *S. patens* var. *patentissimum* (of KY and MS westward).
6 Mid-stem leaves < 1.5 cm long, **either** ascending-appressed, **or** spreading, and then the apical portion abruptly deflexed; rays 5-9 (-11) mm long; [of the Coastal Plain]; [section *Patentes*].
7 Blades of mid-stem leaves ascending-appressed, basally decurrent; [of s. GA south to s. FL, west to se. LA] ..... ***S. adnatum***
7 Blades of mid-stem leaves spreading, the apical portion then abruptly deflexed, basally clasping; [of e. NC to c. peninsular FL] ..... ***S. walteri***
6 Mid-stem leaves > 2 cm long, spreading; rays > 9 mm long (to as short as 7 mm in *S. fontinale* of Panhandle FL); [collectively widespread].
8 Mid-stem leaves cuneate, rounded, or subclasping; [section *Grandiflori*].

9 Phyllaries appressed; phyllary faces glabrous or glabrate, lacking stipitate glands (though there may be a few stipitate glands on the phyllary margins); heads 6-7.6 mm high; [of wet pinelands and marshes of e. Panhandle FL south to s. FL]..... ***S. fontinale***

9 Phyllaries spreading, squarrose, or reflexed; phyllary faces moderately to densely stipitate-glandular (and also often pubescent or scabrous with non-stipitate hairs); heads (5-) 7-12 (-15) mm high; [of dry habitats, of mainly inland provinces, though extending to the Coastal Plain in e. VA, e. NC, and nc. SC].

10 Involucres 8.5-12 (-15) mm high; lower stem leaves (often withered by flowering season) cordate-clasping; [of acidic habitats of the Coastal Plain and Piedmont of e. and c. VA south through e. and c. NC to to nc. SC]..... ***S. grandiflorum***

10 Involucres (5-) 7-9 mm high; lower stem leaves (typically persisting) cuneate, rounded, or subclasping; [of calcareous habitats, south to sc. VA, w. NC, nc. AL, n. MS] ..... ***S. oblongifolium***

8 Mid-stem leaves clasping to auriculate-clasping.

11 Phyllaries with attenuate, loosely spreading tips; disc florets 50-110; ray florets (40-) 50-75 (-100); [mainly of sunny, moist to wet marshes, swamps, fens, south to GA, wc. AL, c. MS]; [section *Grandiflori*] ..... ***S. novae-angliae***

11 Phyllaries with obtuse to acute tips (the inner phyllaries sometimes acuminate, but not attenuate); disc florets 15-50; ray florets 9-24 (-30); [of sunny to semi-sunny dry sites, or of moist forests, collectively widespread, south to ne. FL, Panhandle FL, s. AL, s. MS, se. LA].

12 Involucres 8-10 (-12) mm high; disc florets 8-10 mm long, white with purplish lobes; heads 4-5 (-6) cm across (ray tip to ray tip), the rays 14-24 mm long; plants strongly rhizomatous, forming clonal colonies with the stems mostly scattered along the rhizome (new stems typically arising at least several cm from the old ones); achenes 2.5-4.0 mm long, pale gray-brown, the trichomes about 0.4 mm long and distributed on and between the ribs; anthers purplish; pollen white; [section *Grandiflori*] ..... ***S. georgianum***

12 Involucres 5.5-7.5 (-8.5) mm high (or to 12 mm high in *S. patens* var *patentissimum*, barely entering our area in w. KY and w. MS); disc florets 5.5-8 mm long, either white with purplish lobes or bright yellow; heads 3-4 (-4.5) cm across (ray tip to ray tip), the rays 10-18 (-20) mm long; plants cespitose, generally with 1 or more stems arising from caudices (the new stems arising near the old); achenes 2.0-4.0 mm long, tan, gray, brown, dark-brown, or black, the trichomes various (see below); anthers purplish or yellow; pollen white or yellow; [section *Patentes*].

13 Disc florets white with purplish lobes; stem leaves 7.5-12.5 (-14) cm long, thin in texture, soft-pubescent, the venation apparent, rugose-veiny and wrinkled; anthers purplish; pollen white; achenes 2.5-4.0 mm long, the trichomes concentrated on the ribs, < 0.4 mm long, appressed; [primarily of the Mountains, less commonly the Piedmont, mostly in moist, shady to semi-sunny situations]..... ***S. phlogifolium***

13 Disc florets bright yellow; stem leaves (2-) 3-7 (-9) cm long, thick in texture, scabrous, the venation inconspicuous; anthers yellow; pollen yellow; achenes 2.0-3.5 mm long, the trichomes distributed on and between the ribs, mostly > 0.4 mm long, spreading; [collectively widespread in our area, mostly in dry, semi-sunny to sunny situations]

14 Involucres 8-12 mm high; phyllaries appressed, in 5-7 series; phyllaries obtuse, lacking stipitate glands or sparsely stipitate-glandular; [from w. KY and w. MS westward]..... **[*S. patens* *var. patentissimum*]**

14 Involucres 5.5-7.5 mm high; phyllaries squarrose, in 4-5 series; phyllaries acute to acuminate, sparsely to densely stipitate-glandular; [collectively widespread].

15 Middle phyllaries 0.7-1 mm wide; phyllary faces sparsely stipitate-glandular and densely strigillose; [from se. LA and w. MS westward] ..... **[*S. patens* *var. gracile*]**

15 Middle phyllaries 1-1.2 mm wide; phyllary faces densely stipitate-glandular and sparsely strigillose; [widespread]..... ***S. patens* *var. patens***

Key E

1 Phyllaries appressed (or in some species the outer slightly spreading); rays usually < 20 [(10-) 12-23 (-34)]; [section *Heterophylli*].

2 Middle stem leaves strongly clasping; involucre 3.8-5.5 mm high; disc corollas 15-22 (-25); phyllaries acute, acuminate, to attenuate; green blaze on phyllary lanceolate to elongate diamond-shaped..... ***S. undulatum***

2 Middle stem with a winged, sheathing petiole; involucre (4.2-) 4.5-8 mm high; disc corollas (15-) 19-33 (-43); phyllaries acute, green blaze on phyllary diamond-shaped, about as long as wide or slightly longer.

3 Leaf faces scabrous ..... ***S. oolentangiense* *var. oolentangiense***

3 Leaf faces glabrous.

4 Leaves basally disposed, the largest basal and persistent; largest leaves linear, to 20 cm × 2.5 cm, avg. 10× as long as wide; leaf margins often strongly scabrous; [mainly of the Coastal Plain, of SC and GA west to AR and TX]..... ***S. laeve* *var. purpuratum=S. attenuatum***

4 Leaves cauline, the largest on the stem; largest leaves narrowly to broadly lanceolate, avg. < 9× as long as wide; leaf margins usually only slightly scabrous; [mainly of inland provinces, of NS west to MB, south to GA, Panhandle FL, MS, LA, and OK].

5 Larger leaves > 5× as long as wide, rarely > 2.5 cm wide, the bases slightly clasping; [NYand KY south to GA, Panhandle FL (Jackson County), and MS]..... ***S. laeve* *var. concinnum=S. concinnum***

5 Larger leaves < 5× as long as wide, often > 2.5 cm wide, the bases strongly clasping; [NS west to MB, south to GA, LA, and OK] ..... ***S. laeve* *var. laeve=S. laeve s.s.***

1 Phyllaries spreading to squarrose; rays usually > 20 [15-50 (-60)].

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55. S. elliottii {Symp-Symp-Pun}
56a. S. puniceum var. puniceum {Symp-Symp-Pun}
56b. [S. puniceum var. scabricaule] {Symp-Symp-Pun}
57. S. firmum {Symp-Symp-Symp}
58. S. rhiannon {Symp-Symp-Pun}
59. S. prenanthoides {Symp-Symp-Pun}
60d. S. novi-belgii var. elodes {Symp-Symp-Symp}

60c. [S. novi-belgii var. novi-belgii] {Symp-Symp-Symp}

[from Warners & Laughlin (1999)]

1 Stems glabrous, occasionally hispidulous in lines; stem leaves with glabrous midvein on the lower surface; rays white to pale lavender; inflorescence dense, leafy; shoots arising singly from elongate rhizome; stems 3-5 mm thick (at 20 cm above soil surface) ..... ***S. firmum***
1 Stems densely pubescent, usually purplish; stem leaves with pubescent midvein on the lower surface; rays lavender to purple; inflorescence widely spreading; shoots often in clumps of 2-6 stems from a persistent stout caudex; stems 5-9 mm thick (at 20 cm above soil surface)..... ..... ***S. puniceum*** *var.* ***puniceum***

Key F

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1

37. S. retroflexum {Symp-Het}

38. S. depauperatum {Symp-Port}
40a. S. pilosum var. pilosum {Symp-Port}
40b. S. pilosum var. pringlei {Symp-Port}
42. S. priceae {Symp-Port}

43. S. dumosum var. dumosum {Symp-Dum}
43. S. dumosum var. gracilipes {Symp-Dum}
43. S. dumosum var. pergracile {Symp-Dum}
43. S. dumosum var. strictior {Symp-Dum}
43. S. dumosum var. subulifolium {Symp-Dum}
44?. [S. kralii] {Symp-Dum}
44. S. simmondsii {Symp-Dum}
45. S. racemosum var. racemosum {Symp-Dum}
45. S. racemosum var. subdumosum {Symp-Dum}
48. [S. lateriflorum var. angustifolium] {Symp-Dum}
48. S. lateriflorum var. horizontale {Symp-Dum}
48. S. lateriflorum var. lateriflorum {Symp-Dum}
48. [S. lateriflorum var. spatelliforme] {Symp-Dum}
49a. S. ontarionis var. ontarionis
50c. [S. lanceolatum var. interior] {Symp-Dum}
50e. S. lanceolatum var. lanceolatum {Symp-Dum}
50d. S. lanceolatum var. latifolium {Symp-Dum}
51. S. praealtum var. praealtum {Symp-Dum}
51. S. praealtum var. angustior {Symp-Dum}
51. [S. praealtum var. subasperum] {Symp-Dum}
52. [S. boreale] {Symp-Dum}
55. S. elliottii {Symp-Symp-Pun}

Symphyotrichum adnatum (Nuttall) Nesom. Cp (FL, GA): sandhills, pine flatwoods; common. S. GA south to s. FL, west to se. LA. [= FNA, K, WH, X; = *Aster adnatus* Nuttall – S, SE]

Symphyotrichum bahamense (Britton) Nesom, Bahama Salt-marsh Aster. Cp (FL, GA): salt, brackish, and fresh marshes, ditches, wet areas; uncommon. October-November. E. GA and e. FL Panhandle south to s. FL; the Bahamas. [= K, V; = *S. subulatum* (Michaux) Nesom var. *elongatum* (Bosserd) S.D. Sundberg – FNA, Q; < *Aster subulatus* – GW; < *A. subulatus* Michaux var. *cubensis* – SE; = *A. subulatus* Michaux var. *elongatus* Bosserd]

Symphyotrichum boreale (Torrey & A. Gray) Löve & Löve, Rushlike Aster, Northern Bog Aster. Mt (WV): calcareous wetlands; rare. August-October. NL (Newfoundland) west to AK, south to n. NJ, ne PA, nw. PA, WV, OH, IN, IL, IA, NE, CO, ID, and WA. Reported for WV (Barbour, Fayette, Nicholas, and Randolph counties), PA, and NJ. [= FNA, K, X; = *Aster borealis* (Torrey & A. Gray) Provancher – C; ? *Aster junciformis* Rydberg – F, G]

Symphyotrichum bracei (Britton ex Small) Nesom, Brace's Aster. Cp (FL): brackish marshes; rare. August-December (-February). Panhandle FL south to s. FL; Bahamas; Cuba. [= K, V, WH, X; = *Aster bracei* Britton ex Small – S, SE; = *S. tenuifolium* (Linnaeus) Nesom var. *aphyllum* (R.W. Long) S.D. Sundberg – FNA, Q]

Symphyotrichum chapmanii (Torrey & Gray) Semple & Brouillet, Chapman's Aster. Cp (FL): flatwoods and seepage bogs; rare. Endemic to Panhandle FL and s. AL, with a few widely scattered records in the FL peninsula. [= FNA, WH; = *Eurybia chapmanii* (Torrey & Gray) Nesom – K, X; = *Aster chapmanii* Torrey & Gray – S, SE]

Symphyotrichum concolor (Linnaeus) Nesom *var.* ***concolor***, Eastern Silvery Aster. Cp (DE, FL, GA, NC, SC, VA), Pd (GA, NC, SC, VA), Mt (GA, NC, SC, VA): sandhills, Piedmont woodlands, forest edges, roadbanks; common (rare in DE, rare in Mountains). September-October. MA and NY south to s. FL, west to LA, inland less commonly to TN and KY. [= FNA; < *S. concolor* (Linnaeus) Nesom – K, WH, X; < *Aster concolor* Linnaeus – RAB, C, F, G, S, SE, W; < *Virgulus concolor* (Linnaeus) Reveal & Keener; = *Symphyotrichum concolor* ssp. *concolor* – Haines (2010)]

Symphyotrichum concolor (Linnaeus) Nesom *var.* ***devestitum*** (S.F. Blake) Semple, Gulf Coast Silvery Aster. Cp (FL, GA?, SC?): savannas; uncommon. Panhandle FL, maybe extending to GA, AL, and SC. See Semple (2004). [= FNA; < *Symphyotrichum concolor* (Linnaeus) Nesom – K, WH, X; < *Aster concolor* Linnaeus – RAB, S, SE; < *Virgulus concolor* (Linnaeus) Reveal & Keener; = *Aster concolor* Linnaeus var. *devestitus* S.F. Blake; = *Symphyotrichum concolor* ssp. *devestitum* (S.F. Blake) A. Haines – Haines (2010)]

Symphyotrichum cordifolium (Linnaeus) Nesom. Mt (GA, NC, SC, VA, WV), Pd (DE, GA, NC, SC, VA), Cp (DE, NC, SC, VA): rich forests, shaded roadbanks; common (rare in Piedmont south of DE, rare in Coastal Plain). September-October. [= K; < *Aster cordifolius* Linnaeus – RAB (also see *S. lowrieanum*); = *A. cordifolius* – C, G, S, SE, W; > *A. cordifolius* var. *cordifolius* – F, WV; > *A. cordifolius* var. *polycephalus* Porter – F; > *A. cordifolius* var. *racemiflorus* Fernald – F, WV; < *S. cordifolium* – FNA (also see *S. lowrieanum*); > *S. cordifolium* (Linnaeus) Nesom var. *cordifolium* – X; > *S. cordifolium* (Linnaeus) Nesom var. *polycephalum* (Porter) Nesom – X; > *S. cordifolium* (Linnaeus) Nesom var. *racemiflorum* (Fernald) Nesom – X]

Symphyotrichum depauperatum (Fernald) Nesom, Serpentine Aster. Pd (NC), Mt (WV): glades and barrens over mafic rocks (diabase) [or calcareous rocks in WV?]; rare. Early September-October. MD and se. PA; disjunct southward in nc. NC. Reported for Hardy County, WV (Harmon, Ford-Werntz, & Grafton 2006, Strausbaugh & Core 1978). [= FNA, K, X; = *Aster depauperatus* Fernald – C, F, G, SE]

* ***Symphyotrichum divaricatum*** (Nuttall) Nesom, Midwestern Salt-marsh Aster. Cp (SC, VA), Pd (VA): disturbed areas, including mowed fields, periodically flooded floodplains, waste areas near wool-combing mill; rare, native of sc. United States and Mexico. October-November. See Nesom (2000). [= K, V, X; = *Aster exilis* Elliott – RAB, F, S, apparently misapplied; = *Symphyotrichum subulatum* (Michaux) Nesom var. *parviflorum* (Nees) S.D. Sundberg – FNA, Q; < *Aster subulatus* – GW; = *Aster subulatus* Michaux var. *ligulatus* Shinners – SE]

Symphyotrichum drummondii (Lindley) Nesom *var.* ***drummondii***, Hairy Heart-leaved Aster. Mt (WV): mesic to dry forests; rare. August-October. PA, OH, MI, WI, MN, and NE, south to MD, WV, TN, AL, MS, and LA (including the Florida Parishes). [= FNA, K, X; < *Aster drummondii* Lindley – C, G, SE; = *Aster sagittifolius* var. *drummondii* (Lindley) Shinners – F; = *Aster drummondii* var. *drummondii*; = ***Symphyotrichum drummondii*** (Lindley) Nesom]

Symphyotrichum dumosum (Linnaeus) Nesom var. ***dumosum***, Long-stalked Aster. Cp (FL, GA, NC, SC, VA), Pd (GA, NC, SC, VA), Mt (GA, NC, SC, VA, WV): old fields, disturbed areas, pastures; common. Late August-October. NB, WV, IN, IL, OK south to FL and TX. [= K, X; < *Aster dumosus* – RAB, C, G, GW, SE, W; > *Aster dumosus* Linnaeus var. *dumosus* – F; > *A. dumosus* var. *coridifolius* (Michaux) Torrey & A. Gray – F, WV; < *S. dumosum* – FNA, WH; > *A. dumosus* – S; > *A. coridifolius* Michaux – S]

Symphyotrichum dumosum (Linnaeus) Nesom *var.* ***gracilipes*** (Wiegand) Nesom. Cp (FL), {GA, SC}. Late August-October. SC south to FL, west to LA. [= K; < *Aster dumosus* – RAB, GW, SE; < *S. dumosum* – FNA, WH; = *A. gracilipes* (Wiegand) Alexander – S; = *Aster dumosus* Linnaeus var. *gracilipes* Wiegand]

Symphyotrichum dumosum (Linnaeus) Nesom *var.* ***pergracile*** (Wiegand) Nesom. {NC, SC}. Late August-October. Endemic to NC and SC. [= K; < *Aster dumosus* – RAB, GW, SE; < *S. dumosum* – FNA; = *Aster dumosus* Linnaeus var. *pergracile* Wiegand]

Symphyotrichum dumosum (Linnaeus) Nesom var. ***strictior*** (Torrey & A. Gray) Nesom. Mt (VA), {NC}: woodlands and glades over mafic rock; rare. Late August-October. NH, ON, and WI south to NC and MO. [= K, X; < *Aster dumosus* – RAB, C, G, GW, SE, W; = *A. dumosus* Linnaeus var. *strictior* Torrey & A. Gray – F; < *S. dumosum* – FNA]

Symphyotrichum dumosum (Linnaeus) Nesom var. ***subulifolium*** (Torrey & A. Gray) Nesom. Cp (FL), {GA, NC, SC, VA} Late August-October. ME south to FL, west to TX. [= K, X; < *Aster dumosus* – RAB, C, G, GW, SE, W; = *Aster dumosus* Linnaeus var. *subulifolius* Torrey & A. Gray – F; < *S. dumosum* – FNA, WH]

Symphyotrichum elliottii (Torrey & A. Gray) Nesom, Southern Swamp Aster, Elliott's Aster. Cp (FL, GA, NC, SC, VA): bogs, swamps, and marshes, mainly in the outer Coastal Plain, on tree bases, hummocks, and stumps in tidal freshwater swamps, especially where salinities may occasionally exceed 5-10 ppt; uncommon (rare in GA and VA). Late September-November. Se. VA south to s. FL, west to LA. The Jones & Coile (1988) record for n. GA is rejected. [= FNA, K, WH, X; = *Aster elliottii* Torrey & A. Gray – RAB, C, F, G, GW, S, SE; = *Aster puniceus* Linnaeus var. *elliottii* (Torrey & A. Gray) A. G. Jones]

Symphyotrichum ericoides (Linnaeus) Nesom *var.* ***ericoides***, Heath Aster, Squarrose White Aster. Mt (GA, VA): limestone glades; rare. ME, NL (Labrador), ON, ND, CO, AZ, south to VA, MS, TX, Nuevo Léon, and Coahuila. [= FNA; > *Symphyotrichum ericoides* (Linnaeus) Nesom var. *ericoides* – K, X; > *Symphyotrichum ericoides* (Linnaeus) Nesom var. *prostratum* (Kuntze) Nesom – K, X; > *Aster ericoides* Linnaeus var. *ericoides* – G; > *Aster ericoides* Linnaeus var. *prostratus* (Kuntze) Blake – G; = *Aster ericoides* – C, F, SE, W; = *S. ericoides* var. *ericoides* – FNA; = *Virgulus ericoides* (Linnaeus) Reveal & Keener]

Symphyotrichum expansum (Poeppig ex Sprengel) Nesom. Cp (FL): pond margins, disturbed wet areas; rare. July-November (-January). FL Panhandle and peninsula, AL, OK, UT, NV, and CA south through Mexico and Central America to n. South America; West Indies. [= K, V, X; = *S. subulatum* (Michaux) Nesom var. *parviflorum* (Nees) S.D. Sundberg – FNA, Q] {add synonymy – S}

Symphyotrichum firmum (Nees) Nesom, Shining Aster. Mt (WV): {GA, NC?, VA} (NC Watch List). Included by Nesom (1997) in *Symphyotrichum puniceum* (Linnaeus) Nesom var. *puniceum*, but see Warners & Laughlin (1999) for an analysis of differences between it and *S. puniceum*. [= FNA, X; = *Aster firmus* Nees – C; < *Aster puniceus* – RAB; = *Aster puniceus* Linnaeus var. *firmus* (Nees) Torrey & A. Gray – F, WV; > *Aster puniceus* Linnaeus var. *firmus* (Nees) Torrey & A. Gray – G; > *Aster lucidulus* (A. Gray) Wiegand – G, SE, W; = *Aster puniceus* Linnaeus ssp. *firmus* (Nees) A.G. Jones; < *S. puniceum* (Linnaeus) Löve & Löve var. *puniceum* – K]

Symphyotrichum fontinale (Alexander in Small) Nesom. Cp (FL): wet pinelands, marshes; rare. E. Panhandle FL south to s. FL. [= FNA, WH, X; = *Aster fontinalis* Alexander in Small – S, SE; = *A. patens* Aiton var. *floridanus* R.W. Long]

Symphyotrichum georgianum (Alexander) Nesom, Georgia Aster. Pd (GA, NC, SC), Cp (FL, GA): dry, rocky woodlands, woodland borders, roadbanks, powerline rights-of-way, primarily in places that formerly would have burned and likely been post oak or blackjack oak woodlands or savannas, also in thin soils around granitic flatrocks; rare. Early October-mid November; November-December. Sc. NC south to c. GA and west to c. AL; apparently disjunct on the Coastal Plain of sw. GA and e. Panhandle FL (Leon County). [= FNA, K, WH, X; = *Aster georgianus* Alexander – S, Z; < *Aster patens* – RAB; = *Aster patens* Aiton var.

georgianus (Alexander) Cronquist – SE; = *Virgulus georgianus* (Alexander) Semple; = *Virgulus patens* (Aiton) Reveal & Keener var. *georgianus* (Alexander) Reveal & Keener]

Symphyotrichum grandiflorum (Linnaeus) Nesom, Big-headed Aster. Cp, Pd (NC, SC, VA): dry woodlands, forest edges; roadbanks and powerline rights-of-way; common. Late September-November. E. and c. VA south through e. and c. NC to to nc. SC. [= FNA, K, X; = *Aster grandiflorus* Linnaeus – RAB, C, F, G, S, SE, W; = *Virgulus grandiflorus* (Linnaeus) Reveal & Keener]

Symphyotrichum laeve (Linnaeus) Löve & Löve *var.* ***concinnum*** (Willdenow) Nesom, Narrow-leaved Smooth Aster. Pd (DE, NC, SC, VA), Mt (VA, WV), Cp (FL), {GA}: dry woodlands over mafic or calcareous rocks; rare. September-October. NYand KY south to GA, Panhandle FL (Jackson County), and MS. [= FNA, K, WH, X; = *Aster concinnus* Willdenow – C, G, S, SE; < *A. laevis* – F, WV; = *A. laevis* Linnaeus var. *concinnus* (Willdenow) House – RAB, W; = *S. laeve* ssp. *concinnum* (Willdenow) Semple & Brouillet]

Symphyotrichum laeve (Linnaeus) Löve & Löve *var.* ***laeve***, Smooth Blue Aster. Pd (DE, NC, SC, VA), Mt (NC, VA, WV), Cp (DE, VA), {GA}: mesic hardwood forests; rare. September-October. NS west to MB, south to GA, LA, and OK. [= FNA, K, X; = *Aster laevis* Linnaeus var. *laevis* – RAB, C, G, SE, W; >< *A. laevis* – F, WV; > *A. steeleorum* Shinners – F, WV; > *A. laevis* – S; > *A. falcidens* E.S. Burgess – S]

Symphyotrichum laeve (Linnaeus) Löve & Löve *var.* ***purpuratum*** (Nees) Nesom, Gulf Coast Smooth Aster. Cp (GA, SC): open dry woodlands, prairies; rare (SC Rare). September-October. SC and GA west to AR and TX. [= FNA, K, X; > *Aster attenuatus* Lindley ex Hooker – G, S; > *Aster purpuratus* Nees – S; = *Aster laevis* Linnaeus var. *purpuratus* (Nees) A. G. Jones; = ***Symphyotrichum attenuatum*** (Lindley) Semple]

Symphyotrichum lanceolatum (Willdenow) Nesom var. ***interior*** (Wiegand) Nesom. {VA}: (Kartesz 1999). NH west to MN, south to VA, KY, AR, and OK. South at least to s. PA (Rhoads & Klein 1993). [= FNA, X; = *Aster lanceolatus* Willdenow var. *interior* (Wiegand) Semple & Chmielewski – C; = *A. simplex* Willdenow var. *interior* (Wiegand) Cronquist – F, G; ? *S. lanceolatum* (Willdenow) Nesom ssp. *lanceolatum* var. *interior* (Wiegand) Nesom – K; < *A. lanceolatus* – W; = *A. lanceolatus* ssp. *lanceolatus* var. *interior* (Wiegand) Semple & Chmielewski; = *A. lanceolatus* ssp. *interior* (Wiegand) A.G. Jones]

Symphyotrichum lanceolatum (Willdenow) Nesom var. ***lanceolatum***. Cp (DE), Pd (DE), Mt (NC, WV), {VA} : moist soils; rare. July-October. NL (Newfoundland) west to SK, south to PA (Rhoads & Klein 1993), VA (reported in FNA), NC, SC (?), TN, MS, LA, and TX. Reported for Ashe County, NC (Poindexter & Murrell 2008). [= FNA, X; < *Aster simplex* Willdenow – RAB, GW, WV; = *Aster lanceolatus* Willdenow var. *lanceolatus* – C; = *A. simplex* var. *ramosissimus* (Torrey & A. Gray) Cronquist – F, G; < *A. simplex* var. *simplex* – SE; < *A. lanceolatus* – W; = *A. lanceolatus* ssp. *lanceolatus* var. *lanceolatus*; = *A. lanceolatus* ssp. *lanceolatus*]

Symphyotrichum lanceolatum (Willdenow) Nesom *var.* ***latifolium*** (Semple & Chmielewski) Nesom. Mt (GA, NC, SC, VA), Pd (GA, NC, SC, VA), Cp (DE, FL, GA, NC, SC, VA): bottomlands, other moist sites; common. September-October. ME west to MB, south to e. Panhandle FL and TX. [= FNA, WH, X; < *Aster simplex* Willdenow – RAB, GW; = *A. lanceolatus* Willdenow var. *simplex* (Willdenow) A. G. Jones – C; = *A. simplex* var. *simplex* – F, G; = *S. lanceolatum* (Willdenow) Nesom ssp. *lanceolatum* var. *latifolium* (Semple & Chmielewski) Nesom – K; < *A. lanceolatus* – W; *A. lanceolatus* Willdenow var. *latifolius* Semple & Chmielewski]

Symphyotrichum lateriflorum (Linnaeus) Löve & Löve var. ***horizontale*** (Desfontaines) Nesom, Goblet Aster. {DE?, GA, NC, VA} September-November. ME and MN south to FL and AR. [= K, X; < *S. lateriflorum* – FNA; < *Aster lateriflorus* – C, G, GW, SE, W; = *A. lateriflorus* var. *pendulus* (Aiton) E.S. Burgess – F; *A. lateriflorus* (Linnaeus) Britton var. *horizontalis* (Desfontaines) Farwell]

Symphyotrichum lateriflorum (Linnaeus) Löve & Löve var. ***lateriflorum***, Starved Aster. Mt (WV), {DE?, GA, NC, SC, VA}: dry to moist areas; common in WV. September-November. NS, QC, and MB south to FL and TX. [= K; < *Aster lateriflorus* – RAB (also see *A. ontarionis*); < *A. lateriflorus* – C, G, GW, SE, W; = *A. lateriflorus* (Linnaeus) Britton var. *lateriflorus* – F; < *S. lateriflorum* – FNA; > *S. lateriflorum* var. *lateriflorum* – X; > *S. lateriflorum* var. *hirsuticaule* (Lindley ex A.P. de Candolle) Nesom – X; > *A. lateriflorus* var. *hirsuticaulis* (Lindley ex A.P. de Candolle) Porter]

Symphyotrichum lowrieanum (Porter) Nesom, Smooth Heart-leaved Aster. Mt (GA, NC, VA, WV), Pd (VA): mesic to dry-mesic forests; common (rare in GA and NC). September-October. MA, NY, and ON, south to w. VA, w. NC, ne. GA, e. TN, and c. TN. Perhaps originating from hybridization of *S. cordifolium* and *S. laeve*. [= K, X; < *A. cordifolius* Linnaeus – RAB; = *A. lowrieanus* Porter – C, G, SE, W; > *A. lowrieanus* var. *lowrieanus* – F, WV; > *A. lowrieanus* var. *lanceolatus* Porter – F, WV; < *S. cordifolium* (Linnaeus) G.L. Nesom – FNA; > *A. lowrieanus* – S; > *A. plumarius* E.S. Burgess – S; = *A. cordifolius* ssp. *laevigatus* (Porter) A.G. Jones; = *A. cordifolius* ssp. *laevigatus* Porter]

Symphyotrichum novae-angliae (Linnaeus) Nesom, New England Aster, Michaelmas-daisy. Mt (GA, NC, VA, WV), Pd (DE, VA), Cp (DE, VA*): wet meadows, bogs, prairies; common (rare in GA and NC). September-October. NS west to MT, south to GA, wc. AL, c. MS, s. AR, OK, and NM. [= FNA, K, Z; = *Aster novae-angliae* Linnaeus – RAB, C, F, G, GW, S, SE, W, WV; = *Virgulus novae-angliae* (Linnaeus) Reveal & Keener]

Symphyotrichum novi-belgii (Linnaeus) Nesom *var.* ***elodes*** (Torrey & A. Gray) Nesom, New York Aster. Cp (DE, NC, SC, VA): wet pine savannas, marshes; common. Late September-November. NB south to NY, apparently disjunct southward from e. MD south to e. SC. [= FNA, K, X; < *Aster novi-belgii* – RAB, C, G, GW, SE; = *A. novi-belgii* Linnaeus var. *elodes* (Torrey & A. Gray) A. Gray – F; = *A. elodes* Torrey & A. Gray – S]

Symphyotrichum novi-belgii (Linnaeus) Nesom *var.* ***novi-belgii***, New York Aster. Mt (WV), Cp (DE): {habitat}; common (rare in WV). August-September. NL (Newfoundland) and NL (Labrador) south to MD and WV. [= FNA, K, X; < *Aster novi-belgii* – RAB, C, G, GW, SE; = *A. novi-belgii* Linnaeus *var. novi-belgii* – F; = *A. novi-belgii* – S]

Symphyotrichum oblongifolium (Nuttall) Nesom, Eastern Aromatic Aster, Shale-barren Aster. Mt (NC, VA, WV), Pd (VA): rock outcrops and dry woodlands over limestone, calcareous shale; common (uncommon in WV, rare in NC). Late September-October. NY, WI, MN, and MT, south to sc. VA, w. NC, nc. AL, n. MS, TX, and NM. [= FNA, K, X; > *Aster oblongifolius* Nuttall var. *angustatus* Shinners – G, SE; > *A. oblongifolius* var. *orientis* Shinners – WV; = *A. oblongifolius* – RAB, C, F, S, W; = *Virgulus oblongifolius* (Nuttall) Reveal & Keener]

Symphyotrichum ontarionis (Wiegand) Nesom *var.* ***ontarionis***, Bottomland Aster. Mt (WV), {GA}: bottomlands, samps, bogs; rare. August-October. QC, ON, MN, and SD, south to WV, GA, AL, MS, LA, and TX. See Nesom (1997) and Brouillet

& Labrecque (1997). [= FNA; < *Aster lateriflorus* – RAB; < *Aster ontarionis* Wiegand – C, F, G, SE, W; = *S. ontarione* var. *ontarione* – K, X, orthographic variant]

Symphyotrichum oolentangiense (Riddell) Nesom var. ***oolentangiense***. Cp (FL), {GA}: {habitat}; rare. NY, ON, MN, and SD, south to Panhandle FL and TX. Reported for GA (Kartesz 1999) on the basis of Fernald (1950), and also reported for GA in FNA. East to sw. TN (Chester, Wofford, & Kral 1997), AL, and Panhandle FL (Wunderlin & Hansen 2008). [= K, X; < *Aster oolentangiensis* – C; = *A. azureus* Lindley var. *azureus* – F; < *A. azureus* – G, SE; < *S. oolentangiense* – FNA]

Symphyotrichum patens (Aiton) Nesom var. ***patens***, Common Clasping Aster. Pd (DE, GA, NC, SC, VA), Mt (GA, NC, SC, VA, WV), Cp (DE, FL, GA, NC, SC, VA): dry woodlands, roadsides, woodland edges, clearings, roadbanks; common (rare in FL). Late August-early November; October-November. Var. *patens* ranges from VT and NY west to PA, s. OH, s. IN, s. MO, and se. KS, south to e. GA, ne. FL, Panhandle FL, s. AL, s. MS, s. LA, and sc. TX. [= FNA, K, X; > *Aster patens* Aiton var. *patens* – C, F, G, SE, WV; < *A. patens* – RAB, W; >< *A. patens* var. *gracilis* Hooker – C, F, G, SE, misapplied as to our area (now more narrowly defined and occurring only west of our area); = *A. patens* – S; = *A. patens* var. *patens* – Z; < *Virgulus patens* (Aiton) Reveal & Keener var. *patens*]

Symphyotrichum phlogifolium (Muhlenberg ex Willdenow) Nesom, Appalachian Clasping Aster. Mt (GA, NC, SC, VA, WV), Pd (NC, SC, VA): mesic, nutrient-rich mixed hardwood forests; uncommon (rare in GA). Late August-mid October. NJ and Long Island, NY west to PA, n. OH, and e. IN south to c. VA, c. NC, w. SC, n. GA, and ne. AL, primarily in the Appalachian Mountains and adjacent provinces. [= FNA, K, X; < *Aster patens* – RAB; = *A. phlogifolius* Muhlenberg ex Willdenow – S, W, Z; = *A. patens* Aiton var. *phlogifolius* (Muhlenberg ex Willdenow) Nees – C, F, G, SE, WV; = *Virgulus patens* (Aiton) Reveal & Keener var. *phlogifolius* (Muhlenberg ex Willdenow) Reveal & Keener]

Symphyotrichum pilosum (Willdenow) Nesom var. ***pilosum***. Mt (GA, NC, SC, VA, WV), Pd (DE, GA, NC, SC, VA), Cp (DE, GA, NC, SC, VA): old fields, disturbed areas, woodland borders; common. September-November. NB west to MN, south to Panhandle FL and TX. [= FNA, K, X; < *Aster pilosus* – RAB, W; = *A. pilosus* Willdenow var. *pilosus* – C, F, G, SE, WV; < *S. pilosum* – WH]

Symphyotrichum pilosum (Willdenow) Nesom var. ***pringlei*** (A. Gray) Nesom. Cp (DE, NC), Pd (DE, NC, VA), Mt (WV), {GA, SC}: {habitat}; common (uncommon in NC and VA, rare in WV). September-November. NS west to MN, south to GA and TN. [= FNA, K, X; = *Aster pilosus* Willdenow var. *demotus* Blake – RAB, SE; = *Aster pilosus* var. *pringlei* A. Gray – C; > *A. pilosus* Willdenow var. *demotus* Blake – F, G, WV; > *A. pilosus* var. *pringlei* – F, G, WV]

Symphyotrichum plumosum (Small) Semple. Cp (FL): dry flatwoods; rare. October-November. Endemic to c. Panhandle FL. [= FNA; < *Symphyotrichum concolor* (Linnaeus) Nesom – K; = *Aster plumosus* Small – S; = *S. concolor* (Linnaeus) G.L. Nesom var. *plumosum* (Small) Wunderlin & B.F. Hansen – WH]

Symphyotrichum praealtum (Poiret) Nesom var. ***angustior*** (Wiegand) Nesom, Willow Aster, Veiny Lined Aster. Mt (VA), {NC?}: fen-like calcareous wetlands; rare (VA Rare). ME south to NC and TN. Abrams Creek, Frederick County, VA. Also reported for NC by Kartesz (1999). [= K, X; < *Aster praealtus* – C, GW, W; = *A. praealtus* Poiret var. *angustior* Wiegand – F; < *S. praealtum* – FNA; < *A. praealtus* var. *praealtus* – G, SE]

Symphyotrichum praealtum (Poiret) Nesom var. ***praealtum***. Mt (GA, VA, WV): moist forests over limestone, wooded fens (with *Acer rubrum* and *Fraxinus nigra*); rare. NY, MN, and SD south to Panhandle FL and TX. Reported for Giles County, VA. [= K, X; < *Aster praealtus* – C, GW, W, WV; = *A. praealtus* Poiret *var. praealtus* – F; < *A. praealtus* var. *praealtus* – G, SE; < *S. praealtum* – WH]

Symphyotrichum pratense (Rafinesque) Nesom, Barrens Silky Aster. Mt (GA, VA?), Cp (FL, GA): calcareous glades and barrens; rare. September-October. Se. AR west to ne. TX, south to sc. LA and e. TX; disjunct at scattered localities east of the Mississippi River, as in sw. VA (Ludwig 1999), c. KY, TN (Chester, Wofford, & Kral 1997), nw. GA, sw. GA, Panhandle FL (Gadsden County), n. and c. AL, wc. MS. See Jones, Witsell, & Nesom (2008) for extensive discussion. [= FNA, K, X; < *Aster sericeus* – C, F, G, SE; = *S. sericeum* (Ventenat) Nesom var. *microphyllum* (A.P. de Candolle) Wunderlin & B.F. Hansen – WH; = *A. pratensis* Rafinesque; = *A. sericeus* Ventenat var. *microphyllus* A.P. de Candolle]

Symphyotrichum prenanthoides (Muhlenberg ex Willdenow) Nesom, Zigzag Aster. Mt (NC, VA, WV), Pd (DE, VA): forests, roadbanks; common (rare in DE). Late August-October. MA, NY, s. ON, and MN, south to w. NC, TN, IL, and IA. [= FNA, K, X; = *Aster prenanthoides* Muhlenberg ex Willdenow – RAB, C, F, G, S, SE, W, WV]

Symphyotrichum priceae (Britton) Nesom, Miss Price's Aster. Mt (GA): limestone glades; rare. KY south through c. TN to nw. GA and n. AL. [= FNA, K, X; = *Aster pilosus* Willdenow var. *priceae* (Britton) Cronquist – C, G, SE; < *A. pilosus* var. *pringlei* – F; < *A. pilosus* – W; = *A. priceae* Britton]

Symphyotrichum puniceum (Linnaeus) Löve & Löve var. ***puniceum***, Purple-stem Aster, Swamp Aster. Mt (GA, NC, SC, VA, WV), Pd (DE, GA, NC, SC, VA), Cp (DE, NC, VA): bogs, seeps, ditches, wet meadows; common (rare in Coastal Plain south of VA). September-October. NL (Newfoundland) and NL (Labrador) west to BC, south to GA, AL, MO, and SD. Unresolved material from Grayson County mafic seeps. [= K, X; < *Aster puniceus* Linnaeus – RAB, C, GW, S, SE, W; > *A. puniceus* var. *puniceus* – F, WV; > *A. puniceus* var. *compactus* Fernald – F; = *A. puniceus* var. *puniceus* – G; *? A. conduplicatus* E.S. Burgess – S]

Symphyotrichum racemosum (Elliott) Nesom *var.* ***racemosum***, Small White Aster. Cp (FL, GA, NC, SC, VA), Pd (GA, NC, SC, VA), Mt (VA, WV): bottomlands, marshes; common. ME south to n. FL, west to TX, and inland to OH, IN, IL, MO, and OK. [= K, X; = *Aster vimineus* Lamarck – RAB, G, GW, SE, W, misapplied; < *A. racemosus* – C; > *A. vimineus* var. *vimineus* – F, misapplied; > *A. racemosus* – F; < *S. racemosum* – FNA; > *A. brachypholis* Small – S]

Symphyotrichum racemosum (Elliott) Nesom *var.* ***subdumosum*** (Wiegand) Nesom. Mt (WV), {in e. WV and apparently through our area judging from F} [= X; < *Aster racemosus* Elliott – C; = *A. vimineus* Lamarck var. *subdumosus* Wiegand – F; < *S. racemosum* – FNA; = *A. fragilis* Willdenow var. *subdumosus* (Wiegand) A.G. Jones, misapplied]

Symphyotrichum retroflexum (A.P. de Candolle) Nesom. Mt (GA, NC, SC): forests; common. Late August-October. W. NC and e. TN south to nw. SC and n. GA. [= FNA, K, X; = *Aster curtisii* Torrey & A. Gray – RAB, S, SE, W; = *A. retroflexus* Lindley ex A.P. de Candolle – C]

Symphyotrichum rhiannon Weakley & Govus, Buck Creek Aster, Rhiannon's Aster. Mt (NC): ultramafic outcrop barren; rare. October-November. Endemic (as far as is known) to the Buck Creek Serpentine Barren, Clay County, NC. Showing some similarities to *S. puniceum* and *S. prenanthoides*, but unique in many characters and not seemingly intermediate. See Kauffman et al. (2004) for additional information. [= FNA]

Symphyotrichum ×schistosum (Steele) Nesom [*S. cordifolium* × *laeve* var. *laeve*], Millboro Aster. Mt (VA): rare. [= K, X; = *Aster ×schistosus* Steele (pro sp.); = *A. schistosus* Steele]

Symphyotrichum shortii (Lindley) Nesom, Midwestern Blue Heart-leaved Aster, Short's Aster. Pd (GA, VA), Mt (GA, NC, WV), Cp (FL): dry, rocky slopes, calcareous hammocks (in FL); uncommon (rare in FL, GA, NC, and VA). PA, s. ON, and MN, south to w. NC, c. GA, Panhandle FL (Gadsden and Jackson counties), MS, and AR. The lower stem leaves are indeed reminiscent of the leaves of *Asplenium rhizophyllum* (formerly known as *Camptosorus*), explaining one of Small's names for this species. [= FNA, K, X; = *Aster shortii* Lindley – C, F, G, SE, WV; > *A. shortii* – S; > *A. camptosorus* Small – S]

Symphyotrichum simmondsii (Small) Nesom. Cp (FL, GA, NC, SC), Pd (SC): ditches, other wet places, uncommon? Se. NC south to s. FL. [= K, X; < *S. simmondsii* – FNA, WH (also see *S. kralii*); = *Aster simmondsii* Small; ? *A. pinifolius* Small]

* ***Symphyotrichum squamatum*** (Sprengel) Nesom, South American Salt-marsh Aster. Cp (FL): disturbed areas (on ballast), escaped to coastal marshes and dunes; rare, native of South America. AL (Mobile County), FL (Escambia County), LA, TX. [= K, V, WH, X; = *S. subulatum* (Linnaeus) Nesom var. *squamatum* (Sprengel) S.D. Sundberg – FNA, Q; < *Aster subulatus* Michaux var. *cubensis* – SE; *? Aster subulatus* Michaux var. *australis* (A. Gray) Shinners]

Symphyotrichum subulatum (Michaux) Nesom, Eastern Salt-marsh Aster. Cp (DE, FL, GA, NC, SC, VA): tidal marshes; common. September-November. S. ME south to ne. FL, Panhandle FL, west to LA. See Sundberg (2004). [= K, V, WH, X; = *Aster subulatus* Michaux var. *subulatus* – C, SE; < *A. subulatus* – RAB, GW; = *S. subulatum* var. *subulatum* – FNA, Q; > *A. subulatus* var. *subulatus* – F, G; > *A. subulatus* var. *obtusifolius* Fernald – F, G; > *A. subulatus* Michaux var. *euroauster* Fernald & Griscom – F]

Symphyotrichum tenuifolium (Linnaeus) Nesom, Perennial Salt-marsh Aster. Cp (DE, FL, GA, NC, SC, VA): brackish marshes; common. July-November. ME south to c. peninsular FL, west to TX. See Sundberg (2004). [= K, V, WH, X; = *Aster tenuifolius* Linnaeus – RAB, C, G, GW, SE; = *Symphyotrichum tenuifolium* var. *tenuifolium* – FNA, Q]

Symphyotrichum undulatum (Linnaeus) Nesom. Mt (GA, NC, SC, VA, WV), Pd (DE, GA, NC, SC, VA), Cp (DE, FL, GA, NC, SC, VA): dry forests, woodlands, roadbanks; common. August-November. NS west to s. ON, south to c. peninsular FL and LA. [= FNA, K, WH, X; = *Aster undulatus* Linnaeus – RAB, C, G, SE, W; > *A. undulatus* var. *undulatus* – F, WV; > *A. undulatus* var. *loriformis* E.S. Burgess – F, WV; > *A. undulatus* var. *diversifolius* (Michaux) A. Gray – F; > *A. asperifolius* E.S. Burgess – S; > *A. linguiformis* E.S. Burgess – S; > *A. loriformis* (E.S. Burgess) E.S. Burgess – S; > *A. mohrii* E.S. Burgess – S; > *A. claviger* E.S. Burgess – S; > *A. corrigiatus* E.S. Burgess – S; > *A. gracilescens* E.S. Burgess – S; > *A. proteus* E.S. Burgess – S; > *A. sylvestris* E.S. Burgess – S; > *A. triangularis* (E.S. Burgess) E.S. Burgess – S; > *A. truellius* E.S. Burgess – S*; > A. undulatus* – S; > *A. undulatus* Linnaeus *var. asperulus* (Torrey & A. Gray) Wood]

Symphyotrichum urophyllum (Lindley in A.P. de Candolle) Nesom, White Arrowleaf Aster. {confused} Mt (VA), Pd (NC, SC), Cp (FL, NC, SC), {GA, VA} Late August-October. ME west to MN and NE, south to e. Panhandle FL, MS, and OK. [= FNA, K, WH, X; = *Aster sagittifolius* Wedemeyer ex Willdenow – RAB, C, G, S, SE, W; = *A. sagittifolius var. sagittifolius* – F; = *A. urophyllus* Lindley in A.P. de Candolle]

Symphyotrichum walteri (Alexander) Nesom. Cp (FL, GA, NC, SC): sandhills, pine flatwoods; common. E. NC south to c. peninsular FL. [= FNA, K, WH, X; = *Aster walteri* Alexander – S, SE; = *A. squarrosus* Walter – RAB (the name preoccupied); = *Virgulus walteri* (Alexander) Reveal & Keener]

Symphyotrichum drummondii (Lindley) Nesom var. *texanum* (E.S. Burgess) Nesom. East to MS, AL, and KY. [= FNA, K; = *Aster texanus* Burgess – C, G, SE; = *Aster drummondii* Lindley var. *texanus* (E.S. Burgess) A.G. Jones; = ***Symphyotrichum texanum*** (E.S. Burgess) Semple] {synonymy incomplete}

Symphyotrichum kralii Nesom. Cp (FL): East Gulf Coastal Plain of AL and FL. See Nesom (1997); the name *A. pinifolius* is illegitimate. [= K; = *Aster pinifolius* Alexander in Small – S, name illegitimate; < *S. simmondsii* (Small) Nesom – FNA, WH; < *Aster dumosus* – SE]

Symphyotrichum lateriflorum (Linnaeus) Löve & Löve var. *angustifolium* (Wiegand) Nesom. South to KY and NJ (Kartesz (1999). [= K, X; < *S. lateriflorum* – FNA] {add to synonymy}

Symphyotrichum lateriflorum (Linnaeus) Löve & Löve *var.* ***spatelliforme*** (E.S. Burgess) Nesom. Cp (FL): [= X; < *S. lateriflorum* – FNA, WH; = *Aster spatelliformis* E.S. Burgess]

Symphyotrichum longifolium (Lamarck) Nesom. Cp (SC): [= X; = *A. longifolius* Lamarck]

Symphyotrichum patens (Aiton) Nesom var. *gracile* (Hooker) Nesom. Var. *gracile*, as defined more narrowly by Z, ranges east to se. LA, s. MS, and s. AL from a core range in LA, e. and c. TX, and OK. [= FNA, K; < *A. patens* Aiton var. *gracilis* Hooker – C, F, G, SE; = *A. patens* var. *gracilis* – Z]

Symphyotrichum patens (Aiton) Nesom var. *patentissimum* (Lindley ex de Candolle) Nesom. Var. *patentissimum* is largely Ozarkian, east to w. KY and w. MS. [= FNA, K; = *Aster patens* Aiton var. *patentissimus* (Lindley) Torrey & A. Gray – C, F, G, SE, Z]

Symphyotrichum praealtum (Poiret) Nesom var. *subasperum* (Lindley) Nesom. KY, IN, IL, MO, and OK south to AL and TX. [= K; < *S. praealtum* – FNA]

Symphyotrichum puniceum (Linnaeus) Löve & Löve var. *scabricaule* (Shinners) Nesom. Pineland seepage bogs. AL, MS, LA, TX. [= FNA, K; < *Aster puniceus* Linnaeus – C, GW, S, SE, W]

Symphyotrichum sericeum (Ventenat) Nesom, Western Silvery Aster. See Jones, Witsell, & Nesom (2008); all reports of this species east of the Mississippi River and south of the Ohio River are based on misidentifications (or a taxonomically broader application of) *S. pratense*. [= FNA, K, X; = *Aster sericeus* Ventenat – G, S; < *A. sericeus* Ventenat – C, F, SE; = *Virgulus sericeus* (Ventenat) Reveal & Keener]

Synedrella Gaertner 1791 (Nodeweed)

A monotypic genus, an annual herb, native of tropical America. References: Strother in FNA (2006c).

* ***Synedrella nodiflora*** (Linnaeus) Gaertner, Nodeweed. Cp (FL): moist to wet disturbed areas (on ballast); rare (not collected since the late 1800s), native of tropical America. January-December. [= FNA, S, SE, WH]

Tagetes Linnaeus 1753 (Marigold)

A genus of about 40-50 species, of tropical and warm temperate America. References: Strother in FNA (2006c); Cronquist (1980)=SE.

1 Rays inconspicuous, ca. 1-2 mm long; [plant a well-established weed, primarily in the Coastal Plain]..... ***T. minuta***
1 Rays showy, mostly > 10 mm long; [plant cultivated, rarely occurring as a waif].
2 Peduncles conspicuously swollen and hollow below the flower; involucre 15-20 mm high; achenes 7-10 mm long ..... ***T. erecta***
2 Peduncles not conspicuously swollen and hollow below the flower; involucre 10-15 mm high; achenes 4-7 mm long..... ***T. patula***

* ***Tagetes erecta*** Linnaeus, Common Marigold, African Marigold, Aztec Marigold, Big Marigold. Cp (FL, GA, NC, SC, VA), Pd (NC, SC, VA), Mt (NC, SC, VA): commonly cultivated, rarely persistent or as a waif, native of Mexico. July-November. [= RAB, C, F, G, K, S, SE, WH; < *T. erecta* – FNA]
* ***Tagetes minuta*** Linnaeus, Muster John Henry. Cp (FL, GA, NC, SC, VA), Pd (GA, SC): sandy fields, pecan orchards, sandy roadsides; common (rare in FL), native of South America. Late September-November. [= RAB, C, F, FNA, G, K, S, SE, WH]
* ***Tagetes patula*** Linnaeus, French Marigold. Mt (VA), Pd (NC, SC), Cp (NC, SC, VA): commonly cultivated, rarely persistent or as a waif, native of Mexico. July-November. [= RAB, C, G, K, SE; < *T. erecta* – FNA]

Tanacetum Linnaeus 1753 (Tansy)

A genus of about 150 species, herbs, of north temperate regions, especially the Old World. References: Watson in FNA (2006a); Cronquist (1980)=SE; Arriagada & Miller (1997)=Z.

1 Leaves simple, crenate (sometimes with a few basal lobes)..... ***T. balsamita***
1 Leaves 1-3-pinnatifid.
2 Rays present, white; leaf blades 4-10 cm long, 1-2-pinnate (with 3-5 pairs of primary lobes) ..... ***T. parthenium***
2 Rays absent; leaf blades 8-20 cm long, 2-3-pinnate (with 4-20+ pairs of primary lobes)..... ***T. vulgare***

* ***Tanacetum balsamita*** Linnaeus, Costmary. Cp (DE): disturbed areas, rare, native of Mediterranean Europe. Introduced south to PA (Rhoads & Klein 1993), MD (Kartesz 1999), and DE (Kartesz 1999). August-September. [= FNA; = *Chrysanthemum balsamita* (Linnaeus) Baillon – C; = *Balsamita major* Desfontaines – K]
* ***Tanacetum parthenium*** (Linnaeus) Schultz 'Bipontinus', Feverfew. Cp (DE, SC), Pd (DE, NC), Mt (WV): disturbed areas; rare, native of Europe. June-September. [= FNA, K, Z; = *Chrysanthemum parthenium* (Linnaeus) Bernhardi – RAB, C, F, G, SE, WV; = *Matricaria parthenium* Linnaeus – S]
* ***Tanacetum vulgare*** Linnaeus, Common Tansy, Golden-buttons. Mt (NC, VA, WV), Pd (DE, VA), Cp (DE, VA), {GA}: uncommon, native of Eurasia. August-October. [= RAB, C, F, FNA, G, K, S, SE, W, WV, Z]

Taraxacum G.H. Weber ex Wiggers 1780 (Dandelion)

A genus of about 60 species (or as many as 2000 if apomictic microspecies are recognized), herbs, of boreal and temperate regions. There seems little utility in trying to reconcile the numerous European microspecies against our introduced material. References: Brouillet in FNA (2006a); Cronquist (1980)=SE.

1 Cypselas reddish or purplish at maturity; leaves usually deeply cut throughout their length, the lobes narrow..... ***T. erythrospermum***
1 Cypselas brown or tan at maturity; leaves less deeply cut, particularly toward the base ..... ***T. officinale***

* ***Taraxacum erythrospermum*** Andrzejowski ex Besser, Redseeded Dandelion. Mt (GA, NC, VA, WV), Pd (DE, GA, NC, VA), Cp (DE, NC, SC, VA): roadsides, lawns, pastures, other disturbed sites; uncommon, native of Eurasia. January-December. Brouillet in FNA explains the nomenclatural and taxonomic complexities involved with the various names applied, and the reason for retaining *T. erythrospermum* at this time. [= RAB, F, FNA, WV; >< *T. laevigatum* (Willdenow) de Candolle – C, G, K, SE, W; >< *Leontodon erythrospermum* (Andrzejowski) von Eichwald – S]
* ***Taraxacum officinale*** G.H. Weber ex Wiggers, Common Dandelion. Mt (GA, NC, SC, VA, WV), Pd (DE, GA, NC, SC, VA), Cp (DE, FL, GA, NC, SC, VA): lawns, roadsides, urban areas, pastures, disturbed areas, trailsides, less commonly in a variety of less disturbed habitats; common, native of Eurasia. January-December. [= RAB, C, FNA, G, SE, W, WH, WV; > *T. officinale* var. *officinale* – F; > *T. officinale* ssp. *officinale* – K; = *Leontodon taraxacum* Linnaeus – S]

Tetragonotheca Linnaeus 1753 (Squarehead)

A genus of 4 species, herbs, endemic to se. North America. The other three species in the genus occur in LA, TX, and adjacent Mexico. References: Strother in FNA (2006c); Turner & Dawson (1980)=Z; Cronquist (1980)=SE.

Tetragonotheca helianthoides Linnaeus, Squarehead, Pineland-ginseng. Cp (FL, GA, NC, SC, VA), Pd (GA, NC, SC, VA), Mt (GA, NC, SC): sandhills, sandy woodlands, open hammocks, roadsides; common (uncommon in NC, rare in VA). April-July. Se. VA and e. TN south to c. peninsular FL and s. MS. [= RAB, C, F, FNA, G, K, S, SE, W, WH, Z]

Tetraneuris E.L. Greene 1898 (Bitterweed)

A genus of about 9 species, herbs, of North America. References: Bierner & Turner in FNA (2006c).

* ***Tetraneuris linearifolia*** (Hooker) Greene *var.* ***linearifolia***. Cp (SC): waste area near wool-combing mill; rare, perhaps merely a waif, native of sc. United States. See Nesom (2004d). [= FNA, K; *? Hymenoxys linearifolia* Hooker]

Thelesperma Lessing 1831

A genus of 10 or more species, of c. and w. North America, Mexico, and South America. References: Strother in FNA (2006c).

Thelesperma filifolium (Hooker) A. Gray. MS. Prairies, glades, and roadsides over calcareous substrates. MO, SD, and WY south LA, TX, Nuevo Léon, and NM; disjunct eastward in the Black Belt of MS and on a chalk bluff in Sumter County, wc. AL (Keener (2009). [= FNA; > *Th. filifolium* var. *filifolium* – SE]

Thymophylla Lagasca y Segura 1816

A genus of about 13 species, herbs and shrubs, of sw. and sc. United States and Mexico. References: Strother in FNA (2006c).

* ***Thymophylla tenuiloba*** (A.P. de Candolle) Small *var.* ***tenuiloba***, Dahlberg Daisy, Golden-fleece Cp (FL, SC): dry, disturbed areas, waste areas near wool-combing mills; rare, native of sc. United States. Also known as a naturalized introduction in AL and MS (Nesom 2004d, FNA). [= FNA, K; < *T. tenuiloba* – S, WH; = *Dyssodia tenuiloba* (A.P. de Candolle) B.L. Robinson var. *tenuiloba* – SE]

Tithonia Desfontaines ex Jussieu 1789 (Sunflowerweed)

A genus of about 11 species, herbs, shrubs, and rarely trees, of sw. United States, Mexico, and Central America. References: La Duke in FNA (2006c).

* ***Tithonia rotundifolia*** (Miller) S.F. Blake, Clavel de Muerto. Cp (FL): disturbed areas; rare, native of Mexico. November-January. Also reported for Orleans Parish, LA. [= FNA, K, WH]

Tragopogon Linnaeus 1753 (Goat's-beard)

A genus of about 110 species, herbs, of temperate Eurasia and the Mediterranean region. References: P. Soltis in FNA (2006a); Voss (1996); Cronquist (1980)=SE.

1 Flowers purple; pappus brownish ..... ***T. porrifolius***
1 Flowers yellow; pappus dingy white.
  2 Peduncle obviously swollen below the flower and fruit; margins of the phyllaries green (or pale); leaf tips straight; rays pale yellow, obviously shorter than the longest phyllaries ..... ***T. dubius***
  2 Peduncle only slightly swollen below the flower and fruit; margins of the phyllaries reddish purple (rarely green); leaf tips more or less curled or curved; rays bright yellow, as long as or longer than the phyllaries ..... ***T. pratensis***

* ***Tragopogon dubius*** Scopoli, Goat's-beard, Yellow Salsify. Mt (NC, VA, WV), Pd (DE, NC, VA), Cp (DE, VA): roadsides, fields, other disturbed places; common (uncommon in DE, rare in NC), native of Europe. April-July. [= RAB, C, FNA, G, K, SE, W; ? *T. major* Jacquin – F, WV]

* ***Tragopogon porrifolius*** Linnaeus, Salsify, Vegetable-oyster, Purple Goat's-beard. Mt (NC, VA, WV), Pd (DE, GA, NC, VA), Cp (DE): roadsides, fields; uncommon (rare in GA, NC, and VA), native of Europe. Late April-July. [= RAB, C, F, FNA, G, K, S, SE, W, WV]

* ***Tragopogon pratensis*** Linnaeus, Showy Goat's-beard, Yellow Goat's-beard, Meadow Salsify, Jack-go-to-bed-at-noon. Mt (VA, WV), Pd (DE, VA), Cp (DE), {GA?, NC?}: roadsides, fields; uncommon (rare in VA), native of Europe. April-August. Also reported for NC and GA in FNA. [= C, F, FNA, G, K, S, SE, W, WV]

Tridax Linnaeus 1753

A genus of about 26 species, herbs, mainly of the New World tropics. References: Strother in FNA (2006c); Powell (1965)=Z.

* ***Tridax procumbens*** Linnaeus. Cp (FL): disturbed areas; rare, native of Mexico, Central America, and n. South America. January-December. [= FNA, SE, WH, S, Z]

Trilisa Cassini 1820 (Trilisa)

A genus of 2 species, perennial herbs, endemic to the Southeastern Coastal Plain of North America. The name is an anagram of *Liatris*, as is *Litrisa*, of peninsular FL. Schilling (2011) shows that *Trilisa* and *Litrisa* should be separated from *Carphephorus*. References: Schilling (2011); Nesom in FNA (2006c); Schilling (2011)=V; Correa & Wilbur (1969)=Z; DeLaney, Bissett, & Weidenhamer (1999)=Y; Orzell & Bridges (2002)=X; Cronquist (1980)=SE.

Identification notes: *Trilisa* can be distinguished from *Carphephorus* by its smaller heads (involucres 3.5-6 mm high vs. 6-15 mm high) and fewer phyllaries (6-12 vs. 15-40). When vegetative, *Trilisa* lacks shining resin dots on the leaves, while *Carphephorus* has numerous resin dots.

1 Stem glabrous; capitulescence corymbose, the lateral branches equally or overtopping the central ones; leaves 1-6 (-11) cm wide..... ***T. odoratissima***
1 Stem densely spreading-pubescent; capitulescence a cylindrical panicle; leaves (0.5-) 1-3 (-4) cm wide ..... ***T. paniculata***

Trilisa odoratissima, Deer's-tongue, Vanilla-leaf. Cp (FL, GA, NC, SC): moist to mesic savannas and flatwoods; uncommon. Late July-October; September-November. Se. NC south to c. peninsular FL and west to e. LA. *T. odoratissima* has the largest leaves of our species of *Carphephorus* and *Trilisa*; its leaves are normally wider than 3 cm, and have a very wide and prominent midrib, usually purple toward the base of the leaf and white toward the tip. This species contains coumarin and gives off a pleasant vanilla odor when drying; it is gathered from the wild and used as a supplementary flavoring in cigarettes. See DeLaney, Bissett, & Weidenhamer (1999), Ward (2001), and Orzell & Bridges (2002) for discussion of a southern Florida taxon related to *T. odoratissima*, named (in *Carphephorus*) as a species, *Carphephorus subtropicanus* DeLaney, N. Bissett, & Weidenhamer, and later reduced in rank to a variety, *C. odoratissimus* var. *subtropicanus* (DeLaney, N. Bissett, & Weidenhamer) Wunderlin & B.F. Hansen. It is probably best treated at the varietal level, but the combination is not yet available in *Trilisa*. [= *Carphephorus odoratissimus* (J.F. Gmelin) Herbert var. *odoratissimus* – FNA, WH, X; < *Carphephorus odoratissimus* – GW, K, SE, Z; = *Carphephorus odoratissimus* – Y; < *Trilisa odoratissima* (J.F. Gmelin) Cassini – RAB, S; = *Trilisa odoratissima* var. *odoratissima* – V]

Trilisa paniculata (J.F. Gmelin) Cassini. Cp (FL, GA, NC, SC): savannas and flatwoods; common. August-October; September-November. Se. NC south to s. FL, and west to the FL Panhandle and s. AL. The leaves of this species are reminiscent of *C. odoratissimus*, but are narrower, (0.5-) 1-3 (-4) cm wide, vs. 1-6 (-11) cm wide in *C. odoratissimus*. Sterile *C. paniculatus* can be mistaken for glabrate *C. tomentosus*, which has shorter and broader leaves. [= RAB, S, V; = *Carphephorus paniculatus* (J.F. Gmelin) Herbert – FNA, GW, K, SE, WH, Y, Z]

Tripleurospermum Schultz 'Bipontinus' 1844 (Mayweed)

A genus of about 40 species, herbs, of the northern hemisphere. References: Brouillet in FNA (2006a); Arriagada & Miller (1997)=Z.

1 Stem ascending or erect; achenes with resin glands > 2× as long as wide; annual.....***[T. inodorum]***
1 Stem procumbent (rarely ascending); achenes with resin glands 1.0-1.5× as long as wide; perennial or biennial..... .....***[T. maritimum** ssp. **maritimum]***

* *Tripleurospermum inodorum* (Linnaeus) Schultz 'Bipontinus', Scentless Chamomille. Introduced at scattered locations in North America, such as AL, FL, KY, MD, and PA. [= FNA; = *T. perforata* (Mérat) M. Lainz – K, Z; ? *Matricaria maritima* Linnaeus var. *agrestis* (Knaf) Wilmott – F; = *Matricaria perforata* Mérat]

* *Tripleurospermum maritimum* (Linnaeus) W.D.J. Koch ssp. *maritimum*, Scentless Chamomille. Introduced at scattered locations in eastern North America, such as AL, PA, NJ. [= FNA; = *Matricaria maritima* Linnaeus var. *maritima* – F; = *T. maritima* ssp. *maritima* – K, orthographic variant; ? *Chamomilla maritima* (Linnaeus) Rydberg – S]

Tussilago Linnaeus 1753 (Coltsfoot)

A monotypic genus, an herb, of Eurasia and n. Africa. References: Barkley in FNA (2006b); Cronquist (1980)=SE.

* ***Tussilago farfara*** Linnaeus, Coltsfoot. Mt (NC, VA, WV), Pd (DE, NC, VA), Cp (VA): roadsides, especially gravelly or shaly roadbanks or ditches, streamside gravel bars, disturbed ground; common (uncommon in VA Piedmont and Coastal Plain, rare in DE, rare in NC Piedmont), native of Eurasia. This species has spread rapidly southward from the Northeast, where it was introduced in North America. Fernald (1950) considered its southern limit to be "New Jersey, Pennsylvania, and Ohio". Gleason (1952) extended it to WV. Strausbaugh and Core (1978) reported that the first collection in WV was actually in 1933, "migrating southward year by year, now abundant and often conspicuous along highways, on strip-mined areas and other denuded areas, in every county of the state." First reported in NC in 1971, it is now rather common in most of the mountain counties, and is beginning to appear at scattered sites in the Piedmont. Though preferring a cool and moist climate, *Tussilago* seems likely to continue to increase in abundance and to spread into the Piedmont. [= C, F, FNA, G, K, SE, W, WV]

Uropappus Nuttall 1841 (Silver-puffs)

A monotypic genus, an annual herb, of w. North America and nw. Mexico. References: Chambers in FNA (2006a).

* ***Uropappus lindleyi*** (A.P. de Candolle) Nuttall, Lindley's Silver-puff. Cp (SC): waste area near wool-combing mill; rare, perhaps merely a waif, native of sw. United States. See Nesom (2004d). [= FNA, K]

Verbesina Linnaeus 1753 (Crownbeard, Wingstem, Frostweed)

A genus of about 200-300 species, trees, shrubs, and herbs, of tropical, subtropical, and warm temperate America. References: Strother in FNA (2006c); Olsen (1979)=Z; Coleman (1966)=Y; Cronquist (1980)=SE.

1 Stem and lower leaf-surfaces grey strigose-canescent; alien annuals, 2-10 dm tall, with taproots; [section *Ximenesia*] ..... ***V. encelioides*** *var.* ***encelioides***
1 Stem and lower leaf surfaces glabrous or pubescent, but not grey strigose-canescent; native perennials, 5-40 dm tall, with fibrous or fleshy-fibrous roots.
2 Leaves primarily opposite (the uppermost sometimes alternate).
3 Internodes winged; [collectively widespread].
4 Plants 4-5 (-10) dm tall, perennating from short horizontal rhizomes; ray florets (5-) 8; disc florets 20-60+; [endemic to ne. FL and se. GA]; [section *Pterophyton*] ..... ***V. heterophylla***
4 Plants 10-30 dm tall, perennating from a crown with fleshy roots; ray florets (0-) 1-3 (-5); disc florets 8-15+; [widespread]; [section *Phaethusa*] ..... ***V. occidentalis***
3 Internodes not winged; [collectively of sw. GA, s. AL, and FL Panhandle]; [section *Pterophyton*].
5 Ray florets (5-) 11-13, yellow; heads 3-20 ..... ***V. aristata***
5 Ray florets 0; heads 1 (-3) ..... ***V. chapmanii***
2 Leaves primarily alternate (the lowermost sometimes opposite).
6 Heads few, 1-15 (-20), in a compact inflorescence; disc 7-16 mm wide at anthesis; ray florets (5-) 7-15, yellow; plants 5-12 dm tall; [section *Pterophyton*] ..... ***V. helianthoides***
6 Heads numerous, 10-200 or more, in a dense to open inflorescence; disc 3-15 mm wide at anthesis; ray florets either absent, or 1-5 and white, or 2-10 and yellow; plants 10-40 dm tall.
7 Ray florets 1-5, white; [section *Ochractinia*].
8 Lower and middle leaves pinnately lobed or dissected; achenes of ray florets glabrous; [of the outer Coastal Plain from SC southward] ..... ***V. virginica*** *var.* ***laciniata***
8 Lower and middle leaves entire, serrate, or slightly undulate; achenes of ray florets papillose or short-pubescent; [more widespread in our area] ..... ***V. virginica*** *var.* ***virginica***
7 Ray florets absent, **or** 2-10 and yellow; [section *Actinomeris*].
9 Ray florets present, 2-10, yellow; disc florets yellow ..... ***V. alternifolia***
9 Ray florets absent; disc florets white ..... ***V. walteri***

Verbesina alternifolia (Linnaeus) Britton ex Kearney, Common Wingstem. Mt (GA, NC, SC, VA, WV), Pd (DE, GA, NC, SC, VA), Cp (FL, NC, VA): alluvial forests, marshes, floodplain pastures; common (uncommon in VA Coastal Plain, rare in DE and FL). August-September. NY and s. ON west to IA, south to Panhandle FL and LA. [= RAB, C, FNA, G, GW, K, SE, WH, WV; = *Ridan alternifolia* (Linnaeus) Britton – S]

Verbesina aristata (Elliott) Heller, Coastal Plain Crownbeard. Cp (FL, GA): longleaf pine sandhills, swamp margins, dry woodlands; rare. Sw. GA and ne. FL west to FL Panhandle and s. AL. June-August. [= FNA, K, SE, WH; = *Pterophyton aristatum* (Elliott) Alexander – S]

Verbesina chapmanii J.R. Coleman. Cp (FL): bogs and wet pine flatwoods; rare. June-August. FL Panhandle (6 county endemic). [= FNA, GW, K, SE, WH; = *Pterophyton pauciflorum* (Nuttall) Alexander – S, mispplied; *V. warei* A. Gray, misapplied]

* ***Verbesina encelioides*** (Cavanilles) Bentham & Hooker f. ex A. Gray *var.* ***encelioides***, Skunk-daisy. Cp (FL, GA, NC, SC): fields, pastures, and disturbed areas; uncommon (rare in FL), native of w. United States. May-October. [= C, SE; < *V. encelioides* – RAB, F, FNA, G, WH; = *V. encelioides* ssp. *encelioides* – K, Y; < *Ximenesia encelioides* Cavanilles – S]

Verbesina helianthoides Michaux, Ozark Crownbeard. Mt (NC), Cp? (GA?): dry woodlands over mafic rocks; rare. May-October. OH west to IA and KS, south to c. TN, nw. GA, n. AL, and nc. TX; disjunct in w. NC and e. GA. [= C, F, FNA, G, K, SE; = *Pterophyton helianthoides* (Michaux) Alexander – S]

Verbesina heterophylla (Chapman) A. Gray. Cp (FL, GA): pine flatwoods; rare. (April-) June. Ne. FL (8 counties) and se. GA (Charlton County). [= FNA, GW, K, SE, WH; = *Pterophyton heterophyllum* (Chapman) Alexander – S]

Verbesina occidentalis (Linnaeus) Walter, Southern Crownbeard. Mt (GA, NC, SC, VA, WV), Pd (DE, GA, NC, SC, VA), Cp (DE, FL, GA, NC, SC, VA): forests, woodlands, pastures, and roadsides, especially abundant in alluvial areas or upslope over mafic or calcareous rocks; common (uncommon in FL). MD west to OH and MO, south to Panhandle FL and MS. [= RAB, C, F, FNA, G, GW, K, SE, WH, WV; = *Phaethusa occidentalis* (Linnaeus) Britton – S]

Verbesina virginica Linnaeus *var.* ***laciniata*** (Poiret) A. Gray, Southern Frostweed. Cp (FL, GA, NC?, SC): moist forests and thickets; rare. September-October. E. SC (or e. NC?) south to s. FL. Olsen (1979) maps this variety as occurring in e. NC; I know of no documentation. The two varieties need additional study; specific status may be warranted. [= RAB, GW, K, SE, Z, WH; < *V. virginica* – FNA; = *Phaethusa laciniata* (Poiret) Small – S; = *V. laciniata* (Poiret) Nuttall]

Verbesina virginica Linnaeus *var.* ***virginica***, Common Frostweed. Mt (CA, NC, SC, VA), Pd (GA, NC, SC), Cp (FL, GA, SC, VA): moist to dryish forests, especially over mafic or calcareous rocks, in Coastal Plain ravines in VA over coquina limestone; uncommon (rare in VA). July-October. Sc. NC (e. VA?) west to e. KS, south to s. FL and c. TX. Populations of *V. virginica* from e. VA appear to be substantially disjunct from other populations of either variety. [= RAB, C, GW, K, SE, Z; < *V. virginica* – F, FNA, G, WH; = *Phaethusa virginica* (Linnaeus) Britton – S]

Verbesina walteri Shinners, Walter's Wingstem. Cp (GA, SC), Pd (NC): floodplains, low moist forests; rare (NC Watch List). Late August-September. Coastal Plain of SC south to GA, west to LA; disjunct in Piedmont of NC and Ouachita Mountains of AR. [= RAB, FNA, GW, K, SE; = *Ridan paniculata* (Walter) Small – S]

Vernonia Schreber 1791 (Ironweed)

A genus of about 20 species, perennial herbs, of e. and c. North America and n. Mexico; a few species in South America. Tradititionally very broadly circumscribed to include about 500 species, trees, shrubs, and herbs, of tropical, subtropical, and warm temperate regions, especially America and Africa; this broader circumscription appears increasinglyt indefensible. References: Strother in FNA (2006a); Jones (1982)=Z; Urbatsch (1972)=Y; Jones in Cronquist (1980)=SE. Key based on FNA and SE.

Identification notes: Hybrids are frequent between co-occurring species. Only *V.* ×*georgiana* is keyed separately below (because of its distinctive appearance). Others may be recognized by intermediate morphology and ecological / geographic context.

1 Basal rosette present, its leaves larger than those of the stem; [of xeric habitats of the Coastal Plain and (in NC southward) xeric rocky habitats of the Piedmont].
2 Phyllary tips acute to rounded (sometimes minutely apiculate), the narrowest short acuminate; [from s. MS westward] ..... ***[V. texana]***
2 Phyllary tips subulate to filiform, the broadest long-acuminate.
3 Basal leaves 2-10 cm wide; stem leaves few, abruptly reduced upward in size relative to the basal..... ***V. acaulis***
3 Basal leaves 0.5-2.5 cm wide; stem leaves relatively many, gradually reduced upward..... ***V. ×georgiana***
1 Basal rosette absent; [collectively of a wide variety of habitats].
4 Phyllary tips subulate to filiform, the broadest long-acuminate.
5 Involucres 11-15 mm in diameter; phyllaries (50-) 60-70+; florets 50-100+ ..... ***V. arkansana***
5 Involucres 4-8 (-10) mm in diameter; phyllaries 22-46 (-60+); florets 12-45 (-65).
6 Middle cauline leaves 1.2-7.5 cm wide; plants 4-35 dm tall; [of various habitats, but not typically in Coastal Plain pinelands].
7 Pappus whitish to yellowish, 30 outer bristles intergrading with 30+ inner bristles; leaf blades 2.5-3.5 (-4)× as long as wide ..... ***V. glauca***
7 Pappus brown to purple, 20 outer scales contrasting with 30-40+ inner bristles; leaf blades (3.3-) 4-6× as long as wide..... ***V. noveboracensis***
6 Middle cauline leaves 0.1-1.8 cm wide; plants 3-11 dm tall; [of Coastal Plain pinelands].
8 Leaves 3-7 cm long, (5-) 10-20+ mm wide, 2.5-6× as long as wide, somewhat auriculate at the base ..... ***V. pulchella***
8 Leaves 5-12 cm long, 2-4 (-8+) mm wide, (8-) 12-50× as long as wide, attenuate at the base.
9 Tips of the inner phyllaries long-acuminate, 1.4-4.8 mm long..... ***V. angustifolia*** *var.* ***scaberrima***
9 Tips of the inner phyllaries acuminate, 0.1-1.0 mm long ..... ***V. angustifolia*** *var.* ***angustifolia***
4 Phyllary tips acute to rounded (sometimes minutely apiculate), the narrowest short acuminate.
10 Leaves 2-4 (-8+) mm wide, (8-) 12-50× as long as wide.
11 Heads 16-19-flowered; phyllary tips acuminate ..... ***V. angustifolia*** *var.* ***angustifolia***
11 Heads 8-15-flowered; phyllary tips acute..... ***V. angustifolia*** *var.* ***mohrii***
10 Leaves 5-70 mm wide, 2-9 (-17)× as long as wide.
12 Undersurface of leaf glabrous or nearly so, with pits (best seen at > 10× magnification) containing awl-shaped hairs or glands..... ***[V. fasciculata*** *var.* ***fasciculata]***
12 Undersurface of leaves conspicuously scabrous or pubescent, lacking pits.
13 Stems glabrous ..... ***V. flaccidifolia***
13 Stems hairy.
14 Leaf undersurfaces scabrous with appressed awl-shaped hairs, with few or no resin glands.
15 Heads with 13-30 flowers; leaf blades linear-lanceolate, 10-30 cm long, 1.2-7.5 cm wide, 4-10× as long as wide ..... ***V. gigantea***
15 Heads with 9-20 flowers; leaf blades elliptic to oblanceolate, 6-20 cm long, 1.2-5 cm wide, 3-5× as long as wide.....

.....***V. ovalifolia***
14 Leaf undersurfaces with curled, erect hairs, and with conspicuous resin glands.
16 Heads with (15-) 20-25 (-35) florets; involucres 4-6.7 mm high, 4-7 mm across ..... ***[V. baldwinii** var. **baldwinii]***
16 Heads with 30-55 florets; involucres (6-) 7-10 mm high, 5-9 mm across ..... ***V. missurica***

Vernonia acaulis (Walter) Gleason. Cp, Pd (GA, NC, SC): sandhills, dry rocky woodlands, bluffs, and barrens; common. Late June-August; August-October. Coastal Plain and lower Piedmont of ne. and nc. NC south to sc. GA. [= RAB, FNA, K, S, SE]

Vernonia angustifolia Michaux *var.* ***angustifolia***. Cp (GA, NC, SC), Mt? (NC): sandhills; common. Late June-early September; September-October. Se. NC south to GA. [= RAB; < *V. angustifolia* – FNA, S; = *V. angustifolia* ssp. *angustifolia* – K, SE]

Vernonia angustifolia Michaux *var.* ***mohrii*** S.B. Jones. Cp (FL, GA): sandhills; uncommon? Sw. GA and Panhandle FL west to s. AL and s. MS. [< *V. angustifolia* Michaux – FNA, S, WH; = *V. angustifolia* ssp. *mohrii* (S.B. Jones) S.B. Jones & Faust – K, SE]

Vernonia angustifolia Michaux *var.* ***scaberrima*** (Nuttall) A. Gray. Cp (GA, SC): sandhills; uncommon. Late June-August; August-October. Se. SC south to se. GA. [= RAB; < *V. angustifolia* – FNA, WH; = *V. angustifolia* ssp. *scaberrima* (Nuttall) S.B. Jones & Faust – K, SE; > *V. scaberrima* Nuttall – S; > *V. recurva* Gleason – S]

* ***Vernonia arkansana*** A.P. de Candolle, Arkansas Ironweed. Cp (NC): roadsides; rare, apparently introduced in se. NC from native range in the Ozarkian Midwest. [= C, K, SE; = *V. crinita* Rafinesque]

Vernonia flaccidifolia Small. Pd (GA), Mt (GA): upland deciduous forests and woodlands, woodland borders; common. June-September. C. and nw. GA, se. TN, and ne. and c. AL (Urbatsch 1972). [= FNA, K, S, SE, W, Y]

Vernonia ×georgiana Bartlett (pro sp.). Cp (GA, NC, SC): sandhills; uncommon. Late June-early August; August-October. [= RAB, K, SE; = *V. georgiana* – S]

Vernonia gigantea (Walter) Trelease. Mt (GA, NC, SC, VA, WV), Pd (GA, NC, SC, VA), Cp (GA, NC): pastures, bottomlands, streamsides; common. Late August-October; August-November. W. NY, s. MI and e. NE south to SC, FL, and TX. [= W; = *V. gigantea* (Walter) Trelease ssp. *gigantea* – K, SE, Y; = *V. altissima* Nuttall – RAB, G, WV; = *V. gigantea* var. *gigantea* – C; > *V. altissima* var. *altissima* – F; < *V. gigantea* – FNA, WH; > *V. altissima* var. *taeniotricha* Blake – F; > *V. altissima* – S; > *V. gigantea* – S]

Vernonia glauca (Linnaeus) Willdenow. Cp (DE, GA, NC, SC, VA), Pd (DE, GA, NC, SC, VA), Mt (GA, NC, SC, VA, WV): pastures, bottomlands, streamsides; common (uncommon in DE Piedmont, rare in DE Coastal Plain, rare in WV). Late June-September; August-October. NJ and PA south to GA, AL, and MS. [= RAB, C, F, FNA, G, K, S, SE, W, WV]

Vernonia missurica Rafinesque, Missouri Ironweed. Cp (FL), {GA}: wet hammocks, prairies, glades; rare. IN, C. TN (Chester, Wofford, & Kral 1997), GA (FNA), and Panhandle FL, west to IA, KS, OK, and TX. [= C, F, K, S, SE, WH]

Vernonia noveboracensis (Linnaeus) Michaux. Mt (GA, NC, SC, VA, WV), Pd (DE, GA, NC, SC, VA), Cp (DE, GA, NC, SC, VA): pastures, bottomlands, streamsides; common. July-September; August-October. MA and NY south to ne. and e. Panhandle FL and AL. [= RAB, C, FNA, G, K, SE, W, WH, WV; > *V. noveboracensis* var. *noveboracensis* – F; > *V. noveboracensis* var. *tomentosa* (Walter) Britton – F; > *V. noveboracensis* – S; > *V. harperi* Gleason – S]

Vernonia ovalifolia Torrey & A. Gray, Oval-leaf Ironweed. Cp (FL, GA): rich woods, stream banks; common. Sw. GA south to Panhandle FL and c. peninsular FL. [= S; < *V. gigantea* – FNA, WH; = *Vernonia gigantea* (Walter) Trelease ssp. *ovalifolia* (Torrey & A. Gray) Urbatsch – K, SE, Y]

Vernonia pulchella Small. Cp (GA, SC): sandhills; uncommon. Se. SC (Beaufort and Jasper counties) south to se. GA. [= FNA, K, S, SE]

Vernonia baldwinii Torrey var. *baldwinii*, Western Ironweed. MI, KY, and LA west to NE, CO, and TX. [= C, F; < *V. baldwinii* – FNA; = *V. baldwinii* ssp. *baldwinii* – K, SE]

Vernonia fasciculata Michaux var. *fasciculata*, Smooth Ironweed. KY and OH west to MB and CO. [= C, F; < *V. fasciculata* – FNA; = *V. fasciculata* ssp. *fasciculata* – K]

Vernonia texana (A. Gray) Small, Texas Ironweed. S. MS west to OK and TX. [= FNA, K, S, SE]

Vittadinia A. Richard 1832

* ***Vittadinia sulcata*** N. Burbidge. Cp (SC): waste area near wool-combing mill; rare, perhaps merely a waif, native of sw. Australia. See Nesom (2004d).

Xanthium Linnaeus 1753 (Cocklebur)

A genus of about 3 species, herbs, cosmopolitan (of somewhat uncertain original distribution). References: Strother in FNA (2006c); Cronquist (1980)=SE.

1 Leaves lanceolate, 2-5× as long as wide, cuneate at the base; leaf axil with a 1-3 cm long yellow 3-forked spine .....***X. spinosum***
1 Leaves ovate or orbicular, 0.8-1.5× as long as wide, cordate at the base; leaf axil lacking spines .....***X. strumarium***

* ***Xanthium spinosum*** Linnaeus, Spiny Cocklebur. Mt (VA, WV), Cp (DE, NC, SC), Pd (DE, GA, VA): fields, disturbed ground; uncommon (rare in GA, NC, SC, VA, and WV), introduced, but the native distribution unknown. July-November. [= RAB, C, FNA, K, SE, WV; > *X. spinosum* var. *spinosum* – F; > *X. spinosum* var. *inerme* Bel – F; > *X. ambrosioides* Hooker & Arnott – F; = *Acanthoxanthium spinosum* (Linnaeus) Fourreau – S]

Xanthium strumarium Linnaeus, Cocklebur. Cp (DE, FL, GA, NC, SC, VA), Pd (DE, GA, NC, SC, VA), Mt (GA, NC, SC, VA, WV): disturbed ground, roadsides, pastures, barnyards, beaches; common. July-November. Nearly cosmopolitan, its original distribution unclear, but probably native to the New World. Various taxa have been recognized (see synonymy); it is unclear that any are usefully distinguished. The most commonly followed recent treatment is that by Cronquist, recognizing two varieties in eastern North America: var. *canadense*, with burs 2-3.5 cm long, the prickles of the bur with spreading hairs and stipitate glands toward the prickle bases, and var. *glabratum* (A.P. de Candolle) Cronquist, with burs 1.5-2 cm long, the prickles of the bur nearly glabrous or with short glandular or nonglandular puberulence toward the prickle bases. [= FNA, GW; > *X. strumarium* var. *glabratum* (A.P. de Candolle) Cronquist – RAB, C, G, K, SE, W, WH; > *X. strumarium* var. *strumarium* – RAB, misapplied; > *X. strumarium* var. *canadense* (P. Miller) Torrey & A. Gray – C, G, K, SE, W, WH; > *X. chinense* P. Miller – F; > *X. echinatum* Murray – F; > *X. italicum* Moretti – F< WV; > *X. oviforme* Wallroth – F; > *X. pensylvanicum* Wallroth – F, WV; > *X. strumarium* – F, WV]

Youngia Cassini 1831(Youngia)

A genus of about 30-40 species, herbs, of Asia. References: Spurr in FNA (2006a); Cronquist (1980)=SE.

* ***Youngia japonica*** (Linnaeus) A.P. de Candolle, Asiatic Hawk's-beard, Youngia. Cp (FL, GA, NC, SC, VA), Pd (GA, NC, SC, VA), Mt (NC): roadsides, disturbed areas, trail edges; uncommon, native of se. Asia. Spreading rapidly in our area, and now moving into minimally-disturbed natural areas. [= C, FNA, K, SE, WH; = *Crepis japonica* (Linnaeus) Bentham – RAB, F, G, S; > *Y. japonica* ssp. *japonica*]

Zinnia Linnaeus 1759 (Zinnia)

A genus of about 17 species, herbs, of sw. North America south to South America. References: Smith in FNA (2006c); Cronquist (1980)=SE.

1 Achenes wingless; receptacular bracts (chaff) toothed or erose on the lip ..... ***Z. peruviana***
1 Achenes winged; receptacular bracts (chaff) with a differentiated fimbriate lip ..... ***Z. violacea***

* ***Zinnia peruviana*** (Linnaeus) Linnaeus, Peruvian Zinnia. Cp (FL, GA, NC, SC): disturbed areas; rare (commonly cultivated), native of the New World tropics. May-November. [= FNA, K, SE, WH; *? Z. pauciflora* Linnaeus – S]
* ***Zinnia violacea*** Cavanilles, Garden Zinnia, Elegant Zinnia. Cp (FL, GA, NC, SC): disturbed areas; rare (commonly cultivated), native of the New World tropics. May-November. [= FNA, K, WH; = *Z. elegans* Jacquin – S, SE]

405. ADOXACEAE Trautvetter 1853 (Moschatel Family) [in DIPSACALES]

A family of about 4 genera and about 165-200 species, shrubs, small trees, and herbs (here interpreted as including *Sambucus* and *Viburnum*). There now appears to be little doubt that *Sambucus* and *Viburnum* are more naturally placed in the Adoxaceae, in contrast to their traditional placement in the Caprifoliaceae (Zhang et al. 2003, Eriksson & Donoghue 1997). References: Ferguson (1966a).

1 Leaves pinnately compound; fruit 3-5-seeded ..... ***Sambucus***
1 Leaves simple; fruit 1-seeded ..... ***Viburnum***

Sambucus Linnaeus 1753 (Elderberry)

A genus of about 9 species of shrubs and small trees, north temperate and subtropical. References: Bolli (1994)=Z; Ferguson (1966a)=Y.

1 Inflorescence racemose, normally longer than broad; fruits red when ripe; pith of stems and second-year branches brown; leaves with 5-7 leaflets, these never further divided; foliage and young twigs puberulent; [primarily of the Mountains, extending into the Piedmont in VA] ..... ***S. racemosa*** *var.* ***pubens***
1 Inflorescence cymose, normally broader than long; fruits black or deep purple when ripe; pith of stems and second-year branches white; leaves with 5-11 leaflets, the lower leaflets sometimes further divided; foliage and young twigs glabrous or with trichomes mostly limited to the veins of the leaves; [collectively widespread].
  2 Fruits purplish black, 4-6 mm in diameter; plant a shrub to small tree (usually multi-stemmed from the base); [common, widespread, and native] ..... ***S. canadensis***
  2 Fruits black, 6-8 mm in diameter; plant a small tree; [rare, restricted, and alien] ..... ***S. nigra***

Sambucus canadensis Linnaeus, Common Elderberry. Cp (DE, FL, GA, NC, SC, VA), Pd (DE, GA, NC, SC, VA), Mt (GA, NC, SC, VA, WV): streambanks, thickets, moist forests, disturbed areas; common. Late April-July; July-August. NS west to MB, south to s. FL, TX, Mexico; West Indies. The leaflets, particularly of young shoots or stunted sprouts, are often variegated. This is one of the first woody plants to leaf out in the spring. Bolli (1994) treats this taxon as a subspecies of a

broadly defined *S. nigra*. He recognizes 6 subspecies: ssp. *nigra* in Europe, ssp. *palmensis* (Link) R. Bolli in the Canary Islands, ssp. *maderensis* (Lowe) R. Bolli in Madeira Island, ssp. *canadensis* in eastern North America, Mexico, Central America, and the West Indies, ssp. *cerulea* (Rafinesque) R. Bolli of western North America, and ssp. *peruviana* (Humboldt, Bonplandt, and Kunth) R. Bolli of South America. I prefer to retain these taxa at the species level, particularly as Bolli states "the geographical races, in the following defined as subspecies, turned out to be the biological units in *Sambucus*." Bolli further discusses 3 races within what is here called *S. canadensis* (his *S. nigra ssp. canadensis*), one from eastern North America, another from montane Mexico and Central America, and a third from subtropical se. North America and the West Indies; he considers these geographic races to represent "morphological and perhaps genetical" differences, and that "at present, all races are probably interconnected." This variation may be worthy of taxonomic recognition at the varietal level, and these "races" have formerly been considered to be species or varieties. Plants of most of our area represent *S. canadensis* var. *canadensis*, while evergreen (or tardily deciduous), bipinnate plants of FL, s. GA, s. AL, s. MS, s. LA, se. TX, and the West Indies represent *S. canadensis* var. *laciniata* A. Gray. [= RAB, C, GW, W, WV, Y; > *S. canadensis* var. *canadensis* – F, G; > *S. canadensis* var. *submollis* Rehder – F, G; = *S. nigra* Linnaeus ssp. *canadensis* (Linnaeus) R. Bolli – K, WH, Z; > *S. canadensis* – S; > *S. simpsonii* Rehder ex Sargent – S; > *Sambucus canadensis* Linnaeus var. *laciniata* A. Gray]

* ***Sambucus nigra*** Linnaeus, European Elder. Pd (VA): disturbed areas, uncommonly cultivated; rare, native of Europe. Reported for Petersburg, Dinwiddie County, VA by Fernald (1941). [= C, F, G; = *S. nigra* ssp. *nigra* – K, Z]

Sambucus racemosa Linnaeus *var.* ***pubens*** (Michaux) Koehne, Red Elderberry. Mt (GA, NC, VA, WV), Pd (VA): spruce-fir and northern hardwood forests, especially typical on boulderfield, talus, and other rocky situations, primarily at high elevations in the Mountains, though sometimes descending in our area (mainly in VA) to low elevations (as low as 75 m); uncommon (rare in VA Piedmont). Late April-early June; late June-August. As interpreted here, *S. racemosa* is an interruptedly circumboreal species, represented in ne. North America by var. *pubens*, in n. Europe by var. *racemosa*, and in ne. Asia and nw. North America by several additional varieties. *S. racemosa var. pubens* ranges from NL (Newfoundland) west to BC (?), south to PA, IN, IL, and in the mountains to w. NC, e. TN, and ne. GA (Jones & Coile 1988). [= *S. pubens* – RAB, F, G, S, W, WV; = *S. racemosa* ssp. *pubens* (Michaux) House var. *pubens* – C; < *S. pubens* ssp. *pubens* – Y; < *S. racemosa* var. *racemosa* – K, Z]

Viburnum Linnaeus 1753 (Viburnum)

(contributed by B.A. Sorrie & A.S. Weakley)

A genus of about 150 species of shrubs and small trees, largely temperate, and primarily in Asia and North America. There remain a number of taxonomic problems, particularly in the *Viburnum dentatum* complex; the treatment and key for that group is highly provisional. Dirr (2007) discusses the genus in detail from a horticultural perspective. References: McAtee (1956)=Z; Ferguson (1966a)=Y; Weckman et al. (2002); Winkworth & Donoghue (2005).

Identification notes: Leaves vary in shape in some taxa more than in others; we have allowed for some of this variation in the key, but readers should expect that some specimens will not key cleanly, especially vegetative shoots. Petiole length of leaves varies considerably, even with those possessing “short” petioles. However, by measuring only the petioles of the first leaves below an inflorescence one reduces the chances of misidentifications greatly. Warning: even in some of the “long” petioled taxa, one may occasionally encounter unusually short petioles; therefore it is wise to examine several twigs. Density of pubescence and glandularity of leaves, petioles, and inflorescences varies more in some taxa than in others; we have allowed for some of this variation in the key, but readers should expect that some specimens will not key cleanly, especially vegetative shoots. Stipitate glands are usually very short, especially those on leaf veins; a 10× lens may not be adequate to see them clearly. It is our belief, based on thousands of specimens examined and years of fieldwork, that most *Viburnum* tend to lose pubescence, and perhaps glandularity as well, as the season progresses.

1 Leaves (at least the larger and better developed) palmately lobed and veined.
  2 Petioles lacking glands near its junction with the leaf blade; flowers all alike and fertile; twibs pubescent; fruit blue-black; [section *Lobata*] ..... ***V. acerifolium***
  2 Petioles with several glands near its junction with the leaf blade; marginal flowers of the inflorescence sterile and much larger than the fertile central flowers (or in cultivated forms all the flowers sterile and enlarged); twigs glabrous; fruit red; [section *Opulus*].
    3 Petiolar glands mostly taller than wide, stalked, rounded on the top; [native, of n. WV, PA, and NJ northward] ..... ***V. opulus*** *var.* ***americanum***
    3 Petiolar glands mostly wider than tall, sessile, concave on the top; [alien, sometimes planted and escaped] ..... ***V. opulus*** *var.* ***opulus***
1 Leaves unlobed and pinnately veined.
  4 Lateral veins curving and branching repeatedly through most of their length, not noticeably parallel, the lateral veins becoming obscure in the general pattern of anastamosing veins and not obviously leading to marginal teeth; [section *Lentago*].
    5 Leaves entire or with a crenate margin, the teeth < 5 per cm of margin.
      6 Leaves 2-5 cm long, obovate or spatulate, widest towards the tip; [of e. SC southward in then Coastal Plain] ..... ***V. obovatum***
      6 Leaves 5-12 cm long, generally elliptic or ovate, widest at or below the middle; [collectively widespread and of various habitats].
        7 Leaves dull to slightly shiny above; peduncle (5-) avg. 13 (-25) mm long; leaves undulate-crenulate (or rarely entire); [of Mountains and upper Piedmont] ..... ***V. cassinoides***
        7 Leaves shiny above (as if varnished); peduncle (20-) avg. 35 (-50) mm long; leaves entire (rarely somewhat undulate-crenate); [of Coastal Plain, Piedmont, and low elevation boggy sites in the Mountains] ..... ***V. nudum***
    5 Leaves serrulate, the teeth > 5 per cm of margin.
      8 Leaves mostly strongly acuminate at the tip; [of w. VA northward] ..... ***V. lentago***
      8 Leaves acute, obtuse, or rounded (rarely somewhat acuminate) at the tip; [collectively widespread in our area].
        9 Leaves herbaeous in texture, dull above; petioles and veins (lower surface) glabrous or slightly brown-scurfy; [widespread in our area, usually in bottomland or other mesic forests] ..... ***V. prunifolium***

9 Leaves somewhat coriaceous in texture, glossy above (as if lacquered); petioles and veins (lower surface) red-scurfy; [of c. VA southward, usually in dry to dry-mesic woodlands and forests] ..... ***V. rufidulum***

4 Lateral veins of the leaves nearly straight and prominently parallel for most of their length, many of them forking near the margin, the ultimate veins leading to a tooth.

10 Winter buds consisting of tightly folded leaves uncovered by bud scales; plants strongly and noticeably stellate pubescent, especially on young parts and on the lower leaf surface; fruits red then turning black.

11 Leaves lanceolate, 3-5× as long as wide, entire; leaf base truncate to rounded; leaf surface strongly rugose; [section *Viburnum*] ..... ***V. rhytidophyllum***

11 Leaves ovate, 1-2.5× as long as wide, serrate; leaf base cordate; leaf surface planar to somewhat rugose.

12 Leaves 10-25 cm long, 8-20 cm wide, deeply cordate at the base; [native, of cool, high elevation forests and bogs]; [section *Pseudotinus*] ..... ***V. lantanoides***

12 Leaves 5-12 cm long, 2-6 cm wide, rounded to cordate at the base; [alien, cultivated and escaping to suburban forests]; [section *Lantana*].

13 Flowers all alike and fertile ..... ***V. lantana***

13 Marginal flowers of the inflorescence sterile and much larger than the fertile central flowers (or all the flowers sterile and enlarged) ..... ***[V. macrocephalum]***

10 Winter buds covered by bud scales; plants noticeably stellate-pubescent or not; fruits orange, red, or blue-black.

14 Leaves oblong-obovate, wider towards the tip; inflorescence paniculate, with an elongate central axis, the lowest branches opposite and with other branches above; fresh leaves malodorous; [section *Solenotinus*] ..... ***V. sieboldii***

14 Leaves ovate or suborbicular, widest near or below the middle; inflorescence umbelliform, the main branches all attached at the same point; fresh leaves not malodorous.

15 Leaves with 8-12 lateral veins on each side; marginal flowers of the inflorescence sterile and much larger than the fertile central flowers; winter buds with 2 scales; [section *Tomentosa*] ..... ***V. plicatum***

15 Leaves with 5-9 lateral veins on each side; flowers all alike and fertile; winter buds with > 2, imbricate scales.

16 Fruit orange or red; [aliens, planted and escaping]; [section *Succodontotinus*].

17 Leaves broadly ovate, acute, pubescent on both surfaces ..... ***V. dilatatum***

17 Leaves ovate or ovate-lanceolate, acuminate, glabrous except for long, somewhat appressed hairs along the veins beneath ..... ***V. setigerum***

16 Fruit blue-black; [native].

18 Petioles short, those immediately below a cyme ≤ 8mm long.

19 Cymes and petioles stipitate-glandular; leaf shape ovate, occasionally rotund; [endemic to two small areas: Ozark and Ouachita Mountains of s. MO-AR-e OK and n AL-sc TN-nw GA] ..... ***V. bracteatum***

19 Cymes and petioles eglandular (cymes occasionally sparsely so); leaf shape ovate; [more widespread] ..... ***V. rafinesqueanum***

18 Petioles longer, those immediately below a cyme ≥ 11mm long.

19 Cymes stipitate-glandular (occasionally glabrous in *V. dentatum* var. *deamii* and *V. dentatum* var. *indianense*).

20 Leaf bases strongly cordate; plants usually restricted to limestone substrates.

21 Petioles eglandular; leaf veins eglandular; leaves glabrate beneath or with simple hairs in axils; bark not exfoliating; [endemic to two small areas: n. AL, sc. TN, and nw. GA, and Ozark and Ouachita Mountains of s. MO, AR, and e. OK] ..... ***V. bracteatum***

21 Petioles stipitate-glandular (may be sparse); leaf veins stipitate-glandular; leaves densely pubescent beneath (forma *molle*) to glabrate (forma *leiophyllum*); bark of stems and branches exfoliating ..... ***[V. molle]***

20 Leaf bases cuneate, truncate, or occasionally subcordate; plants of various substrates.

22 Stipitate glands absent on petioles and leaf veins; stipular leaf bracts absent; [of sandstone substrates in Lookout Mountain region of ne. AL] ..... ***V. species 1***

22 Stipitate glands present on petioles and leaf veins; stipular leaf bracts often present.

23 Petioles with stellate hairs all over; leaves beneath moderately to densely stellate pubescent ..... ***[V. dentatum** var. **deamii]***

23 Petioles with stellate hairs confined to groove; leaves beneath glabrate ..... ***[V. dentatum** var. **indianense]***

19 Cymes eglandular (occasionally glandular in *V. dentatum* var. *dentatum* and *V. scabrellum*)

24 Petioles glabrous or glabrate; stellate hairs absent on leaves and petioles; hairs on leaf undersides confined to axils and a few veins; leaf shape usually ovate ..... ***V. dentatum** var. **lucidum***

24 Petioles sparsely to densely stellate pubescent; stellate hairs present on leaf underside and petiole, dense and soft to touch (*V. carolinianum*, *V. scabrellum*, most *V. venosum*) or sparse to moderate (*V. dentatum* var. *dentatum*, some *V. venosum*); leaf shape various.

25 Cymes not stellate pubescent (occasionally sparsely so); leaves thinner textured and with less prominent veins, sparsely to moderately stellate pubescent below; [plants relatively widespread] ..... ***V. dentatum** var. **dentatum***

25 Cymes stellate-pubescent; leaves thick textured and with prominent veins, moderately to densely stellate-pubescent below.

26 Leaf shape ovate to broadly ovate; leaf teeth 5-12 per side; upper leaf surface scabridulous with abundant simple hairs; [of southern Atlantic and Gulf Coastal Plain] ..... ***V. scabrellum***

26 Leaf shape rotund; leaf teeth 10-18 per side; upper leaf surface glabrate, not scabridulous; [of Southern Appalachian mountains or northern Atlantic Coastal Plain].

27 Leaf underside densely pubescent and soft to touch (felt-like); stipular leaf bracts often present; fruits pubescent; leaf teeth 13-18 per side; [of southern Appalachian mountains of w. NC, n. GA, and se. TN] ..... ***V. carolinianum***

27 Leaf underside moderately to densely pubescent and somewhat soft to touch (but not felt-like); stipular leaf bracts absent; fruits glabrous; leaf teeth 10-15 per side; [of northern Atlantic Coastal Plain of se. MA, s. RI, and Long Island, NY] ..... ***V. venosum***

Viburnum acerifolium Linnaeus, Mapleleaf Viburnum, Dockmackie. Mt (GA, NC, SC, VA, WV), Pd (DE, GA, NC, SC, VA), Cp (DE, FL, GA, NC, SC, VA): mesic to dry forests and woodlands; common (rare in Coastal Plain of GA, NC, and SC). Late April-early June; August-October. NB, ON, and WI south to Panhandle FL and TX. [= RAB, C, G, K, S, W, WH, WV, Y; > *V. acerifolium* var. *acerifolium* – F, Z; > *V. acerifolium* Linnaeus var. *glabrescens* Rehder – F, Z; > *V. acerifolium* var. *densiflorum* (Chapman) McAtee – Z; > *V. acerifolium* var. *ovatum* (Rehder) McAtee – Z]

Viburnum bracteatum Rehder, Limerock Arrow-wood. Mt (GA): calcareous forests and woodlands; rare. Late April-early May. Se. TN south to nw. GA and ne. AL; disjunct westwards in the Ozark region of s. MO, nw. AR, and e. OK. [> *V. bracteatum* Rehder – K, S, Y, Z; > *V. ozarkense* W.W. Ashe – K, S, Y, Z]

Viburnum carolinianum Ashe, Carolina Arrow-wood. Mt (GA, NC, SC?, VA?), Pd (NC): moist to dry forests, rock outcrops, streambanks; uncommon. April; July-September. Sw. NC and adjacent GA and TN; remainder of distribution unclear at this time. [<? *V. dentatum* Linnaeus var. *deamii* (Rehder) Fernald – C, F, G; < *V. dentatum* var. *dentatum* – RAB, K; < *V. dentatum* – GW; < *V. semitomentosum* (Michaux) Rehder – S; > *V. carolinianum* Ashe var. *cismontanum* McAtee – Z; > *V. carolinianum* Ashe var. *carolinianum* – Z]

Viburnum cassinoides Linnaeus, Northern Wild Raisin, Withe-rod, Shonny Haw. Mt (GA, NC, SC, VA, WV), Pd (NC, SC), Cp (DE): bogs, moist forests, high elevation forests and outcrops; common (rare in DE). Late May-June; August-October. NL (Newfoundland), ON, and WI south to n. GA and AL. [= RAB, F, G, S, W, WV, Y; = *V. nudum* Linnaeus var. *cassinoides* (Linnaeus) Torrey & A. Gray – C, K; < *V. nudum* – GW; > *V. cassinoides* var. *cassinoides* – Z; > *V. cassinoides* var. *nitidum* Aiton – Z; > *V. cassinoides* var. *harbisonii* McAtee – Z]

Viburnum dentatum Linnaeus *var.* ***dentatum***, Arrow-wood. Cp (DE, FL?, NC, SC, VA), Pd (DE, NC, SC, VA), Mt (NC, SC, VA, WV): marshes, streambanks, other moist places; common (rare in WV). Late March-April; July-September. East of the Appalachians, from Se. PA and sw. NJ south to s. SC and ne. GA, with scattered records westward to sw. NC, nc. TN, sw. VA, n. WV, and w. MD. [= C, F, G, K; < *V. dentatum* var. *dentatum* – RAB (also see *V. carolinianum*); < *V. dentatum* – GW, W, WH, WV, Y; < *V. semitomentosum* (Michaux) Rehder – S; = *V. dentatum* – Z]

Viburnum dentatum Linnaeus *var.* ***lucidum*** Aiton, Smooth Arrow-wood. Cp (DE, NC, SC, VA), Pd (DE, GA, NC, SC, VA), Mt (GA, NC, SC, VA, WV): marshes, moist forests, streambanks; common. Late March-May; July-September. ME, NY, and OH south to e. SC, c. GA, and ne. AL. [= RAB, C, G; = *V. recognitum* Fernald – F, K, WV; < *V. dentatum* – GW, W; = *V. dentatum* – S, misapplied; > *V. recognitum* var. *recognitum* – Z; > *V. recognitum* var. *alabamense* McAtee – Z]

* ***Viburnum dilatatum*** Thunberg, Linden Viburnum. Pd (DE, VA), Cp (VA): suburban woodlands; uncommon (rare in VA), native of e. Asia. [= C, K]

* ***Viburnum lantana*** Linnaeus, Wayfaring Tree. Mt (WV): widely planted, sometimes escaped or persistent; rare, native of Eurasia. Reported as naturalized as far south as MD (Kartesz 1999) and KY (Weckman et al. 2002). May; September. [= C, F, G, K, Z]

Viburnum lantanoides Michaux, Hobblebush, Witch's-hobble, Tangle-legs. Mt (GA, NC, VA, WV): spruce-fir forests, northern hardwood forests, boulderfields, primarily over 1000 m elevation; common. April-early June; June-July. NB and ON south to w. NC, ne. GA, e. TN, and OH. [= K, S, W, Y; = *V. alnifolium* Marshall – RAB, C, F, G, WV; = *V. grandifolium* Aiton – Z]

Viburnum lentago Linnaeus, Nannyberry, Sheepberry. Mt (VA, WV), Pd (DE): shrubby stream-bottoms, other wetlands and wetland margins; rare. NB and SK south to w. VA, MO, and CO. Reported in the past for NC (see Radford, Ahles, & Bell 1968), from GA (Kartesz 1999), and from AL; these reports all appear to be based on misidentifications. [= RAB, C, F, G, K, S, W, WV, Y, Z]

Viburnum nudum Linnaeus, Southern Wild Raisin, Possumhaw. Cp (DE, FL, GA, NC, SC, VA), Pd (DE, GA, NC, SC, VA), Mt (GA, NC, SC, VA): bogs, blackwater floodplains, seepages; common (rare in Mountains). April-May; August-October. RI, CT, and NY south to c. peninsular FL, west to TX, inland to w. NC, TN, w. KY, and AR. [= RAB, G, S, W, WH, Y, Z; = *V. nudum* var. *nudum* – C, K; > *V. nudum* var. *nudum* – F; > *V. nudum* var. *angustifolium* Torrey & A. Gray – F; < *V. nudum* – GW)]

Viburnum obovatum Walter, Small-leaf Viburnum, Walter's Viburnum. Cp (FL, GA, SC): alluvial forests; common. March-April; September-October. E. SC south to s. FL, west to s. AL. [= RAB, GW, K, Y, Z; > *V. obovatum* – S; > *V. nashii* Small – S]

Viburnum opulus Linnaeus *var.* ***americanum*** Aiton, Cranberry-tree, Highbush-cranberry. Mt (WV): wet forests, along streams; rare. June. NL (Newfoundland) and BC south to s. PA (Rhoads & Klein 1993), NJ, n. WV, OH, NE, and WY. [= C, G, K; = *V. trilobum* Marshall – F, WV; = *V. opulus* var. *trilobum* (Marshall) McAtee – Z]

* ***Viburnum opulus*** Linnaeus *var.* ***opulus***, Guelder-rose, Snowball. Mt (VA, WV): commonly cultivated, and rarely persistent or escaping; rare, native of Europe. Well-established in KY (Weckman et al. 2002). [= C, G, K, Z; > *V. opulus* var. *opulus* – F, WV; > *V. opulus* var. *roseum* Linnaeus – F, WV]

* ***Viburnum plicatum*** Thunberg, Japanese Snowball, Doublefile Viburnum. Pd (DE, NC), Mt (WV): suburban woodlands; uncommon (rare in NC), native of e. Asia. Also reported as naturalized in various more northern states, including se. and sw. PA (Rhoads & Klein 1993), OH (Cooperrider 1995), MI (Voss 1996), and others. [= C, G, K, Z]

Viburnum prunifolium Linnaeus, Black Haw, Nannyberry. Pd (DE, GA, NC, SC, VA), Mt (GA, NC, SC, VA, WV), Cp (DE, GA, NC, SC, VA): alluvial forests, other mesic forests; common. March-April; September-October. NY, MI, WI, IA, and KS south to GA, AL, MS, LA, and TX. [= RAB, C, K, S, W, WV, Y, Z; > *V. prunifolium* var. *prunifolium* – F, G]

Viburnum rafinesqueanum J.A. Schultes, Downy Arrow-wood. Pd (GA, NC, VA), Mt (VA, WV), Cp (DE, VA): dry-mesic to dry woodlands and forests, especially over mafic rocks (but not at all restricted to such sites); common (uncommon in WV, rare in DE and GA). Mid April-May; June-July. NH, QC and MB south to n. GA, AL, AR, and OK; apparently not yet recorded for SC. [= *V. rafinesquianum* – RAB, K, S, W, WV (orthographic variant); > *V. rafinesquianum* var. *rafinesquianum* – C, F, G, Y; =? *V. affine* Bush ex Schneider var. *hypomalacum* Blake – Z]

* ***Viburnum rhytidophyllum*** Hemsley, Leatherleaf Viburnum. Mt (NC): planted and rarely naturalizing; rare, native of . c. and w. China. First reported for NC by Pittillo & Brown (1988): "naturalized beneath hedges on the campus of Western Carolina University" (Jackson County, NC). Elsewhere escaping at least as far south as KY (Weckman et al. 2002). [= K]

Viburnum rufidulum Rafinesque, Southern Black Haw. Pd (GA, NC, SC, VA), Cp (FL, GA, NC, SC, VA), Mt (GA, NC, SC, VA): dry woodlands, dry-mesic woodlands and forests, especially common over mafic rocks (but not at all restricted to such sites); common (uncommon in VA). Late March-April; September-October. C. VA, OH, IL, and KS south to n. peninsular FL and TX. [= RAB, C, F, G, K, W, WH, Y, Z; > *V. rufidulum* – S; > *V. rufotomentosum* Small]

Viburnum scabrellum (Torrey & A. Gray) Chapman. Cp (FL, GA, SC): streambanks, marshes, other moist sites; common. A Coastal Plain endemic, ranging from se. GA south to c. peninsular FL, west to e. TX; with scattered collections north to ec. GA (Richmond County), ne. AL (Cherokee County), nw. AL (Lamar County), c. MS, and n. LA. Expected in s AR, but no specimens seen. Specimens of *V. dentatum* from s. SC show signs of hybridization. Mohr (1901) and some other 19th century authors misapplied the name *V. molle* to it. [< *V. dentatum* var. *dentatum* – RAB; < *V. dentatum* var. *venosum* (Britton) Gleason – G, K; < *V. dentatum* – GW, W, WH, Y; < *V. semitomentosum* (Michaux) Rehder – S, misapplied; > *V. scabrellum* (Torrey & Gray) Chapman var. *scabrellum* – Z; > *V. scabrellum* var. *ashei* Bush – Z; = *Viburnum dentatum* Linnaeus var. *scabrellum* Torrey & A. Gray]

* ***Viburnum setigerum*** Hance, Tea Viburnum. Pd (DE, NC): suburban forests, commonly planted horticulturally; uncommon (rare in NC), native of China. Naturalizing at Guilford Courthouse National Military Park (Greensboro, Guilford County, NC) and in Battle Park (Chapel Hill, Orange County, NC), and elsewhere in our area. Also naturalizing in KY (Weckman et al. 2002). [= K]

* ***Viburnum sieboldii*** Miquel, Siebold's Viburnum. Pd (DE, VA), Mt (WV): suburban forests, commonly planted horticulturally; uncommon (rare in NC), native of c. and s. Japan. Also naturalizing in KY (Weckman et al. 2002). [= C, F, K; = *V. sieboldi* – Z, orthographic variant]

Viburnum species 1, Alabama Arrow-wood. Mt (AL): sandstone substrates; rare. Restricted to Lookout Mountain region of ne. AL, in Cullman, DeKalb, and Marshall Counties. Closer to *V. dentatum* than to *V. recognitum* due to hairy petioles and broad ovate-rotund leaf shape. [< *V. recognitum* Fernald – K; = *V. recognitum* var. *alabamense* McAtee – Z]

Viburnum venosum Britton. Cp (VA): moist places; rare? E. MA, RI, s. Long Island, NY (and reputedly as far south as e. MD and e. VA). [= *V. dentatum* Linnaeus var. *venosum* (Britton) Gleason – G, K; < *V. dentatum* – GW, W, Y; < *V. semitomentosum* (Michaux) Rehder – S; = *V. scabrellum* Torrey & A. Gray var. *venosum* (Britton) McAtee – Z]

* *Viburnum macrocephalum* Fortune, Chinese Snowball. Mt (NC): suburban areas near plantngs; rare, native of China. Reported as naturalized in the Mountains of NC (Pittillo 2003, pers. comm.). {investigate}

Viburnum molle Michaux. Limestone areas. Scattered, discontinuous range (but locally may occur in several contiguous counties) from sw. OH, nc. IN, wc. IL, and se. IA south to sc. TN, nw. AR; disjunct in sw. IA. [= C, F, G, K, Y, Z]

406a. DIERVILLACEAE (Rafinesque) Pyck 1998 (Bush-honeysuckle Family) [in DIPSACALES]

Various segregate families (or reassignments) of taxa traditionally placed in the Caprifoliaceae have been proposed, including the transfer of *Sambucus* and *Viburnum* to the Adoxaceae, placement of *Diervilla* and *Weigela* in the Diervillaceae (Backlund & Pyck 1998), placement of *Abelia* and *Linnaea* in the Linnaeaceae (Backlund & Pyck 1998, Pyck et al. 2002), and retention of *Lonicera, Symphoricarpos,* and *Triosteum* in a much more narrowly circumscribed Caprifoliaceae. Alternatively, all these taxa could be included in the Caprifoliaceae, along with Dipsacaceae and Valerianaceae, as a broadly circumscribed Caprifoliaceae. References: Backlund & Pyck (1998); Pyck et al. (2002); Ferguson (1966a).

Diervilla P. Miller (Bush-honeysuckle)

A genus of 3 species, shrubs, of e. North America. References: Hardin (1968)=Z; Ferguson (1966a)=Y.

1 Petioles 5-8 mm long; leaves ciliate on the margins; twig terete in cross-section; [of the Mountains of VA and n. NC, south to Buncombe and McDowell counties, NC]..... ***D. lonicera***
1 Petioles 0-5 mm long; leaves not ciliate; twig more-or-less square in cross-section; [of the Mountains of SC and s. NC, north to Mitchell and Yancey cos., NC].
  2 Branchlets, leaves, pedicels, and calyx densely pubescent; sepal lobes < 2 mm long ..... ***D. rivularis***
  2 Branchlets, leaves, pedicels, and calyx glabrous, except for hairs on the twig angles; sepal lobes 2-3 mm long ..... ***D. sessilifolia***

Diervilla lonicera P. Miller, Northern Bush-honeysuckle. Mt (GA?, NC, VA, WV), Pd (DE), {DC, MD, NJ?, TN, WV}: rock outcrops and ridges at high elevations; uncommon (rare in DE). June-July; August-October. NL (Newfoundland) west to SK, south to w. NC, e. TN, IN, and IA. Reported for GA (GANHP). [= RAB, C, G, K, S, W, WV, Y, Z; > *D. lonicera* var. *lonicera* – F; > *D. lonicera* var. *hypomalaca* Fernald – F]

Diervilla rivularis Gattinger, Hairy Southern Bush-honeysuckle. Mt (GA, NC), {AL, TN}: rock outcrops, ridges, and streambanks at moderate to high elevations; rare (NC Rare). June-August; August-October. W. NC (Yancey County) and e. TN south to nw. GA (Jones & Coile 1988) and ne. AL. [= K, S, Y, Z; = *D. sessilifolia* Buckley var. *rivularis* (Gattinger) Ahles – RAB, W]

Diervilla sessilifolia Buckley, Smooth Southern Bush-honeysuckle. Mt (GA, NC, SC), {AL, TN}: rock outcrops, ridges, landslide scars, trail margins, other rocky open places, streambanks, at moderate to high elevations; uncommon. June-August; August-October. Sw. NC and e. TN south to nw. SC, ne. GA, and ne. AL. [= F, K, S, Y, Z; = *D. sessilifolia* Buckley var. *sessilifolia* – RAB, W]

Weigela Thunberg (Weigela)

A genus of about 10 species, shrubs, of e. Asia.

* *Weigela floribunda* (Siebold & Zuccarini) K. Koch, Weigela, native of Asia, is cultivated and sometimes naturalized, as in e. TN (Chester, Wofford, & Kral 1998). [= K]

406b. CAPRIFOLIACEAE A.L. de Jussieu 1789 (Honeysuckle Family) [in DIPSACALES]

As here circumscribed, a family of about 5 genera and 220 species, shrubs, trees, and less typically herbs and vines, mainly north temperate and boreal. Circumscription of the family is controversial. Various segregate families (or reassignments) of taxa traditionally placed in the Caprifoliaceae have been proposed, including the transfer of *Sambucus* and *Viburnum* to the Adoxaceae, placement of *Diervilla* and *Weigela* in the Diervillaceae (Backlund & Pyck 1998), placement of *Abelia* and *Linnaea* in the Linnaeaceae (Backlund & Pyck (1998), and retention of *Lonicera, Symphoricarpos,* and *Triosteum* in a much more narrowly circumscribed Caprifoliaceae. Alternatively, all these taxa could be included in the Caprifoliaceae, along with Dipsacaceae and Valerianaceae, as a very broadly circumscribed Caprifoliaceae (APG III 2009). References: Backlund & Pyck (1998); Ferguson (1966a). [also see *ADOXACEAE, DIERVILLACEAE, and LINNAEACEAE*]

1 Erect herb ..... ***Triosteum***
1 Shrubs or woody lianas.
  2 Corolla usually > 10 mm long, bilaterally symmetrical; ovary 2-3-locular ..... ***Lonicera***
  2 Corolla 3-8 mm long, radially symmetrical or nearly so; ovary 4-locular ..... ***Symphoricarpos***

Lonicera Linnaeus 1753 (Honeysuckle)

A genus of about 180 species, shrubs and vines, mainly north temperate. References: Ferguson (1966a)=Z; Rehder (1903)=Y; Green (1966).

1 Flowers in opposite 3-flowered cymules, borne in terminal clusters subtended by connate leaves; corolla red and yellow (or yellowish-orange only); twining vine or shrub with vining tendencies (in *L. flava* the "vininess' sometimes not apparent).
  2 Corolla tube (20-) 30-50 mm long; corolla lobes 4-8 mm long, more or less radially symmetrical; [of a wide variety of habitats, primarily in the Piedmont and Coastal Plain] ..... ***L. sempervirens***
  2 Corolla tube 10-35 mm long; corolla lobes 8-15 mm long, unequally divided into 2 lips (4 lobes on the upper side and one lobe on the lower side); [of ridgetops, rocky slopes, granite domes, and bogs of the Mountains, or of areas to the north or west of the primary area].
    3 Leaves pubescent on the upper surface; [of moist forests, south to PA] ..... ***[L. hirsuta]***
    3 Leaves glabrous on the upper surface.
      4 Fused leaves immediately below the inflorescence glaucous on the upper surface, rounded or emarginate; [of c. TN and other areas west and north of our primary area] ..... ***L. reticulata***
      4 Fused leaves immediately below the inflorescence green on the upper surface, pointed to mucronate.
        5 Corolla tube 30-35 mm long; leaves gray beneath; [of soil mats on dome outcrops of s. NC, SC, and GA and westward] .... ***L. flava***
        5 Corolla tube 15-25 mm long; leaves strongly white-glaucous beneath; [of rocky forests, ridgetops, and bogs of n. NC, VA, and northward] ..... ***L. dioica***
1 Flowers in peduncled pairs in the axils of leaves, not subtended by connate leaves; corolla white to pastel pink or yellow; plant an erect shrub or (*L. japonica*) a trailing or climbing vine.
  6 Trailing or climbing vine; corolla 30-50 mm long; fruit black at maturity; leaves of vigorous shoots often pinnately lobed ..... ***L. japonica***
  6 Upright shrub; corolla 7-25 mm long; fruit red or yellow at maturity; leaves unlobed.
    7 Branches with solid and continuous, white pith; [native and exotic species].
      8 Corolla lobes 5, nearly equal; ovaries separate, divergent; [native species of cool moist forests and bogs] ..... ***L. canadensis***
      8 Corolla lobes fused into a 4-lobed lip and a 1-lobed lip; ovaries fused; [exotic species].
        9 Branches glabrous; corolla glabrous on the exterior ..... ***L. fragrantissima***
        9 Branches retrorsely hispid with reddish-brown hairs; corolla pilose on the exterior ..... ***L. standishii***
    7 Branches hollow between the nodes, with tannish pith; [exotic species, many of them seriously invasive and likely to be encountered in natural areas].
      10 Peduncles shorter than or equal to the subtending petiole; leaves ovate (broadest near the base) and distinctly long-acuminate ..... ***L. maackii***
      10 Peduncles longer than the subtending petiole; leaves elongate (broadest near the middle) and obtuse to acute (rarely short-acuminate).
        11 Leaves glabrous; peduncles 15-25 mm long ..... ***L. tatarica***
        11 Leaves pubescent, at least on the lower surface; peduncles 5-15 mm long.
          12 Corolla pink (aging to yellow), nearly glabrous on the exterior, barely bulging on one side at the base; leaves thinly pubescent beneath ..... ***L. ×bella***
          12 Corolla white (aging to yellow), pubescent on the exterior, distinctly bulging on one side at the base; leaves rather densely grayish-pubescent beneath.
            13 Bracts and sepals ciliate, not glandular; ovary lacking glands; leaf blades broadest at or below the middle ..... ***L. morrowii***
            13 Bracts and sepals glandular; ovary glandular; leaf blades broadest beyond the middle ..... ***L. xylosteum***

* ***Lonicera ×bella*** Zabel [*L. morrowii* × *tatarica*], Pretty Honeysuckle. Forests, woodlands, fencerows, suburban woodlands; native of Eurasia. April-May. [= RAB, C, F, K, Z; = *L. bella* – G; = *L. tatarica* × *morrowii* – Y]

Lonicera canadensis Bartram ex Marshall, American Fly-honeysuckle. Shrubby mountain bogs at high elevations, bouldery northern hardwood forests, hemlock and spruce swamps. May-June; June-July. South NS to SK, south to PA, w. NC, n. GA, OH, IN, and MN. [= RAB, C, F, G, K, W, WV, Y, Z; = *Xylosteon ciliatum* Pursh – S]

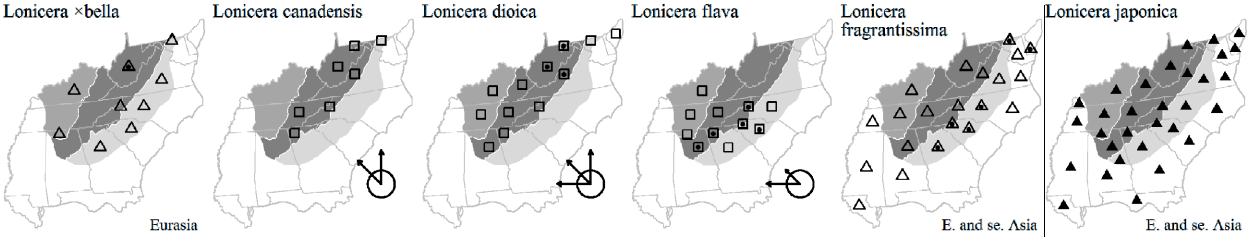
Lonicera dioica Linnaeus. Seepages, bogs, rocky woods, shrubby mountain bogs at high elevations, rocky ridgetop thickets over amphibolite. June-August; August-September. MA and QC west to WI, south to NJ, NC, and IN. Varieties or species have sometimes been maintained based on minor variation of pubescence; it is unlikely that these are taxonomically meaningful. Var. *orientalis* has the lower leaf surfaces, hypanthium, and style hairy (vs. glabrous or nearly so in var. *dioica*). [= RAB, K, W, WV; > *L. dioica* var. *dioica* – C, F, G, Z; > *L. dioica* Linnaeus var. *orientalis* Gleason – C, G; > *L. dioica* var. *glaucescens* (Rydberg) Butters – F, Z; > *L. dioica* – S, Y; > *L. glaucescens* (Rydberg) Rydberg – S, Y]

Lonicera flava Sims, Yellow Honeysuckle. In soil mats around granitic domes. April-May; July-August. W. NC, KY, and MO, south to GA and AR. [= RAB, C, G, K, W, Y; > *L. flava* – F, S; > *L. flavida* Cockerell ex Rehder – F, S; > *L. flava* var. *flava* – Z; > *L. flava* var. *flavescens* Gleason – Z]

* ***Lonicera fragrantissima*** Lindley & Paxton, Sweet-breath-of-spring. Forests, woodlands, old house sites; native of China. February-early April; April-May. [= RAB, K, Y, Z; = *Xylosteon fragrantissimum* (Lindley & Paxton) Small – S]

Lonicera hirsuta Eaton, Hairy Honeysuckle. QC west to MB, south to c. PA (Rhoads & Klein 1993) and MN. [= F, K, Y; > *L. hirsuta* var. *interior* Gleason – C] {rejected; keyed; not mapped}

* ***Lonicera japonica*** Thunberg, Japanese Honeysuckle. Nearly ubiquitous, especially common in the Piedmont and Coastal Plain and in mesic habitats; native of e. Asia. April-June; August-October. Schweitzer & Larson (1999) report on physiological characteristics that make *L. japonica* a successful invasive species. [= RAB, C, G, GW, K, W, WH, WV, Z; > *L. japonica* var. *chinensis* (P.W. Watson) Baker – F, Y; > *L. japonica* var. *japonica* – F, Y; = *Nintooa japonica* (Thunberg) Sweet – S]



* ***Lonicera maackii*** (Ruprecht) Maximowicz, Amur Honeysuckle. Suburban woodlands, moist forests, fencerows; native of e. Asia (Korea, China, Japan). May-June. This is one of worst "shrub-weeds", aggressively invasive in various parts of eastern North America, as in the vicinity of DC and in calcareous substrate parts of the interior South. [= C, K, Y, Z]

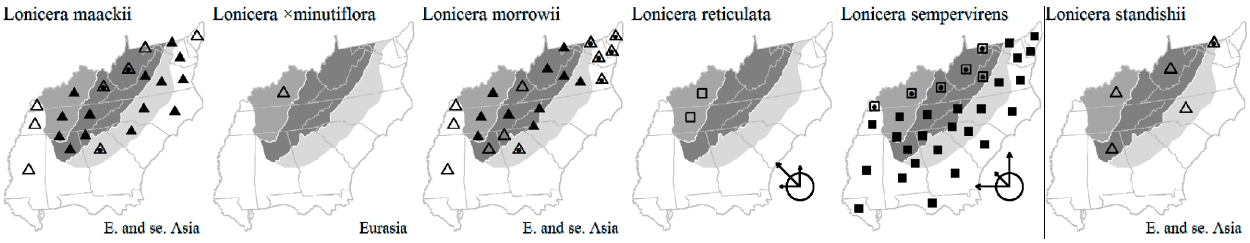
* *Lonicera ×minutiflora* Zabel [of complex hybrid origin, apparently involving *L. morrowii, L. tatarica,* and *L. xylosteum*]. Suburban areas, disturbed areas. Known from KY and other states in e. North America (Clark et al. 2005). [= K] {not yet keyed}

* ***Lonicera morrowii*** A. Gray, Morrow's Honeysuckle. Forests, woodlands, old house sites, suburban woodlands; native of Japan. April. Seriously invasive in WV, MD, DC, and northward; first reported for NC by Leonard (1971b) and for SC by Hill & Horn (1997). [= C, K, W, Y; = *L. morrowi* – F, G, WV, orthographic variant]

Lonicera reticulata Rafinesque. {habitats}. NY west to WI, south to TN and AR. In nc. TN (Davidson County) (Chester, Wofford, & Kral 1997; Wofford & Chester 2002). [= K; > *L. prolifera* (G. Kirchner) Booth ex Rehder var. *prolifera* – C, G; = *L. sullivantii* A. Gray – Y; = *L. prolifera* – F, Z]

Lonicera sempervirens Linnaeus, Coral Honeysuckle. Dry forests and woodlands, maritime forests. March-July (and sporadically to November); July-September. CT to OK, south to c. peninsular FL and TX; and more widely distributed as an escape from cultivation. Var. *hirsutula* has sometimes been maintained, differing from var. *sempervirens* in its ciliate leaf margins, pubescent upper leaf surfaces, sometimes glandular hypanthia and stems (vs. glabrous; it is doubtful that these distinctions are taxonomically meaningful. [= RAB, GW, W, WH, WV, Z; > *L. sempervirens* Linnaeus var. *sempervirens* – C, G, K, Y; > *L. sempervirens* Linnaeus var. *hirsutula* Rehder – C, F, G, K, Y; > *L. sempervirens* var. *sempervirens* – F; > *L. sempervirens* var. *minor* Aiton – F; = *Phenianthus sempervirens* (Linnaeus) Rafinesque – S]

* ***Lonicera standishii*** Jacques, Standish's Honeysuckle. Forests, woodlands, old home sites; native of China. Locally abundant and invasive in c. NC (Uwharrie National Forest, Montgomery County, NC). Also reported from KY (Jones 2005), se. PA (Rhoads & Klein 1993), and MD (Kartesz 1999). [= F, K, Y]



* ***Lonicera tatarica*** Linnaeus, Tartarian Honeysuckle. Disturbed forests; native of Central Asia. [= C, F, G, K, WV; > *L. tatarica* var. *tatarica* – Y]

* ***Lonicera xylosteum*** Linnaeus, European Fly-honeysuckle. Suburban forests, disturbed forests; native of Europe and Asia. Establishing mainly in ne. United States, south to VA, MD (Kartesz 1999), and KY (Clark et al. 2005). [= C, F, G, K; > *L. xylosteum* var. *xylosteum* – Y]

Symphoricarpos Duhamel 1755 (Snowberry, Coralberry)

A genus of about 17 species, shrubs, of North America and e. Asia. References: Jones (1940); Ferguson (1966a)=Z.

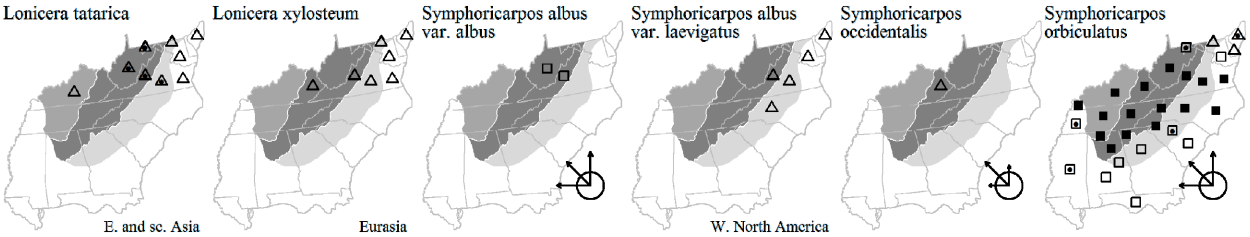
1 Corolla 2-4 mm long; fruits pink to purple ..... ***S. orbiculatus***
1 Corolla 5-9 mm long; fruits white.
  2 Fruit 6-10 (-12) mm in diameter; young twigs puberulent; leaves usually pubescent beneath; shrub usually < 1 m tall; [native] ..... ***S. albus* var. *albus***
  2 Fruit 12-20 mm in diameter; young twigs glabrous; leaves usually glabrous beneath; shrub usually 1-2 m tall; [introduced] ..... ***S. albus* var. *laevigatus***

Symphoricarpos albus (Linnaeus) Blake *var.* ***albus***, Common Snowberry. Limestone woodlands. QC west to s. AK, south to w. VA, WV, MI, MN, and CA; the original native distribution somewhat uncertain due to cultivation and escapes. Var. *albus* is the more eastern variety. [= C, F, G, K, Z; < *S. albus* – RAB, S, W, WV]

* ***Symphoricarpos albus*** (Linnaeus) Blake *var.* ***laevigatus*** (Fernald) Blake, Pacific Snowberry. Disturbed areas, sometimes in natural areas; native of w. North America. [= C, F, G, K, Z; < *S. albus* – RAB, S, W; *? S. rivularis* Suksdorf]

* *Symphoricarpos occidentalis* Hooker, Western Snowberry, Wolfberry. In PA, MD, KY. {investigate} [= F, K] {not yet keyed}

Symphoricarpos orbiculatus Moench, Coralberry. Moist to dry forests, woodlands, thickets, pastures, and old fields, especially over mafic or calcareous rocks. Late July-September; September-November (and often persisting well into winter). CT west to IN, MN, and CO, south to Panhandle FL, TX, and Mexico; the original native distribution somewhat uncertain due to cultivation and escapes. Seemingly increasing in VA and behaving aggressively in dry woodlands and barrens over greenstone and diabase. [= RAB, C, F, G, K, W, WH, WV, Z; = *S. symphoricarpos* (Linnaeus) MacM. – S]



Triosteum Linnaeus 1753 (Horse-gentian, Feverwort)

A genus of 6 species, rather woody herbs, of e. Asia (3 species) and e. North America (3 species); the 3 North American species form one clade, the 3 Asian species another (Gould & Donoghue 2000). References: Gould & Donoghue (2000); Ferguson (1966a)=Z.

1 Longer (nonglandular) hairs of the stem 1.5-3 mm long; corolla greenish-yellow; leaves 1.5-6 cm wide.
  2 Lower leaf surface glabrous or pubescent only along the main veins; leaves averaging 4× as long as wide ..... ***T. angustifolium* var. *angustifolium***
  2 Lower leaf surface densely puberulent; leaves averaging 2× as long as wide ..... ***T. angustifolium* var. *eamesii***
1 Longer (nonglandular) hairs of the stem 0-1.5 mm long (or with a very few longer hairs); leaves 4-15 cm wide; corolla greenish-yellow to purple.
  3 Most the stem hairs 1-2 mm long, mostly not gland-tipped; leaves predominantly not connate (or if 1-3 pairs connate, then only 1-2 cm wide at the joined base); style equaling or slightly shorter than the corolla (rarely exserted) ..... ***T. aurantiacum* var. *aurantiacum***
  3 Most the stem hairs 0-0.5 mm long (sometimes with a few scattered longer hairs), gland-tipped; leaves predominantly connate-perfoliate, the joined base 3-9 cm wide); style exserted beyond the corolla ..... ***T. perfoliatum***

Triosteum angustifolium Linnaeus *var.* ***angustifolium***, Smooth Lesser Horse-gentian. Cp (DE, Pd (DE), Mt (WV), {Pd (NC, VA), Mt (GA, VA), Cp (VA)}: distributional and habitat information needed for two varieties} (GA Rare). April-May; July-August. CT west to ON and MO, south to NC, nw. GA (Jones & Coile 1988), AL, and LA. [= C, F, G; < *T. angustifolium* – RAB, K, S, W, WV, Z]

Triosteum angustifolium Linnaeus *var.* ***eamesii*** Wiegand, Hairy Lesser Horse-gentian. {Pd (NC, VA), Mt (VA), WV?}: distributional and habitat information needed for two varieties}. April-May; July-August. CT and NJ south to NC. [= C, F, G; < *T. angustifolium* – RAB, K, S, W, Z]

Triosteum aurantiacum Bicknell *var.* ***aurantiacum***. Mt (GA?, NC, SC, VA, WV), Pd (DE, NC, VA): woodlands and forests in circumneutral soils, particularly those over mafic or calcareous rocks; uncommon (rare in DE, GA, and NC). Late May-early June; August-October. QC west to MN, south to GA, KY, and OK; other varieties are more restricted and midwestern or northern in distribution. [= C, F, K; < *T. aurantiacum* – RAB, S, W, WV, Z; < *T. perfoliatum* Linnaeus var. *aurantiacum* (Bicknell) Wiegand – G]

Triosteum perfoliatum Linnaeus, Perfoliate Horse-gentian. Mt (GA, NC, SC, VA, WV), Pd (DE, NC, SC, VA), Cp (DE, VA): woodlands and forests in circumneutral soils, particularly those over mafic or calcareous rocks; uncommon (rare in DE). Late May-early June; August-October. MA west to MN, south to n. SC, n. GA (Jones & Coile 1988), and OK. [= RAB, C, F, K, S, W, WV, Z; = *T. perfoliatum* var. *perfoliatum* – G]

406c. LINNAEACEAE (Rafinesque) A. Backlund 1998 (Twinflower Family) [in DIPSACALES]

A family of 5 genera and about 35 species, shrubs and suffrutescent herbs. Various segregate families (or reassignments) of taxa traditionally placed in the Caprifoliaceae have been proposed, including the transfer of *Sambucus* and *Viburnum* to the Adoxaceae, placement of *Diervilla* and *Weigela* in the Diervillaceae (Backlund & Pyck 1998), placement of *Abelia*, *Linnaea*, and *Kolkwitzia* in the Linnaeaceae (Backlund & Pyck 1998), and retention of *Lonicera, Symphoricarpos,* and *Triosteum* in a much more narrowly circumscribed Caprifoliaceae. Alternatively, all these taxa could be included in the Caprifoliaceae, along with Dipsacaceae and Valerianaceae, as a very broadly circumscribed Caprifoliaceae. References: Backlund & Pyck (1998).

1 Trailing shrubby herb; [native] ..... ***Linnaea***
1 Upright shrub; [planted and persistent or weakly naturalizing].
  2 Sepals oblanceolate, the larger > 1 mm wide; fruit and ovaries free, not hirsute ..... ***Abelia***
  2 Sepals lanceolate to linear, < 1 mm wide; fruit and ovaries fused in pairs, densely hirsute ..... ***Kolkwitzia***

Abelia R. Brown, Abelia

A genus of about 30 species, shrubs, primarily of s. and e. Asia.

* ***Abelia ×grandiflora*** (André) Rehder [***chinensis* × *uniflora***], Abelia. Cp (AL, FL, NC): suburban thickets; commonly planted in our area; sometimes persistent or rarely weakly naturalizing, the parent species native of China. Reported for AL (Diamond & Woods 2009). [= K, WH]

Kolkwitzia Graebner (Beautybush)

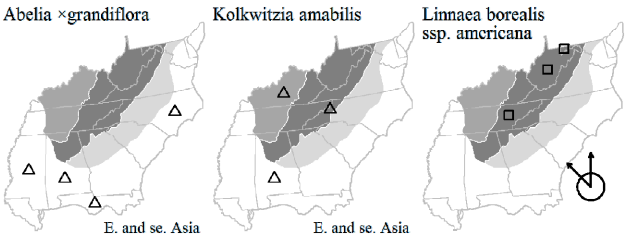
A monotypic genus, a shrub, of c. China.

* ***Kolkwitzia amabilis***, Beautybush. Mt (NC) {KY}: disturbed areas; planted as an ornamental shrub, rarely naturalized from plantings, native of c. China. [= K]

Linnaea Linnaeus (Twinflower)

A monotypic genus, a trailing weak shrub, circumboreal.

Linnaea borealis Linnaeus *ssp.* ***americana*** (Forbes) Hultén ex Clausen, American Twinflower. Mt (MD, TN, WV): northern hardwoods; rare. Greenland, NL (Labrador), and AK south to WV, IN, IL, IA, NM, AZ, and CA; disjunct in e. TN. *L. borealis* is documented by an early specimen (1892) from Sevier County, TN, presumably from the Great Smoky Mountains; the TN population (not seen since) is disjunct from e. WV and w. MD. [= K; = *L. borealis* var. *longiflora* Torrey – C, G; = *L. borealis* var. *americana* (Forbes) Rehder – F; < *L. borealis* – W; = *L. americana* Forbes; = *L. borealis* ssp. *longiflora* (Torrey) Hultén]



406d. DIPSACACEAE A.L. de Jussieu 1789 (Teasel Family) [in DIPSACALES]

A family of about 11 genera and 300 species, herbs and shrubs, of Eurasia and Africa.

1 Stem prickly ..... ***Dipsacus***
1 Stem not prickly ..... ***Knautia***

Dipsacus Linnaeus (Teasel)

A genus of about 15 species, herbs, of Eurasia. *Dipsacus* begins flowering about halfway up the head, the flowers then opening sequentially toward both the base and the tip of the inflorescence. References: Ferguson (1965)=Z; Ferguson & Brizicky (1965); Stace (2010).

1 Principal cauline leaves laciniate-pinnatifid, cut at least halfway to the midrib; stems to 3 (-4) m tall ..... ***D. laciniatus***
1 Principal cauline leaves entire or toothed; stems to 2 (-3) m tall.
2 Bracts on the receptacle with straight apical spines, these stiff but flexible; bracts of the involucre curved upward ..... ***D. fullonum***
2 Bracts on the receptacle with recurved apical spines, these rigid; bracts of the involucre spreading more or less horizontally..... ***D. sativus***

* ***Dipsacus fullonum*** Linnaeus, Wild Teasel, Common Teasel. Mt (GA, NC, VA, WV), Pd (VA), Cp (DE, VA): roadsides, pastures, disturbed areas; common (rare in DE and NC, rare in VA Coastal Plain), native of Europe. July-September; September-October. Recently discovered for GA in Floyd County (T. Govus, pers. comm. 2009). The inflorescences are frequently collected for crafts and dried arrangements. [= K, W, Z; = *D. sylvestris* Hudson – RAB, C, F, G, S, WV; = *D. fullonum* ssp. *sylvestris* (Hudson) Clapham]

* ***Dipsacus laciniatus*** Linnaeus, Cutleaf Teasel. Mt (VA, WV), Pd (VA): disturbed areas; uncommon, native of Europe. July-September; September-October. [= C, F, G, K, WV, Z]

* ***Dipsacus sativus*** (Linnaeus) Honckeny, Fuller's Teasel. Mt (VA): disturbed areas; rare, native of Europe. July-September; September-October. I am here following Ferguson (1965), Ferguson & Brizicky (1965), and Stace (2010) in their determination that *D. sativus* is the correct name to apply to this plant. The occurrence of this species in our area is implied in various sources; I have not seen specimens. The dried inflorescences were used in the past for fulling cloth (raising the nap). [= K, Z; = *D. fullonum* – C, F, G, misapplied]

Knautia Linnaeus

A genus of about 60 species, herbs, of Europe, w. Asia, and n. Africa.

* ***Knautia arvensis*** (Linnaeus) Coulter, Blue Buttons. Mt (WV): dry areas, pastures, other disturbed areas; rare, native of Europe. June-September. Naturalized south at least to s. PA (Rhoads & Klein 1993), MD (Kartesz 1999), and WV (Harmon, Ford-Werntz, & Grafton 2006). [= C, F, G, K; = *Scabiosa arvensis* Linnaeus]

406e. VALERIANACEAE Batsch 1802 (Valerian Family) [in DIPSACALES]

A family of about 10 genera and 300-350 species, herbs (rarely shrubs), nearly cosmopolitan in distribution. References: Bell (2004); Ferguson (1965).

1 Stem leaves divided into 3-21 segments ..... ***Valeriana***
1 Stem leaves simple ..... ***Valerianella***

Valeriana Linnaeus 1753 (Valerian)

A genus of about 200 species, herbs and shrubs, of temperate North America and Eurasia, s. Africa, and Andean South America.

1 Corolla tube 12-16 mm long; stem leaves pinnately divided into 3-7 segments; [native, of VA and TN northward]..... ***V. pauciflora***
1 Corolla tube 1.5-4 mm long; stem leaves divided **either** into 3 segments **or** into 11-21 segments.
2 Upright perennial herb; stem leaves divided into 11-21 segments; corolla tube 3-4 mm long; [alien, grown as an ornamental and casually escaped]..... ***V. officinalis***
2 Scandent vine; stem leaves divided into 3 segments; corolla tube 1.5-2 mm long; [native, of FL]..... ***V. scandens***

* ***Valeriana officinalis*** Linnaeus, Garden-heliotrope. Mt (WV): cultivated and rarely escaped; rare, native of Europe. Sometimes cultivated in our area; it may escape or persist. May-August. [= C, F, G, K]

Valeriana pauciflora Michaux, Pink Valerian, Long-tube Valerian. Pd (VA, WV): very nutrient-rich alluvium in floodplain forests; uncommon (rare in VA). May; June. MD, se. PA, and sw. PA, west to s. IL, south to n. VA, sc. TN, KY, and MO. [= C, F, G, K, W, WV]

Valeriana scandens Linnaeus, Florida Valerian. Cp (FL): floodplain forests, hammocks; rare. Ne. FL south to c. peninsular FL. [= K, S, WH]

Valerianella P. Miller 1754 (Corn-salad)

A genus of about 50 species, herbs, of temperate North America, Eurasia, and n. Africa. References: Ware (1983)=Z.

Identification notes: *Valerianella* species exhibit an interesting set of fruit polymorphisms; the fruit forms in a single species are often strikingly different, and these forms were traditionally regarded as separate taxa. Ware (1983) demonstrated that they were under simple genetic control,

and that different fruit forms were found in the same population. Thus, some taxa previously considered distinct are best considered mere fruit types. The fruit consists of three locules, one of which is fertile and dorsal to or more-or-less flanked by the two sterile locules. The sterile locules may be elongate, forming (between them) a groove, or they may be expanded laterally well beyond the width of the fertile locule into flattened or bulbous wings. In *V. locusta*, there is additionally a corky mass on the side of the fertile locule opposite the two sterile locules.

1 Fruit greatly thickened by a corky mass on the back of the fertile locule; corolla pale blue (or white).....***V. locusta***
1 Fruit lacking a corky mass on the back of the fertile locule; corolla white.
2 Fertile locule much wider than the combined width of the 2 sterile locules; fruit sharply triangular in ×-section ..... ***V. chenopodiifolia***
2 Fertile locule slightly wider or narrower than the combined width of the 2 sterile locules; fruit not sharply triangular in ×-section.
3 Corolla 1.5-2 mm long, the corolla lobes 0.4-0.8 mm long.....***V. radiata***
3 Corolla 3-5 mm long, the corolla lobes 1-2 mm long.....***V. umbilicata***

Valerianella chenopodiifolia (Pursh) A.P. de Candolle. Mt (VA, WV): moist forests, bottomlands; common (rare in VA). S. ON west to WI, south to MD, PA, WV, sw. VA, IN, and IL. [= K; = *V. chenopodifolia* – C, F, G, WV, orthographic variant]

* ***Valerianella locusta*** (Linnaeus) Laterrade, European Corn-salad. Pd (DE, GA, NC, SC, VA), Cp (DE, NC, VA), Mt (GA, NC, VA): roadsides, moist forests, bottomlands, disturbed areas; common (uncommon in DE), native of Europe. April-May. [= RAB, C, K, S, WV, Z; = *V. olitoria* (Linnaeus) Pollich – F, G]

Valerianella radiata (Linnaeus) Dufresne. Cp (DE, FL, GA, NC, SC, VA), Pd (GA, NC, SC, VA), Mt (GA, NC, SC, VA, WV): moist forests, bottomlands, disturbed areas; common (rare in WV). April-May. VA, s. IL, and KS, south to n. FL, Panhandle FL, and TX. [= RAB, C, K, S, WH, WV, Z; > *V. radiata* var. *fernaldii* Dyal – F, G; > *V. radiata* var. *radiata* – F, G]

Valerianella umbilicata (Sullivant) Wood. Pd (NC, VA), Mt (NC, VA, WV), Cp (VA), {SC?}: moist forests, bottomlands, disturbed areas; rare. S. NY west to IL, south to NC and sc. TN (Chester, Wofford, & Kral 1997). Ware (1983) raises the question of whether *V. woodsiana* is a distinct taxon; further study is needed. [= Z; < *V. umbilicata* – RAB, C, WV; > *V. umbilicata* – F, G; > *V. patellaria* (Sullivant ex A. Gray) Wood – F, S; > *V. intermedia* Dyal – F; > *V. radiata* var. *intermedia* (Dyal) Gleason – G]

* ***Valerianella dentata*** (Linnaeus) Pollich. Reported as naturalized in central TN by Kral (1981) and Chester et al. (1997), in nc. GA (Jones & Coile 1988), and in AL (Kartesz 1999). [= K] {not yet keyed; synonymy incomplete}

Valerianella woodsiana (Torrey & A. Gray) Walpers. Cp (NC, SC, VA), Pd (SC): bottomlands; rare. {distribution} [= K, S, Z;] {not yet keyed; add to synonymy}

410. PITTOSPORACEAE R. Brown 1814 (Pittosporum Family) [in APIALES]

A family of about 9-11 genera and 150-200 species, trees, shrubs, and vines, of tropical and warm temperate Old World. References: Judd (1996).

Pittosporum Banks ex Solander (Pittosporum)

A genus of about 100-150 species, trees and shrubs, of tropical and warm temperate Old World. References: Judd (1996)=Z.

* ***Pittosporum tobira*** (Thunberg) Aiton f., Japanese Pittosporum, Australian Laurel. Cp (FL, GA?, NC, SC?): frequently planted on barrier islands, at least persisting and apparently naturalizing; rare, native of Japan and China. Various cultivars are seen, including ones with variegated leaves. This species is one of the more common landscaping plants used on developed barrier islands. The revolute, obovate leaves are characteristic. [= K, WH, Z]

411. ARALIACEAE A.L. de Jussieu 1789 (Ginseng Family) [in APIALES]

A family of about 47 genera and 1325 species, trees, shrubs, vines, and rarely herbs, mainly tropical in distribution. *Hydrocotyle* is more closely related to Araliaceae than to Apiaceae, and is transferred here (Chandler & Plunkett 2003). References: Frodin & Govaerts (2003); Graham (1966); Smith (1944).

1 Plant a woody vine; [tribe *Schefflereae*].....***Hedera***
1 Plant an herb, shrub, or tree.
2 Leaves simple, peltate or cordate, roundish (if lobed, with 3-5 rounded lobes), 0.3-10 cm wide; rhizomatous, creeping herbs....***Hydrocotyle***
2 Leaves **either** compound with 3-many leaflets **or** simple and then with 5-7 pointed lobes (*Kalopanax*), > 10 cm wide; herbs, shrubs, or trees; [tribe *Aralieae*].
3 Leaves simple, palmately-lobed.
4 Leaves 5-7-lobed; tree ..... ***[Kalopanax]***
4 Leaves >9-lobed (some of the lobes themselves sublobed); robust herb to shrub ..... ***Tetrapanax***
3 Leaves compound
5 Leaves 2-3× compound, at least the final order of division pinnate; leaves either 1 from a subterranean stem or 2-many, alternate on an aboveground stem; inflorescence compound, consisting of (2-) 3-many umbels, either on a separate peduncle from the rhizome or in a terminal panicle or raceme; fruit purple or black.....***Aralia***
5 Leaves 1× palmately compound, leaflets 3-7; leaves 3-5 in a whorl at the summit of the stem (*Panax*) or many, clustered on spur shoots (*Eleutherococcus*); inflorescence of a single, simple umbel borne terminally on the stem; fruit red to yellow (*Panax*) or black (*Eleutherococcus*).

6 Plant a shrub, with prickles; fruit black ..... ***[Eleutherococcus]***
6 Plant an herb, lacking prickles; fruit red or yellow..... ***Panax***

Aralia Linnaeus 1753 (Aralia)

A genus of about 30-70 species, herbs, shrubs, vines, and trees, primarily of e. North America, e. Asia, and se. Asia. Wen (1998) has suggested that *A. nudicaulis* may need to be removed from the genus *Aralia* in order to maintain both *Aralia* and *Panax* as monophyletic genera. References: Smith (1982)=Z; Moore, Glenn, & Ma (2009)=V; Wen et al. (1998); Wen (1993); Wen (1998); Smith (1944)=Y; Frodin & Govaerts (2003)=X.

1 Plant a shrub or small tree, 3-6 (-10) m tall, definitely woody; stem armed throughout with prickles, those on the stem stout, broad-based, and distributed to the summit of the stem; leaves usually armed with prickles on the axes and the main veins; [section *Dimorphanthus*]
2 Main lateral veins running all the way to the teeth; inflorescence 3-6 dm long, often broader than long, lacking a well-developed main axis; petiolules 0-1 (-6) mm long; dry fruit 3.0-3.5 mm long; [alien spreading southward from ne. United States] ..... ***A. elata***
2 Main lateral veins running branching repeatedly and getting smaller before reaching the teeth; inflorescence 4-12 dm long, usually longer than broad, with a well-developed central axis; petiolules 1-7 mm long; dry fruit 4.0-5.0 mm long; [widespread native] ..... ***A. spinosa***
1 Plant an acaulescent herb or stout, suffruticose herb, not at all to somewhat woody at the base; stem unarmed (or in *A. hispida* bristly with thin prickles on the lower stem only); leaves unarmed.
3 Plant an acaulescent herb, the solitary leaf and scapose inflorescence arising from a subterranean rhizome; inflorescence a raceme of (2-) 3 (-7) umbels; [section *Nanae*] ..... ***A. nudicaulis***
3 Plant a caulescent herb, the leaves several and alternate, the inflorescence terminal on the leafy stem; inflorescence a raceme or panicle of (2-) 5-many umbels.
4 Stem bristly toward its base; inflorescence a raceme or weak panicle of (2-) 5-25 umbels; [section *Hispidae*] ..... ***A. hispida***
4 Stem unarmed; inflorescence a compound panicle of 15-many umbels; [section *Aralia*]..... ***A. racemosa***

* ***Aralia elata*** (Miquel) Seemann, Japanese Angelica-tree. Pd (DE): suburban woodlands; uncommon. Naturalizing in ne. North America at least as far south as NJ, DE, se. PA, and DC (likely to be present in MD). See Moore, Glenn, & Ma (2009) for detailed information on this alien species and its naturalization in the northeastern United States. [= K, V]

Aralia hispida Ventenat, Bristly Sarsaparilla. Mt (NC?, VA, WV,): rocky woodlands, cliffs, and clearings, primarily over acidic rocks (such as quartzite, granite, and sandstone); rare. June-August. NL (Labrador) and NL (Newfoundland) west to MB, south to w. VA, w. NC (?), WV, OH, IN, IL, and MN. This species appears to be strongly dependent on disturbance, such as fire, appearing in great numbers following fire where previously rare or apparently absent. F and Y credit this species to w. NC; the documentation is not known to me, and the species was not treated by RAB. Doug Rayner (pers. com. 2002) reports a site record of it in Polk County, NC. [= C, F, G, K, S, W, X, Y, Z]

Aralia nudicaulis Linnaeus, Wild Sarsaparilla. Mt (GA, NC, SC, VA, WV), Pd (DE, NC, VA), Cp (DE, VA): upland forests and woodlands, rocky places, most typically in rather dry places, such as ridgetop forests; common (uncommon in Piedmont south of DE, rare in Coastal Plain south of DE, rare in GA). May-July. NL (Labrador) and NL (Newfoundland) west to BC, south to e. VA, c. NC, ne. GA, w. TN, IL, MO, NE, CO, and ID. [= RAB, C, F, G, K, S, W, X, Y, Z]

Aralia racemosa Linnaeus, Spikenard, Hungry-root. Mt (GA, NC, SC, VA, WV), Pd (DE, NC, VA), Cp (DE, VA): rich woodlands, trail margins and roadsides; uncommon (rare in Coastal Plain, locally common in Mountains of far sw. VA). June-August. NB and QC west to MN and SD, south to NC, n. GA, AL, MS, MO, and e. KS. The related *A. bicrenata* Wooton & Standley (sometimes treated as a subspecies of *A. racemosa*) occurs in AZ, NM, TX, and n. Mexico. [= RAB, C, F, G, S, W, X, Y, Z; = *A. racemosa* ssp. *racemosa* – K]

Aralia spinosa Linnaeus, Devil's-walking-stick, Hercules's-club, Prickly-ash. Cp (DE, FL, GA, NC, SC, VA), Pd (GA, NC, SC, VA), Mt (GA, NC, SC, VA, WV): disturbed pocosins and bottomlands, disturbed areas, moist to dry forests and woodlands; common. June-September. NJ west to s. IN, IL, and IA, south to c. peninsular FL and e. TX. Smith (1982) discusses the juvenile (prickly) and adult (unarmed) leaf phases of *A. spinosa*. [= RAB, C, F, G, GW, K, S, V, W, WH, X, Y, Z]

Eleutherococcus Maximowicz 1859 (Fiveleaf Aralia)

A genus of about 38 species, shrubs, of e. Asia. References: Frodin & Govaerts (2003)=Z.

* ***Eleutherococcus sieboldianus*** (Makino) Koidz., Fiveleaf Aralia. Mt (WV): disturbed areas; rare, native to e. Asia. Reported as introduced and apparently naturalized in Randolph County, WV, scattered locations in PA (Rhoads & Klein 1993), OH, and n. KY (Clark et al. 2005). [= Z; < *Eleutherococcus pentaphyllus* (Siebold & Zuccarini) Nakai – K, misapplied; = *Acanthopanax sieboldianus* Makino]

Hedera Linnaeus 1753 (Ivy)

A genus of 5-15 species, vines, distributed from Mediterranean Europe west to e. Asia. References: Graham (1966)=Y; Stace (2010)=Z; Staff of the Bailey Hortorium (1976)=X; Ackerfield & Wen (2002)=Q; Frodin & Govaerts (2003)=V.

Identification notes: The leaves of *Hedera* are dimorphic, sometimes confusing observers; "juvenile" leaves (those of the sterile branches) are about as wide as long and (in *H. helix*) palmately 3-5-lobed, those of the fertile branches (less commonly seen) are obovate or elliptic.

1 Trichomes scale-like, 0.1-0.4 mm, those on the leaves, petioles, and young stems with rays fused basally for 1/4 to 1/2 their length; juvenile leaves orbicular, little or not at all lobed, the larger 15-25 cm wide ..... ***H. colchica***
1 Trichomes stellate, 0.5-1.0 mm, those on the leaves, petioles, and young stems with rays fused basally for < 1/8 their length; juvenile leaves slightly to deeply lobed, the larger 5-15 cm wide.
2 Hairs of young stems, leaves, and petioles whitish, the rays erect (at a right angle to the leaf surface); juvenile leaves usually < 8 cm wide, usually dark green and often also marbled with white, often lobed > ½ the way to the base; [often strongly climbing] ..... ***H. helix*** *var.* ***helix***
2 Hairs of young stems, leaves, and petioles yellowish-brown to rusty-brown, the rays not erect (parallel to the leaf surface); juvenile leaves often > 8 cm wide, usually medium green (rarely also marbled with white), usually lobed < ½ the way to the base; [usually not climbing] .. .. ***H. hibernica***

* ***Hedera colchica*** (K. Koch) K. Koch, Persian Ivy. Pd (NC), Cp (SC): persistent after cultivation, perhaps not naturalized; rare, native of the Caucasus. [= K, Q, V, X, Z]

* ***Hedera helix*** Linnaeus *var.* ***helix***, Common Ivy, English Ivy. Cp (DE, FL, GA, NC, SC, VA), Pd (DE, GA, NC, SC, VA), Mt (GA, NC, SC, VA, WV): persistent, established, and spreading around old home sites, in suburban woodlands and waste areas; uncommon (rare in FL), native of Europe. June-July. Var. *helix* is diploid, n = 24. Hundreds of cultivars, varying greatly in habit and leaf size, lobing, and marbling are grown; see for instance, Staff of the Bailey Hortorium (1976) for a partial listing and brief descriptions. [= X, Y; < *H. helix* – RAB, C, F, G, K, S, W, WH; = *H. helix* ssp. *helix* – Q, V, Z]

* ***Hedera hibernica*** (G. Kirchner) Carrière, Atlantic Ivy, Irish Ivy. Pd (NC, SC): persistent, established , and spreading around old home sites, in suburban woodlands and waste areas; uncommon, native of Europe. June-July. Var. *hibernica* is tetraploid, n = 48. [= Q, V; = *H. helix* Linnaeus var. *hibernica* G. Kirchner – X, Y; < *H. helix* – RAB, C, F, G, K, S, W; = *H. helix* ssp. *hibernica* (G. Kirchner) D. McClint. – Z]

Hydrocotyle Linnaeus 1753 (Water-pennywort)

A genus of about 130 species, herbs, cosmopolitan (especially Australia). Molecular analyses have clarified that the affinities of *Hydrocotyle* lie with the Araliaceae rather than the Apiaceae (Downie et al. 1998; Chandler & Plunkett 2004). References: Mathiuas & Constance (1945)=MC.

1 Leaves peltate, lacking a sinus extending to the attachment of the petiole.
2 Inflorescence umbellate; leaves 1-4 (-7) cm wide ..... ***H. umbellata***
2 Inflorescence verticillate or umbellate-verticillate (when first developing sometimes appearing merely umbellate); leaves 1-15 cm wide.
3 Inflorescence compound, the main inflorescence axis with nodes which produce verticels or umbels of pedicellate flowers, the inflorescence nodes also producing branches which themselves produce verticels or umbels of flowers; leaves (1-) 4-15 cm wide .... ***H. bonariensis***
3 Inflorescence verticillate, all the flowers borne sessile or on pedicels on the unbranched inflorescence axis; leaves 1-6 cm wide.
4 Flowers and fruits pedicellate, the pedicels 1-10 mm long ..... ***H. prolifera***
4 Flowers and fruits sessile or subsessile ..... ***H. verticillata***
1 Leaves not peltate, a sinus extending to the attachment of the petiole.
5 Central leaf lobe notably more distinct than the other lobes (the sinuses on either side extending 1/3 to 3/4 of the way to the petiolar attachment); stems and petioles fleshy ..... ***H. ranunculoides***
5 Central leaf lobe not more distinct than the other lobes (the sinuses on either side extending 1/10 to 1/4 the way to the petiolar attachment); stems and petioles filiform.
6 Fruiting umbels on peduncles 1-3 mm long; leaves 10-50 mm wide; [native of bogs, spray cliffs, and other wetlands] ..... ***H. americana***
6 Fruiting umbels on peduncles 9-24 mm long; leaves 5-30 mm wide; [alien of lawns and other disturbed habitats].
7 Leaves 5-lobed, 15-30 mm wide ..... ***H. bowlesioides***
7 Leaves 7-lobed, 5-13 mm wide ..... ***H. sibthorpioides***

Hydrocotyle americana Linnaeus, American Water-pennywort. Mt (NC, VA, WV), Pd (DE, VA), Cp (DE): bogs, marshes, seepages, cliffs and ledges where wet by seepage or spray from waterfalls, sometimes roadside ditches; uncommon (rare in NC). June-September. Widespread in ne. North America, south to w. NC, SC, e. and c. TN, and IN. [= RAB, C, F, G, GW, K, MC, S, W, WV]

Hydrocotyle bonariensis Lamarck, Dune Water-pennywort. Cp (FL, GA, NC, SC, VA): beaches, dunes, and moist sandy areas; uncommon (rare in VA). April-September. Widespread in South and Central America, north in North America to the Southeastern Coastal Plain, se. VA to s. FL and TX. [= RAB, GW, K, MC, S, WH]

* ***Hydrocotyle bowlesioides*** Mathias & Constance. Cp (FL, GA): lawns; rare, native of Costa Rica and Panama (naturalized in South America, se. United States, and New Zealand). See Anderson (1983) for discussion of the species' occurrence in Thomasville, Thomas Co. GA. Reported for Panhandle FL (Wunderlin & Hansen 2008). [= K, MC; = *H. sibthorpioides* Lamarck var. *oedipoda* O. Degener & Greenwood]

Hydrocotyle prolifera Kellogg. Cp (DE, FL, GA, NC, SC, VA): swamp forests, pools; uncommon. May-July. Widespread in North, Central, and South America. [= K; = *H. verticillata* Thunberg var. *triradiata* (A. Richard) Fernald – RAB, C, G, GW, MC, WH; < *H. verticillata* var. *verticillata* – F; > *H. australis* Coulter & Rose – S; > *H. canbyi* Coulter & Rose – S]

Hydrocotyle ranunculoides Linnaeus f., Swamp Water-pennywort. Cp (DE, FL, GA, NC, SC, VA), Pd (DE, VA), Mt (VA, WV): stagnant to (less commonly) swiftly flowing waters of swamps pools, backwaters, blackwater streams; common (rare in WV). April-July. Widespread in North, Central, and South America. [= RAB, C, F, G, GW, K, MC, S, W, WH, WV]

* ***Hydrocotyle sibthorpioides*** Lamarck, Lawn Water-pennywort. Pd (DE, GA, NC, VA), Cp (DE, FL, GA, NC, VA), Mt (WV): lawns, pond margins; uncommon (rare in FL and WV, rare in VA Piedmont, rare in DE), native of Asia and Africa. March-September. Apparently becoming more common as a lawn weed. [= RAB, C, F, G, K, MC, WH, WV]

Hydrocotyle umbellata Linnaeus, Marsh Water-pennywort. Cp (DE, FL, GA, NC, SC, VA), Pd (GA, NC, SC, VA): moist areas; common (rare in lower Piedmont only). April-September. Widespread in North, Central, and South America. [= RAB, C, F, G, GW, K, MC, S, WH]

Hydrocotyle verticillata Thunberg. Cp (DE, FL, GA, NC, SC, VA), Pd (GA, SC): swamp forests, pools; uncommon. May-July. Widespread in North, Central, and South America. [= S; = *H. verticillata* var. *verticillata* – RAB, C, G, GW, K, MC, WH; < *H. verticillata* var. *verticillata* – F]

Kalopanax Miquel 1863 (Castor Aralia)

A monotypic genus, a medium-sized trees, of e. Asia. References: Frodin & Govaerts (2003)=Z.

* *Kalopanax septemlobus* (Thunberg ex A. Murray) Koidzumi, Castor Aralia. Introduced in ne. United States, apparently naturalizing in s. MD and n. VA (Fort Belvoir, Fairfax County) (E. Wells, pers. comm., 2006). [= K; > *K. septemlobus* ssp. *lutchuensis* (Nakai) H. Ohashi – Z; > *K. septemlobus* ssp. *septemlobus* – Z; = *Kalopanax pictus* (Thunberg) Nakai]

Panax Linnaeus 1753 (Ginseng)

Panax is a genus of ca. 14 species, herbs, 12 of e. Asia and 2 of e. North America. Wen & Zimmer (1996) and Choi & Wen (2000) studied the phylogeny of *Panax* using molecular techniques. *P. trifolius* does not appear to be closely related to any of the other species, and is interpreted as a basal component of the genus. *P. quinquefolius* is most closely related to *P. ginseng* C.A. Meyer and *P. japonicus* C.A. Meyer. References: Smith (1944)=Z; Frodin & Govaerts (2003)=Y; Wen & Zimmer (1996); Choi & Wen (2000).

1 Leaflets (3-) 5, petiolulate, the petiolules (0.7-) 1-2.5 cm long; larger leaflets 6-15 cm long, 3.5-7 cm wide, mostly about 2× as long as wide, the apex acuminate; fruit bright red when ripe ..... ***P. quinquefolius***
1 Leaflets 3 (-5), sessile or subsessile; larger leaflets 4-8 cm long, 0.5-2.5 cm wide, mostly about 3× as long as wide, the apex obtuse to acute; fruit yellow-green when ripe ..... ***P. trifolius***

Panax quinquefolius Linnaeus, Ginseng, Sang, American Ginseng. Mt (GA, NC, SC, VA, WV), Pd (DE, GA, NC, SC, VA), Cp (DE, GA, NC, VA): cove forests, mesic hardwood forests, generally in nutrient-rich forests though tending to avoid the richest coves; uncommon (rare in DE). May-June; August-October. QC west to MN and SD, south to e. VA, e. NC, nc. SC, GA, c. AL, LA, and OK. *P. quinquefolius* is gathered in quantity throughout its range for the herbal trade; most of the North American harvest is shipped to China, where it is prized for medicinal uses. Dried roots command prices in excess of $1000 per kilogram; in our area, "sang" is a multimillion dollar industry. Formerly abundant and occurring in large populations, *P. quinquefolius* has been reduced in most of its range to small populations of scattered individuals, a classic example of a "predator-prey" relationship. Collection and trade in ginseng is monitored and regulated in most states. In NC, it is illegal for ginseng dealers to buy ginseng from collectors before September; this allows the plants to mature fruits prior to collection. Schlessman (1985) discusses the floral biology of *P. quinquefolius*. [= F, K, W, WV, Y, Z; = *P. quinquefolium* – RAB, C, G, S, orthographic variant]

Panax trifolius Linnaeus, Dwarf Ginseng. Mt (GA, NC, VA), Pd (DE, NC, VA), Cp (DE, VA): cove forests, bottomland forests, other nutrient-rich forests; uncommon (rare south of VA). April-June; August-October. NS and QC west to MN, south to PA, e. VA, c. NC, nc. GA, ec. TN, IN, and IA. [= F, K, W, WV, Y, Z; = *P. trifolium* – RAB, C, G, S, orthographic variant]

Tetrapanax (K. Koch) K. Koch 1859 (Ricepaper-plant)

A monotypic genus, a robust herb or shrub, of China.

* ***Tetrapanax papyriferus*** (Hooker) K. Koch, Ricepaper-plant. Cp (FL): disturbed forests; rare, native of Asia. [= K, WH]

413. APIACEAE Lindley 1836 or ***UMBELLIFERAE*** A.L. de Jussieu 1789 (Carrot Family) [in APIALES]

A family of about 445 genera and about 3540 species of herbs (rarely shrubs or trees), cosmopolitan, but especially north temperate. *Hydrocotyle* is more closely related to Araliaceae, and has been transferred there (Chandler & Plunkett 2004). References: Mathias & Constance (1945)=MC. [also see *ARALIACEAE*]

[only a small fragment of the key to genera complete at this time]

1 Fruits (partly to fully mature) with thin-edged wings; flowers yellow, maroon, or white; central flower of each umbellet staminate and pedicelled; fruits all pedicelled in all umbellets..... ***Thaspium***

1 Fruits ribbed (with rounded, cordlike ribs), lacking thin-edged wings; flowers yellow; central flower of each umbellet either staminate and pedicelled, or pistillate and sessile; fruits all pedicelled in some umbellets (those with a staminate central flower), or the central fruit sessile in some umbellets (those with a pistillate central flower) ..... ***Zizia***

Aegopodium Linnaeus 1753 (Goutweed)

A genus of 5-7 species, perennial herbs, of temperate Eurasia. References: Mathias & Constance (1945)=MC.

* ***Aegopodium podograria*** Linnaeus, Goutweed. Mt (GA, NC, VA, WV), Pd (DE, GA, NC, VA), Cp (DE, SC, VA): disturbed areas; rare, native of Europe. The cultivated forms encountered in our area are usually those with white-margined or variegated leaves. [= C, F, K, MC; > *A. podograria* var. *podograria* – RAB, G; > *A. podograria* var. *variegatum* L.H. Bailey – RAB, G]

Aethusa Linnaeus 1753

A monotypic genus, an annual herb, of Europe, n. Africa, and w. Asia. References: Sell & Murrell (2009)=Z; Mathias & Constance (1945)=MC.

* ***Aethusa cynapium*** Linnaeus, Fool's-parsley. Cp (DE), Pd (DE), Mt (WV): disturbed areas; uncommon, native of Eurasia. Introduced and naturalized in ne. United States, at least as far south as se. PA (Rhoads & Klein 1993), DE, and Pocahontas County, WV. In Europe, several subspecies are often recognized; it is not known how these entities relate to material naturalized in North America and for now we treat the species broadly. [= C, F, G, K, MC, WV; > *A. cynapium* ssp. *agrestis* (Wallr.) Dostál – Z; > *A. cynapium* ssp. *cynapium* – Z; > *A. cynapium* ssp. *gigantea* (Lejeune) P.D. Sell; > *A. cynapium* ssp. *cynapioides* (M. Bieb.) Arcangeli – Z]

Ammi Linnaeus 1753 (Bishop's-weed)

A genus of about 4-10 species, annual or biennial herbs, distributed in Mediterranean Europe. References: Mathias & Constance (1945)=MC.

1 Lower leaves with elliptic to narrowly elliptic segments; fruits 1.5-2 mm long; rays 15-60, not rigid and thickened at maturity; bracts not strongly reflexed in fruit ..... ***A. majus***
1 Lower leaves with filiform segments; fruits 2-2.8 mm long; rays up to 150, rigid and thickened at maturity; bracts strongly reflexed in fruit .... ***A. visnaga***

* ***Ammi majus*** Linnaeus, Bullwort. Cp (FL, GA, SC): disturbed areas; rare, native of Mediterranean Europe. June. [= RAB, K, MC, S, WH]

* ***Ammi visnaga*** (Linnaeus) Lamarck, Toothpick-plant. Cp (FL, NC): dry sandy roadsides, disturbed areas; rare, native of Mediterranean Europe. May-June. [= RAB, K, MC, S, WH]

Ammoselinum Torrey & A. Gray 1855 (Sand-parsley)

A genus of 3 species, herbs, of sc. and sw. North America and temperate s. South America. References: Mathias & Constance (1945)=MC.

1 Umbels sessile; fruit glabrous (or slightly roughened) ..... ***A. butleri***
1 Umbels pedunculate; fruit roughened with well-developed teeth ..... ***A. popei***

* ***Ammoselinum butleri*** (Engelmann ex S. Watson) Coulter & Rose, Butler's Sand-Parsley. Pd (NC): lawns, disturbed places; rare, native of sc. United States (MO and se. KS south through AR and OK to LA and TX). March-April. Boufford (1977) reports the naturalization of this diminutive midwestern umbel on a grassy, weed-covered slope in NC, and since reported from additional southeastern states, including MS (Bryson 1991) and AL (Keener 2007). [= GW, K, MC]

Ammoselinum popei Torrey & A. Gray, Pope's Sand-parsley. Ip (TN): limestone barrens; rare. KS, OK, TX, and NM south to ne. Mexico (Nuevo Léon); disjunct and apparently native in the Nashville Basin of c. TN. [= K, MC]

Anethum Linnaeus 1753 (Dill)

A monotypic genus, an annual herb, apparently native to sw. Asia. References: Mathias & Constance (1945)=MC.

* ***Anethum graveolens*** Linnaeus, Dill, Dillweed. Mt (NC, VA, WV), Pd (NC, VA): roadsides, disturbed areas, abandoned garden plots; rare, native of sw. Asia. June-July. [= RAB, C, F, G, K, MC, S]

Angelica Linnaeus 1753 (Angelica)

A genus of about 60-110 species, perennial herbs of the northern hemisphere. References: Mathias & Constance (1945)=MC.

1 Larger leaflets 3-6 cm long, 1-2.5 cm wide, obtuse at the apex; umbels **either** densely pubescent **or** glabrous; ovary and fruit **either** pubescent **or** glabrous; [collectively widespread in our area, in dry to mesic habitats].
  2 Umbels glabrous; ovary and fruit glabrous; leaf segments coarsely toothed ..... ***A. dentata***
  2 Umbels pubescent; ovary and fruit hispid; leaf segments finely toothed ..... ***A. venenosa***
1 Larger leaflets 8-15 cm long, 4-8 cm wide, acute to acuminate at the apex; umbels glabrous or sparsely pubescent; ovary and fruit glabrous or sparsely pubescent; [restricted to the Mountains in our area, in mesic habitats]
  3 Leaflets acute, the margin hyaline and mostly glabrous; umbels with 20-45 umbellets ..... ***A. atropurpurea***
  3 Leaflets acuminate, the margin ciliolate; umbels with 13-25 umbellets ..... ***A. triquinata***

Angelica atropurpurea Linnaeus, Purple Angelica. Pd (DE), Mt (NC*?, WV): riverbanks, streambanks, moist roadsides; rare. May-June; July-August. S. NL (Labrador) west to WI and MN, south to NL (Newfoundland), NS, DE, MD, WV, OH, IN, IL, and ne. IA (and in the mountains to ne. TN and w. NC – the NC occurrences have sometimes been speculated to be naturalized). [= RAB, C, G, K, MC, W; > *A. atropurpurea* var. *atropurpurea* – F]

Angelica dentata (Chapman) Coulter & Rose, Sandhill Angelica. Cp (FL, GA): sandhills, flatwoods; uncommon (rare in GA). Sw. GA, sc. GA, and e. Panhandle FL. [= K, MC, S, WH]

* *Angelica lucida* Linnaeus. Native to n. North America. Reported by Harvill et al. (1992) for Warren County, VA; more information is needed to substantiate this surprising record, presumably from cultivation. [= C, G, K, MC; = *Coelopleurum lucidum* (Linnaeus) Fernald – F] {not keyed}

Angelica triquinata Michaux, Mountain Angelica, Filmy Angelica. Mt (GA, NC, VA, WV): mesic forests at moderate to high elevations, grassy balds, brookbanks; common (uncommon in WV). August-September; September-October. PA south to sw. NC, se. TN, and n. GA, a Southern and Central Appalachian endemic. The nectar is very attractive, but apparently strongly intoxicating, to yellow jackets and hornets; on the grassy balds of Roan Mountain one can see thousands of umbels of *Angelica* densely coated by lethargic bees. [= RAB, C, F, G, K, MC, W; ? *A. curtisii* Buckley – S]

Angelica venenosa (Greenway) Fernald, Hairy Angelica. Mt (GA, NC, SC, VA, WV), Pd (DE, GA, NC, SC, VA), Cp (DE, FL, GA, NC, SC, VA): dry forests and woodlands, woodland borders, longleaf pine sandhills, hammocks; common (rare in DE and FL). June-August; July-September. MA west to MN, south to Panhandle FL, MS, and AR. Populations of this species in dry sandhill communities in the Fall Line Sandhills have a number of peculiar features: basal leaves often borne appressed against the ground, small leaflets, coarse and more equilateral toothing of the leaflets. These populations may be worthy of taxonomic recognition; they need further study. [= RAB, C, F, G, K, MC, W; ? *A. villosa* (Walter) Britton, Sterns, & Poggenburg – S]

Anthriscus Persoon 1814 (Chervil)

A genus of about 10-20 species, herbs, of Eurasia and mountains of Africa. References: Spalik (1996)=Z; Mathias & Constance (1945)=MC.

1 Fruit ovoid, 2.9-3.2 mm long, hispid with hooked hairs; [section *Anthriscus*] ..... ***A. caucalis***
1 Fruit lanceolate or linear, 6-10 mm long, glabrous.
  2 Beak of fruit (1-) 2-4 mm long, well-differentiated from the body; plant an annual; umbel rays pubescent; [section *Anthriscus*] ..... ***A. cerefolium***
  2 Beak of fruit ca. 1 mm long, scarcely differentiated from the body; plant a perennial; umbel rays glabrous (or nearly so); [section *Cacosciadium*] ..... ***A. sylvestris*** *ssp.* ***sylvestris***

* ***Anthriscus caucalis*** Bieberstein, Bur Chervil, Bur-parsley. Mt (NC, WV), Pd (NC, SC, VA), Cp (DE, GA, NC, SC): disturbed areas; rare, native of Europe. April-May; May-June. First reported for South Carolina by Hill & Horn (1997) and for GA (Carter, Baker, & Morris 2009). [= C, K, Z; = *A. scandicina* (Weber ex Wiggers) Mansfeld – RAB, F, G, MC, illegitimate name]

* ***Anthriscus cerefolium*** (Linnaeus) Hoffmann, Garden Chervil. Pd (VA): cultivated in gardens, sometimes persistent or escaped; rare, native of western Medterranean Europe. May-July. [= C, F, G, K, MC, Z]

* ***Anthriscus sylvestris*** (Linnaeus) Hoffmann *ssp.* ***sylvestris***, Wild Chervil, Cow-parsley. Mt (NC, TN, VA), Pd (DE): moist disturbed areas; rare, native of Eurasia. May-July. This species has also been reported from the NC-TN state line, on Roan Mountain (Mellichamp, Matthews, & Smithka 1987, 1988); the population is actually entirely in TN. Reported for Watauga, Ashe, and Alleghany counties, NC (Poindexter, pers. comm. 2009). [= Z; < *A. sylvestris* – C, F, G, K, MC]

Apium Linnaeus 1753 (Celery)

A genus of about 20 species, herbs, of temperate and subtropical regions, mainly Southern Hemisphere. References: Ronse et al. (2010)=Z; Mathias & Constance (1945)=MC.

1 Involucel absent; fresh plant smelling of celery; stem solid ..... ***A. graveolens*** *var.* ***dulce***
1 Involucel present; fresh plant not smelling of celery; stem hollow ..... ***[Heliosciadium nodiflorum]***

* ***Apium graveolens*** Linnaeus *var.* ***dulce*** (P. Miller) A.P. de Candolle, Celery. Cp (FL, NC, SC), Mt (WV): disturbed areas, escaped or persisting from cultivation; rare, native of Europe. June-July; July-August. [= K; < *A. graveolens* Linnaeus – RAB, C, F, G, MC, WH, WV; < *Celeri graveolens* (Linnaeus) Britton – S; = *A. graveolens* ssp. *dulce* (P. Miller) Bertoloni]

Bifora Hoffmann 1816 (Bishop)

A genus of 4-6 species, annual herbs, of Mediterranean Europe, w. Asia (Caucasus), and w. North America.

* *Bifora americana* Bentham, Prairie Bishop. Disturbed areas; native of sc. North America. April-June. [= K] {perhaps not naturalized; not keyed or mapped}
* *Bifora radians* Bieberstein. [= K] {probably not naturalized; not keyed or mapped}
* *Bifora testiculata* (Linnaeus) Sprengel. [= K] {probably not naturalized; not keyed or mapped}

Bowlesia Ruiz & Pavón 1794 (Bowlesia)

A genus of ca. 15 species, herbs, of South America. References: Mathias & Constance (1945)=MC.

* ***Bowlesia incana*** Ruiz & Pavón. Cp (FL): open wet hammocks and bottomlands; rare, native of South America. [= GW, K, MC, WH; = *Bowlesia septentrionalis* Coulter & Rose – S]

Bupleurum Linnaeus 1753 (Hare's-ear, Thoroughwax)

A genus of about 190 species, herbs and shrubs, primarily Eurasian. References: Snogerup & Snogerup (2001)=Z; Mathias & Constance (1945)=MC.

1 Upper leaves linear, sessile; [section *Aristata*] ..... ***B. gerardii***
1 Upper leaves ovate, perfoliate; [section *Bupleurum*] ..... ***B. rotundifolium***

* ***Bupleurum gerardii*** Allioni. Mt (VA): disturbed areas over limestone; rare, native of Mediterranean Europe. Also reported for c. TN (Neves, Weakley, & Cox 2009). Snogerup & Snogerup (2001) apply narrower taxonomic concepts in this group, and would treat our material as *B. virgatum*, a segregate of *B. gerardii*. [= *B. odontites* Linnaeus – K, apparently misapplied; = *B. fontanesii* Gussone – C, G, MC, apparently misapplied; > *B. virgatum* Cavanilles – Z]
* *Bupleurum lancifolium* Hornemann. Reported as a waif for MD by Shetler & Orli (2000) and Reed (1964). [= K] {not keyed; not mapped}
* *Bupleurum odontites* Linnaeus. Reported as a waif for MD by Shetler & Orli (2000) and Reed (1964). [= K; > *B. fontanesii* Guss. ex Careul – C, G, MC] {not keyed; not mapped}
* ***Bupleurum rotundifolium*** Linnaeus, Hare's-ear, Thoroughwax. Mt (VA, WV), Pd (DE, NC, VA), Cp (DE): lawns, disturbed areas; rare, native of Eurasia. June. [= RAB, C, F, G, K, MC, S, W]

Carum Linnaeus 1753 (Caraway)

A genus of about 30 species, temperate. References: Mathias & Constance (1945)=MC.

* ***Carum carvi*** Linnaeus, Caraway. Mt (NC, VA, WV): disturbed areas, roadsides; rare, native of Eurasia. May-June. [= RAB, C, F, G, K, MC, WV]

Centella Linnaeus 1764 (Centella, Coinleaf)

A genus of about 40 species, of warm temperate and tropical regions, centered in s. Africa. References: Mathias & Constance (1945)=MC.

Centella erecta (Linnaeus f.) Fernald, Centella, Coinleaf. Cp (DE, GA, NC, SC, VA): savannas, pondshores, ditches, and a wide variety of other moist to wet habitats; common (rare in DE). June-August; July-September. S. NJ and DE south to s. FL, west to s. TX; West Indies, Mexico, Central America. *C. erecta* has sometimes been included in the pantropical *C. asiatica*, but the two taxa differ in morphology and chromosome number (*C. erecta* has n = 27, *C. asiatica* has n = 9). [= C, F, G, K, MC; < *C. asiatica* (Linnaeus) Urban – RAB, GW, misapplied; ? *C. repanda* (Persoon) Small – S]

Chaerophyllum Linnaeus 1753 (Chervil)

A genus of about 35 species, herbs, of north temperate areas. References: Mathias & Constance (1945)=MC.

1 Ribs of fruit broad, the intervals between the ribs much narrower than the ribs; pedicels somewhat club-shaped; stem and leaf surfaces essentially glabrous ..... ***C. tainturieri***
1 Ribs of fruit narrow, the intervals between the ribs equal to or wider than the ribs; pedicels mostly uniform in shape; stem and leaf surfaces mostly pilose.
2 Fruit glabrous, 6-10 mm long, 1.5-2 mm broad ..... ***C. procumbens* *var.* *procumbens***
2 Fruit densely puberulent, 4.5-6.5 mm long, 2-2.5 mm broad ..... ***C. procumbens* *var.* *shortii***

* *Chaerophyllum bulbosum* Linnaeus, Parsnip Chervil. Waif in DC; native of Europe. [= C, G, K, MC] {not keyed; not mapped}

Chaerophyllum procumbens (Linnaeus) Crantz *var.* ***procumbens***, Common Spreading Chervil. Pd (DE, GA, NC, SC, VA), Cp (DE, FL, GA, NC, SC, VA), Mt (VA, WV): alluvial forests; common (uncommon in NC, rare in DE, FL, GA, and SC). Late March-April; April-May. NY and s. ON to MI, s. WI, and e. NE, south to GA, AR, and OK. [= RAB, C, F, G, K, MC; < *C. procumbens* – GW, W, WH; = *C. procumbens* – S]

Chaerophyllum procumbens (Linnaeus) Crantz *var.* ***shortii*** Torrey & A. Gray, Short's Spreading Chervil. Mt (VA, WV), Pd (SC): nutrient-rich mountain forests, alluvial forests; rare. March-April. W. PA west to IN, south to SC, TN, and LA. The validity of this variety needs additional study. [= RAB, C, F, G, K, MC; < *C. procumbens* – GW, W; = *C. shortii* (Torrey & A. Gray Bush – S]

Chaerophyllum tainturieri Hooker, Southern Chervil. Cp (DE, FL, GA, NC, SC, VA), Pd (GA, NC, SC, VA), Mt (GA, NC, SC, VA, WV): roadsides, disturbed areas, fields; common (rare in DE and WV). March-April; April-May. MD west to NE, south to c. peninsular FL, TX, and AZ. Var. *tainturieri* (with fruits glabrous) and var. *dasycarpum* (with fruits pubescent) are sometimes distinguished (see synonymy). They have largely overlapping distributions, and seem unlikely to warrant taxonomic status, but need additional study. *C. texanum* Coulter & Rose is reported as a native in the Nashville Basin of TN (Chester, Wofford, & Kral 1997); it is usually now included in *C. tainturieri* (var. *tainturieri*). [= RAB, C, GW, W, WH; > *C. tainturieri* var. *tainturieri* – K; > *C. tainturieri* var. *tainturieri* – F, G, MC; > *C. tainturieri* var. *floridanum* Coulter & Rose – F; > *C. texanum* Coulter & Rose – F, G, MC; > *C. teinturièri* – S, orthographic variant; > *C. floridanum* (Coulter & Rose) Bush – S; > *C. tainturieri* var. *dasycarpum* Hooker ex S. Watson – K, MC; > *C. dasycarpum* (Hooker ex S. Watson) Nuttall ex Small – S]]

* *Chaerophyllum temulem* Linnaeus, Rough Chervil. Native of Europe; introduced as a waif south to PA and NJ (Kartesz 1999). [= C, G, K, MC] {not keyed; not mapped}

Cicuta Linnaeus 1753 (Water-hemlock)

A genus of 8 species, herbs, north temperate in distribution. References: Mulligan (1980)=Z; Mathias & Constance (1945)=MC.

1 Flowers usually aborting (if present, the fruits 1.5-2 mm long); axils of upper leaves bearing clusters of bulbils; leaflets with narrowly linear segments, usually < 5 mm wide ..... ***C. bulbifera***
1 Flowers usually forming mature fruits 2-4 mm long; axils of leaves not bearing bulbils; leaflets lanceolate, usually > 6 mm wide.
2 Dorsal and lateral corky ribs of the fruit much narrower than the oil tubes; fruit abruptly and unevenly constricted at the commissure ..... ***C. bolanderi***
2 Dorsal and lateral corky ribs of the fruit equaling to slightly exceeding the width of the oil tubes; fruit restricted or not at the commissure, but not as above.
3 Lateral ribs of the commissure flush against one another; leaflets lanceolate, 0.6-3 cm wide ..... ***C. maculata* *var.* *maculata***
3 Lateral ribs of the commissure separated by a groove; leaflets ovate, up to 3.5-5 cm wide..... ***C. mexicana***

Cicuta bolanderi S. Watson. Marshes, bogs, seepages, ditches, swamp forests. Scattered in distribution, from NJ, WI, and MN south to GA, TX, Mexico, and AZ. Further study is needed of the distinctiveness, distribution, and ecology of this species. [= K, MC; < *C. maculata* var. *maculata* – C, F, G; = *C. maculata* Linnaeus var. *bolanderi* (S. Watson) Mulligan – Z]

Cicuta bulbifera Linnaeus, Bulb-bearing Water-hemlock. Marshes and swamps. July-September. NL (Newfoundland) west to AK, south to MD, n. VA (?), OH, KY, IN, IL, IA, NE, MT, ID, and OR; disjunct (perhaps introduced only) in NC and FL. [= C, F, G, K, MC, Z]

Cicuta maculata Linnaeus *var.* ***maculata***, Water-hemlock. Marshes, bogs, seepages, ditches, swamp forests. May-August; July-September. NS west to AK, south to FL, CA, and Mexico. Two other varieties are more northern or western: var. *victorinii* (Fernald) Boivin of QC and var. *angustifolia* Hooker of western North America. All parts of the plant, especially the tubers, are dangerously poisonous. [= *C. maculata* – RAB, GW, MC, S, W; < *C. maculata* var. *maculata* – C, F, G (also see var. *bolanderi*); < *C. maculata* var. *maculata* – K, Z (also see *C. mexicana*); < *C. maculata* – WH]

Cicuta mexicana Coulter & Rose, Southern Water-hemlock. Marshes, bogs, seepages, ditches, swamp forests, floating vegetation mats. May-August; July-September. Se. VA (GW), south to FL, and west to TX, south into Mexico (more inland records in our area and westward are of uncertain disposition). Though not recognized by Mulligan (1980), this taxon appears to warrant taxonomic recognition. It is a generally coarser plant than *C. maculata*. [= RAB, GW, MC; = *C. maculata* var. *curtissii* (Coulter & Rose) Fernald – F, G; < *C. maculata* var. *maculata* – K, Z; = *C. curtissii* Coulter & Rose – S; < *C. maculata* – WH]

Conioselinum Hoffmann 1819 (Hemlock-parsley)

A genus of about 10 species, herbs, north temperate in distribution. References: Mathias & Constance (1945)=MC.

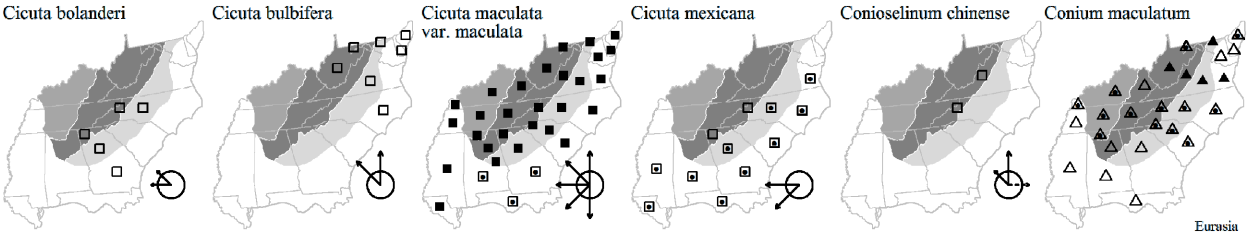
Conioselinum chinense (Linnaeus) Britton, Sterns, & Poggenburg, Hemlock-parsley. Nutrient-rich seepage over cliffs and through boulderfields, at high elevations, known from seepage over cliffs and through boulderfields at about 1500 m on the north

slope of Grandfather Mountain (Avery County, NC), and from a north-facing greenstone cliff-top seep at 1150 m on Stony Man, Page County (VA). July-September. The specific epithet is a misnomer; the species is native to n. North America (the specific epithet a misnomer): south to PA, IN, IA, and NB, and disjunct in VA and NC) and ne. Asia (e. Siberia), but not found in China (the epithet a mistake based on confusion between "Genesee," New York, and "Chinensem"). The single NC population was first discovered in 1842 by Asa Gray and John Carey, and not seen again until 1989. The VA population was first reported by Fleming & Ludwig (1996). The report of the species from Roan Mountain was found to be in error; see *Anthriscus* (Mellichamp, Matthews, & Smithka 1987, 1988). [= RAB, C, F, G, K, MC, S, W]

Conium Linnaeus 1753 (Poison-hemlock)

A genus of 6 species, herbs, north temperate and s. African in distribution. References: Mathias & Constance (1945)=MC.

* ***Conium maculatum*** Linnaeus, Poison-hemlock. Ditches, roadsides, streambanks, disturbed areas; native of Eurasia. May-June; June-July. All parts of the plant are highly toxic if ingested, causing respiratory failure in humans and other mammals. [= RAB, C, F, GW, K, MC, S, W, WV]



Coriandrum Linnaeus 1753 (Coriander, Cilantro)

A genus of 3 species, herbs, sw. Asian in distribution. References: Mathias & Constance (1945)=MC.

* ***Coriandrum sativum*** Linnaeus, Coriander, Cilantro, Mexican-parsley, Chinese-parsley. Disturbed areas, cultivated in gardens, sometimes persisting or escaped; native of Eurasia. June-July. [= RAB, C, F, G, K, MC, S]

Cryptotaenia A.P. de Candolle 1829 (Honewort)

A genus of 6 species, herbs, in north temperate areas (and montane Africa). References: Mathias & Constance=MC.

Cryptotaenia canadensis (Linnaeus) A.P. de Candolle, Honewort. Moist and nutrient-rich forests (alluvial, bottomland, slope, and cove forests). May-June; June-August. NB and QC to MB, south to e. GA, sw. GA, Panhandle FL, AL, and TX; also in Japan. [= RAB, C, F, GW, K, MC, WH, WV; = *Deringa canadensis* (Linnaeus) Kuntze – S]

Cyclospermum Lagasca y Segura 1821 (Marsh-parsley)

A genus of 3 species, herbs, of tropical and warm temperate America. Only distantly related to *Apium* and warranting generic ststus (Ronse et al. 2010). References: Ronse et al. (2010)=Z; Mathias & Constance (1945)=MC.

Cyclospermum leptophyllum (Persoon) Sprague ex Britton & Wilson, Marsh-parsley. Freshwater marshes, disturbed areas, roadside ditches. April-early June; June-July. Widespread in se. North America, from NC and OK south into tropical America. [= K, WH, Z; = *Apium leptophyllum* (Persoon) F. Mueller ex Bentham – RAB, C, G, GW, MC; = *Ciclospermum leptophyllum*, orthographic variant; ? *Ciclospermum ammi* Lagasca y Segura – S]

Cynosciadium A.P. de Candolle 1829

A genus of 2 species, of sc. North America. References: Mathias & Constance (1945)=MC.

Cynosciadium digitatum A.P. de Candolle. Wet places, ditches, blackland prairies. IL, sw. TN (Shelby County), and AL west to OK and TX. [= C, F, G, GW, K, MC, S]

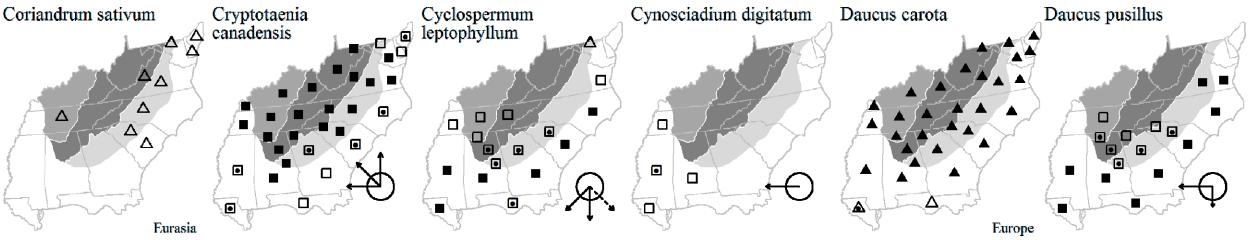
Daucus Linnaeus 1753 (Wild Carrot, Queen-Anne's-lace)

A genus of about 22 species, herbs, of temperate and tropical areas, primarily Old World. References: Mathias & Constance (1945)=MC.

1 Involucral bracts scarious-margined, spreading or reflexed in fruit; spines of fruit not prominently barbed apically; umbel rays 10-65 mm long (at least some in a given inflorescence usually exceeding 3 cm); umbellets (10-) 20-numerous flowered; central flower of the umbel usually dark purple; plant a freely-branched biennial.....***D. carota***
1 Involucral bracts not scarious-margined, appressed-ascending in fruit; spines of fruit prominently barbed apically; umbel rays 5-26 mm long; umbellets 5-12 flowered; central flower of the umbel white; plant an unbranched (or rarely few-branched) annual ..... ***D. pusillus***

* ***Daucus carota*** Linnaeus, Queen-Anne's-Lace, Carrot, Wild Carrot. Pastures, fields, roadsides, waste places; native of Europe. May-September. The cultivated carrot is a form with a fleshy taproot rich in carotene; the familiar field weed has a "carroty" flavor, but the root is woody and tan in color. [= RAB, C, F, G, K, MC, S, W, WH, WV]

Daucus pusillus Michaux, American Queen-Anne's-lace. Pastures, fields, roadsides, waste places. April-May; May-June. This native relative of *D. carota* is smaller and less branched. Widespread in Southeastern United States, north to NC and MO. It should be expected in the lower Piedmont of NC and in the Coastal Plain of se. VA, which it closely approaches. Robert Wright has collected this species as a waif in Henrico County, VA (R. Wright, 2002, pers. comm.). [= RAB, C, F, G, K, MC, S, W, WH]



Erigenia Nuttall 1818 (Harbinger-of-spring, Pepper-and-salt)

A monotypic genus, an herb of e. North America. References: Buddell & Thieret (1985)=Z; Mathias & Constance (1945)=MC.

Erigenia bulbosa (Michaux) Nuttall, Harbinger-of-spring, Pepper-and-salt, Erigenia. Mesic, nutrient-rich forests, either over calcareous substrate or on very rich alluvial deposits (such as riverbanks). February-May. S. PA, w. NY, s. ON, c. MI, and se. WI south to MD, DC, c. VA, w. VA, nc. NC, w. NC, e. TN, nw. GA, c. AL, n. MS, sw. AR, and se. KS (almost entirely west of the Blue Ridge). Rodgers (1950) states "reported in mtns. of N.C. by Kephart and Hyams;" now documented from both the nc. Piedmont and the w.MD, DC, Mountains. See Buddell & Thieret (1985) for a very interesting and entertaining account of this plant. [= RAB (excluded), C, F, G, K, MC, S, W, WV, Z]

Eryngium Linnaeus 1753 (Eryngo)

A genus of about 250 species, herbs, tropical and temperate. References: Bell (1963)=Z; Mathias & Constance (1945)=MC; Calviño, Martínez, & Downie (2008).

1 Leaves thickly coriaceous, palmately lobed, the lobes and teeth tipped with stout spines; [subgenus *Eryngium*] .....***E. maritimum***
1 Leaves thin, fleshy, or subcoriaceous, entire, toothed, palmately lobed, or pinnately incised, the teeth or lobes (if present) unarmed or with weak spines.
2 Inflorescence unbranched, the heads solitary on peduncles from the leaf axils of the prostrate to erect stem; [subgenus *Monocotyloidea*].
3 Leaves pinnately lobed or dissected.....***E. divaricatum***
3 Leaves entire, irregularly toothed (rarely with some irregular lobing).
4 Heads subglobose or hemispherical when fully developed, about as wide as long; bracts subtending the head barely extending beyond the base of the head; main stems leaves linear, narrowly elliptic, narrowly oblanceolate, sometime tricuspid apically ....***E. baldwinii***
4 Heads cylindrical, longer than wide; bracts subtending the head longer than the radius of the head, thus extending conspicuously beyond the base of the head; main stem leaves elliptic, broader than above.....***E. prostratum***
2 Inflorescence branched, the heads in a cyme borne terminally on the erect stem.
5 Basal and cauline leaves (all, or at least many of the cauline) definitely deeply lobed into 3 or more divisions, < 10 cm long.
6 Heads blue; basal leaves serrate but not divided; [subgenus *Monocotyloidea*].....***E. hookeri***
6 Heads greenish; basal leaves pinnately or pinnately-ternately divided.
7 Plants slender, not fleshy, green; basal and cauline leaves 2-6 cm long, 3-5 (-7) pinnately parted; heads 5-8 mm in diameter; [native species of dry pinelands of the Coastal Plain of e. GA, s. AL, and FL]; [subgenus *Monocotyloidea*] ..... ***E. aromaticum***
7 Plants stout, fleshy, usually glaucescent; basal leaves 10-25 cm long and wide, pinnately or pinnate-ternately divided into > 7 segments, the cauline leaves similar but reduced in size and number of divisions; heads 10-15 mm in diameter; [rare ballast waif of disturbed ground]; [subgenus *Eryngium*] .....***E. campestre***
5 Basal and cauline leaves unlobed (except sometimes the uppermost; note that bracts in the inflorescence are often lobed), 3-100 cm long; [subgenus *Monocotyloidea*].
8 Blades of basal and lower cauline leaves 3-7 (-10) cm long, acute to obtuse apically, cordate to truncate basally, with a length/width ratio of 1.5-3 (-6) .....***E. integrifolium***

8 Blades of basal and lower cauline leaves 10-100 cm long, acuminate to acute apically, clasping basally, with a length/width ratio of 5-50.
9 Leaves with primary veins parallel, with marginal bristles; flowers greenish-white.
10 Larger leaves > 1.5 cm wide; marginal bristles of leaves solitary ..... ***E. yuccifolium*** *var.* ***yuccifolium***
10 Larger leaves < 1.5 cm wide; marginal bristles in fascicles of 1-3 (-4), those on the lower portion of the leaf usually in fascicles of 2-3 ..... ***E. yuccifolium*** *var.* ***synchaetum***
9 Leaves with primary veins pinnate-reticulate, with or without marginal bristles; flowers blue.
11 Styles 3.0-3.5 mm long at maturity, scarcely exceeding the bractlets (which subtend each flower); heads subglobose to hemispherical, 6-12 mm in diameter; middle cusp of the bractlets elongate, distinctly longer than the lateral cusps ..... ***E. aquaticum*** *var.* ***aquaticum***
11 Styles 4.0-6.0 mm long at maturity, exceeding the bractlets; heads globose, 9-15 mm in diameter; middle cusp of the bractlets about equal in length to the lateral cusps ..... ***E. aquaticum*** *var.* ***ravenelii***

Eryngium aquaticum Linnaeus *var.* ***aquaticum***, Marsh Eryngo. Cp (DE, FL, GA, NC, SC, VA): tidal freshwater to brackish marshes; uncommon (rare in DE). July-September. NJ to ne. FL along the Atlantic coast, mostly in brackish marshes. [= RAB, K, MC, Z; < *E. aquaticum* – C, F, G, GW, WH; = *E. virginianum* Lamarck – S]

Eryngium aquaticum Linnaeus *var.* ***ravenelii*** (A. Gray) Mathias & Constance, Ravenel's Eryngo. Cp (FL, GA, NC, SC): wet savannas, mostly or entirely over calcareous substrate; rare. July-September. Se. NC (Onslow and Pender counties) south to sw. GA and n. FL. McMillan (2003) suggests that it may warrant specific status distinct from *E. aquaticum*. [= RAB, K, MC, Z; < *E. aquaticum* – GW, WH; = *E. ravenelii* A. Gray – S]

Eryngium aromaticum Baldwin, Fragrant Eryngo. Cp (FL, GA): dry pinelands; common (uncommon in GA). E. GA west to s. AL, south to s. FL. [= K, MC, S, WH, Z]

Eryngium baldwinii Sprengel. Cp (FL, GA): pinelands, temporary pools, ditches, other moist to wet sites; common (uncommon in GA). Se. GA and sw. GA south to s. FL. [= GW, K, S, WH, Z; = *E. baldwini* – MC, orthographic variant]

* *Eryngium campestre* Linnaeus, Field Eryngo. Ballast waif around ports, in AL (Mobile), MD, and NJ (Z; Kartesz 1999). Native of Eurasia. [= K, MC, Z]

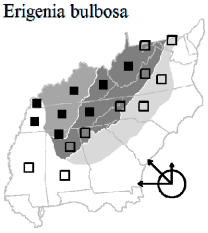
* ***Eryngium divaricatum*** Hooker & Arnott. Cp (FL, NC): disturbed areas, introduced on ballast at old port towns (Wilmington, NC; Pensacola, FL); rare, native of South America. July-October. Not seen in recent years and probably not persistent. [= RAB, K, MC, S, WH, Z]

* *Eryngium foetidum* Linnaeus, Spiritweed. Listed by Kartesz (1999) as introduced in GA and FL, but the only reports are very early and anecdotal, and the species was excluded from the North American flora by Coulter & Rose (1900), with no subsequent documentation that would change that conclusion. Native of Mexico, Central America, South America, and West Indies. [= K, MC] {not keyed}

*? *Eryngium hookeri* Walpers. Ditches, other wet areas. MS and AR west to OK and TX, perhaps recently adventive in the eastward portions of that distribution, not credited as occurring east of TX in Matthias & Constance (1945). [= K, MC]

Eryngium integrifolium Walter, Savanna Eryngo. Cp (FL, GA, NC, SC), Mt (GA, NC, SC), Pd (GA, NC, SC, VA): savannas, pine flatwoods, seepages, other moist, nutrient-poor places; common (rare in Piedmont and Mountains). August-October. Se. VA (Greensvillle County) (Belden et al. 2004) and e. NC south to ne. FL and Panhandle FL, west to OK and TX, inland in c. TN. [= RAB, K, MC, W, WH, Z; > *E. integrifolium* – S; > *E. ludovicianum* Morong – S]

Erigenia bulbosa



* ***Eryngium maritimum*** Linnaeus, Sea Holly. Cp (NC): ocean and soundside dunes; rare, presumably native of Europe, though perhaps adventive. July. [= RAB, C, G, K, MC, Z]

Eryngium prostratum Nuttall ex A.P. de Candolle, Spreading Eryngo. Cp (DE*, FL, GA, NC, SC, VA), Pd (GA, NC, SC, VA), Mt (NC, SC): floodplain forests, bogs, pond ,margins, moist ditches and lawns, other moist, open habitats; uncommon, definitely native southwards, perhaps only rather recently spread to the northern parts of our area. May-October. Se. VA south to FL, west to OK and TX. [= RAB, C, GW, K, MC, S, W, WH, Z; > *E. prostratum* var. *prostratum* – F, G; > *E. prostratum* var. *disjunctum* Fernald – F, G]

Eryngium yuccifolium Michaux *var.* ***synchaetum*** A. Gray ex Coulter & Rose, Southern Rattlesnake-master. Cp (FL, GA, NC, SC): wet savannas, especially those over calcareous clay soils; rare (NC Watch List). June-August. A Southeastern Coastal Plain endemic: se. NC to s. FL and west across the Gulf Coastal Plain, the exact range limits obscure. The distinction between the two varieties, seemingly clear in NC and elsewhere in states bordering the Atlantic, seems to become less straightforward further west, as in LA and AR. In NC it has been seen in Pender, Brunswick, Columbus, Bladen, and Robeson counties. [= RAB, K, MC, Z; < *E. yuccifolium* – GW, WH; = *E. synchaetum* (Gray ex Coulter & Rose) Coulter & Rose – S]

Eryngium yuccifolium Michaux *var.* ***yuccifolium***, Northern Rattlesnake-master. Pd (GA, NC, SC, VA), Mt (GA, NC, SC, VA), Cp (FL?, GA, NC, SC, VA): diabase barrens and glades, olivine barrens, pine savannas, pine flatwoods over loamy or clay soils, other open sites with at least periodic moisture, generally in sites showing some prairie affinities; uncommon (rare in VA). June-August. Widespread in southeastern and midwestern North America, the exact range limits of the typic variety and var. *synchaetum* somewhat obscure. [= RAB, K, MC, Z; < *E. yuccifolium* – C, F, G, W, WH; < *E. yuccifolium* – GW (also see *E. yuccifolium* var. *synchaetum*); = *E. aquaticum* – S, misapplied]

Falcaria Fabricius 1827 (Sickleweed)

A monotypic genus, an herb, of Eurasia. References: Mathias & Constance (1945)=MC.

* ***Falcaria vulgaris*** Bernhardi, Sickleweed. Mt (VA, WV): disturbed areas; rare, native of Eurasia. July-September. [= C, F, K; = *F. sioides* (Wibel) Ascherson – G, MC, WV]

Foeniculum P. Miller 1763 (Fennel)

A genus of 4-5 species, herbs, of Asia and Mediterranean Europe. References: Mathias & Constance (1945)=MC.

* ***Foeniculum vulgare*** P. Miller, Fennel. Cp (DE, FL, GA, NC, SC, VA), Mt (GA, NC, SC, VA, WV), Pd (DE, NC, SC, VA): fields, dredge spoil, old gardens, waste places, vacant lots, roadsides; uncommon (sometimes locally common, rare in DE and WV), native of Mediterranean Europe. June-August; August-September. This is the common garden fennel, cultivated for its seeds, leaves, "bulbs" (finocchio), and ornamental appearance (especially bronze forms), widely used in Mediterranean cuisines. [= RAB, C, F, G, K, MC, W, WH, WV; = *Foeniculum foeniculum* (Linnaeus) Karsten – S]

Harperella Rose 1906 (Harperella)

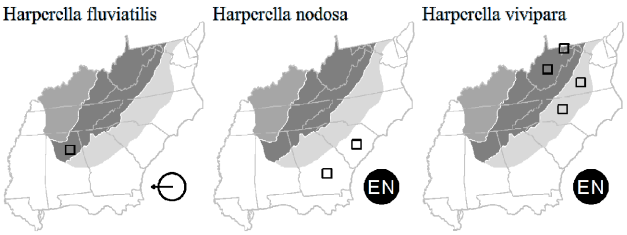
A genus of 3 species, herbs, temperate, of e. North America. Based on work of Feist & Downie (2008), *Harperella* should be (re)-separated from *Ptilimnium*. Some authors, such as C, K, and Kral (1981a) prefer to include *H. fluviatilis* and *H. vivipara* in *H. nodosa*, but recent electrophoretic and morphologic data suggest the existence of three taxa: *H. vivipara* of w. MD, e. WV, VA, and c. NC, *P. fluviatilis* of n. AL and AR, and *P. nodosa* of SC and GA. See Maddox & Bartgis (1990) and Kress, Maddox, & Roesel (1994) for additional information. Further electrophoretic and morphologic studies are underway. References: Feist & Downie (2008); Easterly (1957)=Z; Kral (1981a)=Y; Rose (1911)=X; Mathias & Constance (1945)=MC; Kress, Maddox, & Roesel (1994).

1 Leaves 8-30 cm long; plants 4-10.5 dm tall, not proliferating from the nodes (strictly annual); rays 10-25 mm long, 6-15 per inflorescence; pedicels 3.0-6.0 mm long; [of still water of Coastal Plain ponds] ..... ***H. nodosa***
1 Leaves 4-12 (-15) cm long; plants 1-5 (-8) dm tall, proliferating from the nodes (thus adventitiously perennial); rays 1-9 mm long, 2-5 (-9) per inflorescence; pedicels 0.5-2.0 (-2.5) mm long; [of shoals, outcrops, and banks of rocky streams or rivers]
  2 Umbellets 6-15-flowered; [n. AL and AR] ..... ***H. fluviatilis***
  2 Umbellets 2-8-flowered; [w. MD, e. WV, VA, and c. NC] ..... ***H. vivipara***

Harperella fluviatilis Rose, Gulf River Harperella. Rocky riverbeds. N. AL and AR. [= X; = *Ptilimnium fluviatilis* – MC, orthographic variant; < *P. fluviatile* (Rose) Mathias – RAB, G, GW, Z; < *P. nodosum* (Rose) Mathias – C, K, Y; < *Harperella fluviatilis* Rose – S, X]

Harperella nodosa Rose, Pond Harperella. Upland depression ponds, seepage on granite outcrops. June. Known only from a few sites in SC and c. GA. [= S, X; = *Ptilimnium nodosum* (Rose) Mathias – RAB, GW, MC, Z; < *P. nodosum* (Rose) Mathias – C, K, Y (also see *P. fluviatile*)]

Harperella vivipara Rose, Atlantic River Harperella. Rocky riverbeds. July-August. Belden et al. (2004) provide details on the Virginia occurrence in Aquia Creek, Stafford County. [= X; = *Ptilimnium viviparum* (Rose) Mathias – MC; < *Ptilimnium fluviatile* (Rose) Mathias – RAB, G, GW, WV, Z; < *P. nodosum* (Rose) Mathias – C, K, Y; = *P. viviparum* (Rose) Mathias – F; < *Harperella fluviatilis* Rose – S]



Helosciadium W.D.J. Koch 1824

A genus of 5 species, herbs, of Eurasia. References: Ronse et al. (2010)=Z; Mathias & Constance (1945)=MC.

* ***Helosciadium nodiflorum*** (Linnaeus) W.D.J. Koch, Fool's Watercress. Cp (SC): disturbed areas near old seaports; rare, native of Eurasia. [= Z; = *Apium nodiflorum* (Linnaeus) Lagasca y Segura – RAB, K, MC; = *Ciclospermum nodiflorum* (Linnaeus) W.D.J. Koch – S]

Heracleum Linnaeus 1753 (Cow-parsnip, Hogweed)

A genus of about 65 species, herbs, north temperate (and tropical mountains). References: Mathias & Constance (1945)=MC.

* *Heracleum mantegazzianum* Sommier & Levier. Native to the Caucasus Mountains, has been introduced in ne. North America and is becoming established; it may eventually spread to our area. It is considerably larger and coarser even than *H. maximum* (not a paltry herb itself), reaching 5.5 m in height, the hollow stems to 15 cm in diameter, the lower leaves to 2.5 m long, and the umbels to 5 dm across. More modestly-sized individuals may be distinguished from *H. maximum* by wider oil tubes on the fruit [(0.6-) 0.8-1.0 mm wide vs. 0.3-0.5 (-0.8). [= K] {not keyed}

Heracleum maximum W. Bartram, Masterwort, Cow-parsnip, American Hogweed. Mt (GA, NC, VA, WV), Pd (DE): forests, roadbanks, meadows, forest openings; uncommon (rare in GA). May-July; July-August. NL (Labrador) west to AK, south to DE, PA, OH, IN, IL, MO, KS, NM, AZ, CA, and in the Appalachians south to w. NC, e. TN, and n. GA; also in e. Siberia. The synonymy reflects two questions, one nomenclatural, the other taxonomic. North American plants are very similar to European ones, leading some workers to treat our plants as a subspecies or variety of the European. If recognized as specifically distinct from European *H. sphondylium*, the nomenclatural question is whether to accept Bartram's (older) name as validly published. [= F, GW, K, WV; = *H. lanatum* Michaux – RAB, C, G, MC, W; = *H. sphondylium* Linnaeus var. *lanatum* (Michaux) Dorn; ? *H. sphondylium* Linnaeus ssp. *montanum* (Schleicher ex Gaudin) Briquet]

Imperatoria Linnaeus 1753 (Masterwort)

A genus of 3 species, of Eurasia. References: Ball in FNA (in prep.); Mathias & Constance (1945)=MC.

* ***Imperatoria ostruthium*** Linnaeus, Masterwort. Mt (TN, WV): disturbed areas; rare, native of Europe. May-July. Naturalized in ne. United States from Europe. Reported from Carter County, TN (Chester, Wofford, & Kral 1997), and also is reported for scattered localities in PA (Rhoads & Klein 1993). [= FNA, MC, WV; = *Peucedanum ostruthium* (Linnaeus) W.D.J. Koch – C, K]

Ligusticum Linnaeus 1753 (Lovage)

A genus of 40-50 species, herbs, circumboreal and north temperate. References: Mathias & Constance (1945)=MC.

Ligusticum canadense (Linnaeus) Britton, Nondo, Angelico, American Lovage. Mt (GA, NC, SC, VA, WV), Pd (GA, NC, SC, VA), Cp (FL, NC): moist to dryish, nutrient-rich forests and woodlands; common (rare in Coastal Plain). June-July; August-September. S. PA south to c. GA, AL, and Panhandle FL; also in s. MO and n. AR, centered in the Southern and Central Appalachians and the Ozarks-Ouachitas, but extending considerably into adjacent provinces, and even slightly into the Coastal Plain. A distinctive character is the straightish and toothless basal portion of each leaflet. [= RAB, C, F, G, K, MC, S, W, WV]

Lilaeopsis Greene 1891 (Lilaeopsis)

A genus of about 13 species, herbs, warm temperate and tropical, of America, Australia, and New Zealand. References: Affolter (1985)=Z; Mathias & Constance (1945)=MC; Hatch & Slack (2008).

1 Leaves 7-30 (or more) cm long, often spatulate, up to 11 mm wide toward the apex, with (7-) 10-20 transverse septae; peduncles much shorter than the leaves; pedicels 5-10 mm long ..... ***L. carolinensis***
1 Leaves 1-5 cm long, linear (rarely spatulate), 1-2 (-5) mm wide, with 4-8 (-10) transverse septae; peduncles about as long as or longer than the leaves; pedicels 3-4 mm long ..... ***L. chinensis***

Lilaeopsis carolinensis Coulter & Rose, Carolina Lilaeopsis. Cp (FL, GA, NC, SC, VA): freshwater marshes and pondshores, ditches, interdune ponds, shores of brackish to freshwater estuarine sounds and rivers; uncommon (rare in GA, NC, SC, and VA)). May-June. Se. VA south to FL and west to e. TX (Hatch & Slack 2008); it is also found in South America (Argentina, Brazil, and Paraguay). [= RAB, F, GW, K, S, WH, Z; = *L. attenuata* (Hooker & Arnott) Fernald – C, G, MC]

Lilaeopsis chinensis (Linnaeus) Kuntze, Marsh Lilaeopsis. Cp (DE, FL, GA, NC, SC, VA): brackish and freshwater tidal marshes, especially in mud-flats in the intertidal zone; common. May-June. NS south to FL and west to TX (Brown & Marcus 1998). The epithet "*chinensis*" is a misnomer; the species is native to e. North America and has nothing to do with China. [= RAB, F, G, GW, K, MC, WH, Z; = *L. lineata* (Michaux) Greene – S]

Oenanthe Linnaeus 1753 (Water-dropwort)

A genus of ca. 40 species, herbs, of north temperate areas.

* ***Oenanthe javanica*** A.P. de Candolle, Water Celery, Water Parsley, Java Dropwort, Seri. Pd (VA), Mt (GA): edge of swamp forests, ditches; rare (but seemingly with the ability to spread rapidly), native of Asia. July-August. [] {add to synonymy}

Osmorhiza Rafinesque 1819 (Sweet Cicely, Wild Chervil)

A genus of about 10 species, herbs, of temperate North America, temperate South America, montane tropical Central and South America, and Asia (Wen et al. 2002). References: Lowry & Jones (1979)=Z; Mathias & Constance (1945)=MC; Wen et al. (2002).

1 Styles plus stylopodium 0.5-1.5 mm long; flowers 4-7 (-10) per umbellet (inclusing withering staminate flowers); flowers 3-4 mm across; umbellets 3-5 (-6) per umbel, on rays 2-8 (-10) cm long, the umbel therefore relatively uncrowded; roots (and foliage) not strongly anise-scented ..... ***O. claytonii***
1 Styles plus stylopodium 2.0-3.5 mm long; flowers (6-) 9-18 per umbellet (including withering staminate flowers); flowers 5-6 mm across; umbellets 4-6 (-8) per umbel, on rays 1.5-5.0 (-7.5) cm long, the umbel therefore rather crowded; roots (and foliage) strongly anise-scented ..... ***O. longistylis***

Osmorhiza claytonii (Michaux) C.B. Clarke, Bland Sweet Cicely, Hairy Sweet Cicely. Mt (GA, NC, VA, WV), Pd (DE, NC, SC, VA), Cp (DE, VA): cove forests, other moist, fertile forests; common (rare in Piedmont south of DE, rare in Coastal Plain, rare in SC). April-May; May-June. NS and QC west to SK, south to NC, n. GA, AL, and AR. [= RAB, C, F, G, K, MC, W, Z; = *O. claytoni* – WV; = *Osmorrhiza claytonii* – S, misspelling]

Osmorhiza longistylis (Torrey) A.P. de Candolle, Anise-root, Smooth Sweet Cicely. Pd (DE, GA, NC, SC, VA), Mt (GA, NC, VA, WV), Cp (DE, GA, NC, VA): moist, fertile forests; common (uncommon in DE Coastal Plain, rare in GA, NC, and VA Coastal Plain). April-May; May-June. QC west to SK, south to GA, TX, and CO. [= RAB, C, F, G, K, W, Z; > *O. longistylis* var. *brachycoma* Blake – F, MC, WV; > *O. longistylis* var. *longistylis* – F, MC, WV; > *O. longistylis* var. *villicaulis* Fernald – F, MC; = *Osmorrhiza longistylis* – S, misspelling]

Oxypolis Rafinesque 1825 (Dropwort, Hog-fennel, Cowbane)

A genus of about 7 species, herbs, of temperate North America. Based on work of Feist & Downie (2008), *Oxypolis* is likely to be split into two genera. References: Feist & Downie (2008); Mathias & Constance (1945)=MC; Kral (1981); Tucker et al. (1983).

1 Leaves with 1-13 leaflets, the leaflets flat; [***Oxypolis*** *s.s.*].
  2 Leaflets (5-) 7-11 (-13), pinnately disposed, usually toothed (rarely entire), net-veined ..... ***O. rigidior***
  2 Leaflets 1-3, entire, palmately disposed, parallel-veined ..... ***O. ternata***
1 Leaves reduced to hollow, linear, nodose-septate quills, consisting of the petiole and leaflet-less rachis, undivided; [***Tiedemannia***].
  3 Mature fruits with corky-thickened peripheral ribs, the fruit with a narrowly rectangular cross-section, about as thick near the ends of the ribs as at the center, 0.8-2 mm thick at the edge; plants with stoloniferous rhizomes 1-3 (-10) dm long; lower nodes often losing their leaves by flowering ; umbellets/umbel 5-9 (-12) ..... ***O. canbyi***
  3 Mature fruits with peripheral ribs progressively thinning away from the seed cavity, the fruit with a fusiform cross-section, distinctly thinner toward the ends of the ribs than at the center, 0.2 mm thick at the edge; plants with stout rhizomes or a caudex, not long stoloniferous; lower nodes generally retaining their leaves until flowering; umbellets/umbel 10-20
    4 Flowers white; segments of phyllodia cylindrical ..... ***O. filiformis***
    4 Flowers maroon; segments of phyllodia distinctly bulging ..... ***O. greenmanii***

Oxypolis canbyi (Coulter & Rose) Fernald, Canby's Cowbane. Cp (DE, GA, NC, SC): clay-based Carolina bays and other depressional wetlands; rare. July-August; August-September. Sw. GA through SC to se. NC (mostly in the middle and inner Coastal Plain); and from e. MD to (formerly) DE. See Tucker et al. (1983) for detailed information on this rare species and a comparison of it to the more widespread *O. filiformis*. [= C, F, G, K, MC; ***Tiedemannia***]

Oxypolis filiformis (Walter) Britton, Water Dropwort. Cp (FL, GA, NC, SC): wet savannas, sandhill seepages; common (uncommon north of FL). July-August; August-September. Se. NC south to s. FL, west to se. TX; West Indies. [= RAB, GW, K, MC, S; = *O. filiformis* ssp. *filiformis* – WH; ***Tiedemannia***]

Oxypolis greenmanii Mathias & Constance. Cp (FL): depression ponds, wet pine flatwoods; rare. Endemic to Bay, Calhoun, and Gulf counties, FL. [= K, MC; = *O. filiformis* (Walter) Britton ssp. *greenmanii* (Mathias & Constance) Judd – WH; ***Tiedemannia***]

Oxypolis rigidior (Linnaeus) Rafinesque, Cowbane, Pig-potato. Mt (GA, NC, SC, VA, WV), Pd (DE, GA, NC, SC, VA), Cp (DE, FL, GA, NC, SC, VA): bogs, seepages, swamps, wet meadows, streambanks; common (uncommon in FL and WV). August-October; October-November. NY west to MN and south to n. FL and TX. Very variable in the size and shape of the leaflets. [= RAB, C, G, GW, K, MC, W, WH; > *O. rigidior* var. *rigidior* – F, WV; > *O. rigidior* var. *ambigua* (Nuttall) Robinson – F, WV; > *O. rigidior* – S; > *O. turgida* Small – S]

Oxypolis ternata (Nuttall) A. Heller, Savanna Cowbane. Cp (FL, GA, NC, SC, VA): wet pine savannas, sandhill seepages; rare. September-October; October-November. Scattered from se. VA south to Panhandle FL; alleged occurrences in e. TX are based on misidentifications of narrow-leafleted forms of *O. rigidior* (Sorrie et al. 2003). Edmondson's (2005) change of the name to *O. denticulata* is incorrect; the type of *O. denticulata* is unquestionably *O. rigidior* (Feist 2009). [= *O. ternata* (Nuttall) A. Heller – RAB, C, F, G, GW, K, MC, S, WH; = *O. denticulata* (Baldwin) J.R. Edmondson, misapplied]

Pastinaca Linnaeus 1753 (Parsnip)

A genus of about 14 species, herbs, of temperate Eurasia. References: Mathias & Constance (1945)=MC.

* ***Pastinaca sativa*** Linnaeus, Parsnip. Mt (NC, SC, VA, WV), Pd (DE, NC, SC, VA), Cp (DE, NC, VA): roadsides, fields; common (uncommon in DE Piedmont, rare in DE Coastal Plain), native of Europe. June-July; July-August. [= RAB, C, F, K, MC, S, W, WV; > *P. sativa* var. *hortensis* Ehrhart – G; > *P. sativa* var. *sativa* – G]

Perideridia Reichenbach 1837

A genus of about 13 species, perennial herbs, mainly of w. North America. References: Mathias & Constance (1945)=MC.

Perideridia americana (Nuttall ex A.P. de Candolle) Reichenbach, Eastern Yampah. East to the Nashville Basin of c. TN (Davidson, Rutherford, Williamson, and Giles counties) (Chester, Wofford, & Kral 1997; Estes 2004). [= C, F, G, K, MC; = *Eulophus americanus* Nuttall ex A.P. de Candolle – S]

Petroselinum J. Hill 1756 (Parsley)

A genus of about 2 species, herbs, of Mediterranean Europe. References: Mathias & Constance (1945)=MC.

* ***Petroselinum crispum*** (P. Miller) Nyman ex A.W. Hill, Parsley, Garden Parsley. Cp (FL, SC), Pd (GA, NC): commonly cultivated in gardens, rarely persistent or weakly escaped, native of Mediterranean Europe. June-July. [= RAB, C, F, G, K, MC, WH; = *Apium petroselinum* Linnaeus – S]

Pimpinella Linnaeus 1753

A genus of about 150 species, herbs, of Europe and Africa. References: Mathias & Constance (1945)=MC.

* ***Pimpinella saxifraga*** Linnaeus *ssp.* ***saxifraga***, Burnet-saxifrage. Cp (DE), Pd (DE), Mt (VA, WV): fields and roadsides, disturbed areas; common (rare in VA), native of Eurasia. [= K, MC; < *P. saxifraga* – C, F, G]

Polytaenia A.P. de Candolle 1830

A genus of 2 species, herbs, of North America. References: Mathias & Constance (1945)=MC.

Polytaenia nuttallii A.P. de Candolle, Prairie-parsley. Prairies, glades. MI west to NE, south to TX and NM, occurring as a disjunct eastward in prairie-like or glade situations in MS and c. TN (Chester, Wofford, & Kral 1998). [= C, F, G, K, MC; = *Pleiotaenia nuttallii* (A.P. de Candolle) Coulter & Rose – S]

Pseudotaenidia Mackenzie 1903 (Mountain Pimpernel)

A monotypic genus, an herb, endemic to the central Appalachians. Although this species has been traditionally separated into a monotypic genus, *Pseudotaenidia*; Cronquist (1982) has suggested that *Pseudotaenidia* be submerged in *Taenidia*. Cronquist's argument that the two monotypes are most closely related to one another is very possibly correct and has been generally followed since, but awaits further assessment with molecular methods. References: Cronquist (1982)=Z; Mathias & Constance (1945)=MC.

Pseudotaenidia montana Mackenzie, Mountain Pimpernel, Shale-barren Pimpernel. Mt (VA, WV): shale barrens and rocky woodlands over shale, greenstone, calcareous sandstone, and other calcareous and mafic rocks; rare. May-June. A Central Appalachian endemic: w. VA and e. WV north to sc. PA. [= F, G, MC, W, WV; = *Taenidia montana* (Mackenzie) Cronquist – C, K, Z]

Ptilimnium Rafinesque 1819 (Bishopweed, Harperella)

A genus of 5 species, annual and perennial herbs, temperate, of e. North America. Based on work of Feist & Downie (2008), *Ptilimnium* should be re-split into two genera, *Harperella* and *Ptilimnium s.s.* References: Feist (2010)=V; Feist & Downie (2008); Easterly (1957)=Z; Kral (1981a)=Y; Rose (1911)=X; Mathias & Constance (1945)=MC; Weakley & Nesom (2004)=Q; Kress, Maddox, & Roesel (1994).

1 Leaves reduced to hollow, linear, nodose-septate quills, consisting of the petiole and leaflet-less rachis, undivided..... [see ***Harperella***]
1 Leaves dissected into filiform or linear segments.

2 Styles on fruit (0.8-) 1-2 mm long; plant perennial from a small rounded corm at base of stem; rachis of mid-stem leaves with (8-) 10-16 nodes, each node frequently bearing >4 whorled segments; flowering July-October; fruiting mid July-October; fruits 2.2-4 mm long..... ..... ***P. costatum***

2 Styles on fruit 0.1-0.6 mm long; plant annual; rachis of mid-stem leaves with 2-10 nodes, each bearing 1-3 segments; flowering April-August; fruiting late May-September; fruits 1.0-4.2 mm long.

3 Styles on fruit (0.3-) 0.4-0.6 mm long; rachis of mid-stem leaves with 2-4 (-5) nodes; fruits 1.0-1.9 mm long ..... ***P. nuttallii***

3 Styles on fruit 0.1-0.2 mm long; rachis of mid-stem leaves with <10 nodes.; fruits 1.4-4.2 mm long

4 Fruits 2.7-4.2 mm long; umbellets usually 5-7 per umbel; flowers usually 5-7 (-8) per umbellet; bracts subtending the umbels and umbellets with 1 (-3) linear segments; leaf segments of mid-stem leaves 15-30 (40), capillary to linear, 0.5-1.9 mm wide; flowering May-early June; fruiting late May-July; [plants of tidal marshes]..... ***P. ahlesii***

4 Fruits 1.4-2.0 mm long; umbellets usually 10 or more per umbel; flowers usually 10 or more per umbellet; bracts subtending the umbel and umbellets with (1-) 3-5 linear segments; leaf segments of mid-stem leaves 50 or more, capillary, usually < 0.5 mm wide (except in submersed leaves); flowering June-August, fruiting July-September; [plants of a wide variety of wet habitats, including tidal marshes]..... ***P. capillaceum***

Ptilimnium ahlesii Weakley & Nesom, Carolina Bishopweed, Coastal Bishopweed. Cp (GA, NC, SC): tidal freshwater marshes; rare. May-June; Late May-July. This species, recognized but not validly named by H.E. Ahles, ranges from se. NC (Onslow, New Hanover, and Brunswick counties) south through SC to e. GA. The lowermost leaves (withering prior to fruiting) sometimes lack leaflets and thus approach in appearance the quill-leaves of *P. fluviatile* and *P. nodosum*. Feist (2010) expresses doubt as to its distinctiveness. [= Q; < *P. capillaceum* – RAB, V; = *P. macrospermum* – K, nomen nudum]

Ptilimnium capillaceum (Michaux) Rafinesque, Eastern Bishopweed, Atlantic Bishopweed. Cp (DE, FL, GA, NC, SC, VA), Pd (GA, NC, SC, VA): ditches, marshes, other wet places; common. June-August; July-September. MA, NY, and MO south to s. FL and TX. [= RAB, C, F, G, GW, K, MC, Q, S, W, WH, Z; < *P. capillaceum* – RAB, V]

Ptilimnium costatum (Elliott) Rafinesque, Big Bishopweed. Cp (NC), Pd (GA), Mt (GA): tidal freshwater marshes (NC), wet prairies (GA), bottomland hardwood forests (GA); rare. July-October; mid July-October. Se. NC south to GA, and west to IL, MO, and AR (material from LA and TX is of *P. texense*); it is rare and disjunct through much of that range. It has the potential to be a great deal larger and coarser than any other member of the genus, but individuals will be encountered no larger than a fairly robust plant of *P. ahlesii* or *P. capillaceum*. [= RAB, C, F, G, GW, K, MC, Q, S, V, Z]

Ptilimnium nuttallii (A.P. de Candolle) Britton, Midwestern Bishopweed. Cp (AL): marshes, distches, wetlands; rare. April-July; late May-early August. KY, MO, and KS south to se. TN (Chester, Wofford, & Kral 1997), s. AL, s. LA, and e. TX. [= C, F, G, GW, K, MC, Q, S, V, Z]

Sanicula Linnaeus 1753 (Sanicle, Snakeroot)

A genus of about 40 species, herbs, nearly cosmopolitan. References: Pryer & Phillippe (1989)=Z; Mathias & Constance (1945)=MC. Key based in part on Z.

Identification note: *Sanicula* species cannot be reliably determined from sterile plants. Fruits or flowers are required for identification of *Sanicula* species. An important character is the length of the styles in relation to the calyx and/or to the bristles on the fruit. In the longer-styled species, the styles are slender and curved outward, sometimes enmeshed in the bristles, but distinctly longer than them or than the calyx. In the shorter-styled species, the styles are straight to slightly curved, shorter than or about as long as the bristles, and more or less included in the calyx. In most species the calyx is inconspicuous, but consists of 5 deltoid to narrowly triangular (or even subulate) calyx lobes, 0.4-2.0 mm long, at the summit of the schizocarp (the fruit).

1 Styles 1.5× or more as long as the calyx; umbellets dimorphic – some contain both perfect and staminate flowers, while others contain staminate flowers only (except sometimes *S. canadensis* var. *grandis*, which may have polygamous umbellets only).

2 Calyx lobes 0.4-0.7 mm long, deltoid, flexible or weak in texture, the apices acute to obtuse; petals yellowish green, much longer than the calyx ..... ***S. odorata***

2 Calyx lobes 0.7-2.0 mm long, narrowly triangular to subulate, rigid in texture, the apices acute-acuminate; petals white or greenish-white, equal to or slightly longer than the calyx.

3 Styles about 1.5× as long as the calyx, inconspicuously exserted from between the calyx lobes and recurved; umbellets usually polygamous (rarely some staminate only); polygamous umbellets with 6-18 flowers (3 perfect and 3-15 staminate); fruit with a short but distinct pedicel 0.5-1.0 mm long; bases of fruit bristles dilated but not bulbous, often minutely papillose ..***S. canadensis*** *var.* ***grandis***

3 Styles > 2× as long as the calyx, conspicuously exserted from the calyx and recurved; umbellets dimorphic, some polygamous and others staminate only; polygamous umbellets with 12-120 flowers (3-4 perfect and the remainder staminate); fruits sessile to subsessile; bases of fruit bristles prominently bulbous, with a minutely warty-reticulate surface pattern ..... ***S. marilandica***

1 Styles shorter than (or rarely as long as) the calyx; umbellets usually monomorphic (all containing both perfect and staminate flowers), with staminate flowers 1-7 per umbellet.

4 Sepals on mature fruit connivent, forming a beak-like structure equaling or usually exceeding the adjacent fruit bristles, the tips of the sepals subulate and incurved; pedicels of staminate flowers 3-8 mm long; [mostly of the Mountains in our area, rarely in the Piedmont of VA]..... ***S. trifoliata***

4 Sepals on mature fruit somewhat spreading, loose, inconspicuous and immersed in the adjacent fruit bristles, the tips of the sepals acute or narrowly acute, straight; pedicels of staminate flowers 1-2 (-3) mm long; [collectively widespread in our area].

5 Plant a perennial, from thickened, cordlike roots; umbellets with 7-9 flowers (3 perfect and 4-6 staminate)..... ***S. smallii***

5 Plant a biennial, from slender, fibrous roots; umbellets with 4-6 flowers (3 perfect and 1-3 staminate).

6 Larger leaves mostly 8-15 cm across; leaf teeth weak, hyaline; [widespread in our area, mostly not in the Coastal Plain south of VA]. ..... ***S. canadensis*** *var.* ***canadensis***

6 Larger leaves mostly 3-8 cm across, thick in texture; leaf teeth stiff, sharp, and prominently whitened; [of the Coastal Plain in our area].....***S. canadensis** var. **floridana***

Sanicula canadensis Linnaeus *var.* ***canadensis***, Canada Sanicle, Black Snakeroot. Mt (GA, NC, SC, VA, WV), Pd (DE, GA, NC, SC, VA), Cp (DE, FL, GA, NC, SC, VA): dry-mesic to mesic forests; common. April-May; June-July. VT and s. ON west to MN and SD, south to Panhandle FL and e. TX. [= F, G, Z; < *S. canadensis* – RAB, C, MC, W, WH, WV; < *S. canadensis* var. *canadensis* – K; = *S. canadensis* – S]

Sanicula canadensis Linnaeus *var.* ***floridana*** (Bicknell) H. Wolff, Florida Sanicle, Florida Snakeroot. Cp (FL, GA, NC, SC, VA): dry-mesic to mesic, sandy forests, often associated with *Fagus grandifolia* (and southward *Magnolia grandiflora*); common (uncommon north of GA). April-May; June-July. Se. VA south to c. peninsular FL, west to s. MS, in the Coastal Plain. Additional differences between var. *floridana* and var. *canadensis* should be investigated. They may not be worthy of taxonomic differentiation. [= F, G; < *S. canadensis* – RAB, C, MC, WH; < *S. canadensis* var. *canadensis* – K; = *S. floridana* Bicknell – S]

Sanicula canadensis Linnaeus *var.* ***grandis*** Fernald, Large Sanicle. Mt (NC?, VA?, WV): {herbarium work, and information on habitats, rarity, phenology}. VT and n. NY west to s. ON, WI, se. MN, and n. IA, south to PA, n. WV, n. KY, c. IL, and allegedly south in the Mountains to VA and/or NC. [= F, K, Z; < *S. canadensis* – RAB, C, MC, W, WV]

Sanicula marilandica Linnaeus, Maryland Sanicle. Mt (GA, NC, SC, VA, WV), Cp (FL, GA, NC, SC, VA), Pd (DE, NC, SC, VA): mesic to dry-mesic nutrient-rich forests; common (uncommon in Coastal Plain, uncommon in WV, rare in DE). May-June; July-August. QC and NL (Newfoundland) west to BC, south to Panhandle FL, se. LA, NM, and WA. The Coastal Plain populations (designated as var. *petiolulata* by Fernald) are disjunct from the main range of distribution, occur in rather different (more acidic) habitats, and warrant additional study. The primary morphological difference indicated by F is that var. *petiolulata* has "the leaflets of 1 or 2 lower cauline leaves on petiolules 1.5-5 cm long" (vs. sessile or short-petiolulate). [= RAB, C, K, MC, W, WH, WV, Z; > *S. marilandica* var. *marilandica* – F, G; > *S. marilandica* var. *petiolulata* Fernald – F, G; = *S. marylandica* – S, orthographic variant]

Sanicula odorata (Rafinesque) K.M. Pryer & L.R. Phillippe, Clustered Sanicle, Clustered Snakeroot. Mt (GA, NC, SC, VA, WV), Pd (DE, GA, NC, SC, VA), Cp (DE, FL, GA, NC, SC, VA): mesic to dry-mesic nutrient-rich forests; uncommon. May-June; June-July. NS and QC west to MN and e. SD, south to Panhandle FL and e. TX. [= K, WH, Z; = *S. gregaria* Bicknell – RAB, C, F, G, MC, S, W, WV]

Sanicula smallii Bicknell, Southern Sanicle, Small's Sanicle. Pd (Ga, NC, SC, VA), Mt (GA, NC, SC, VA, WV), Cp (FL, GA, NC, SC, VA): mesic to dry-mesic forests; common (uncommon in Coastal Plain, rare in FL and WV). April; May-June. C. VA, sw. VA, s. WV, KY, se. MO, south to Panhandle FL, se. LA, c. LA, and e. TX. [= RAB, C, F, G, K, MC, S, W, WH]

Sanicula trifoliata Bicknell, Beaked Sanicle, Large-fruited Sanicle. Mt (GA, NC, SC, VA, WV), Pd (DE, VA): cove forests, other mesic, nutrient-rich forests; common (rare in Piedmont, rare in GA). May; June-July. QC and VT west to s. WI and se. MN, south to n. VA, w. NC, n. GA, c. TN, c. IL, and ne. IA. [= RAB, C, F, G, K, MC, S, W, WV, Z]

Scandix Linnaeus 1753 (Venus'-comb)

A genus of about 15-20 species, herbs, temperate, of Eurasia. References: Mathias & Constance (1945)=MC.

* ***Scandix pecten-veneris*** Linnaeus, Venus'-comb, Shepherd's-needle. Pd (GA, NC, SC), Cp (FL): roadsides, fields, disturbed areas; rare, native of Mediterranean Europe. March-April. [= RAB, C, G, K, MC, S, WH]

Sium Linnaeus 1753 (Water-parsnip)

A genus of about 14 species, herbs, of the northern hemisphere. References: Mathias & Constance (1945)=MC.

Sium suave Walter, Water-parsnip. Cp (DE, FL, GA, NC, SC, VA), Pd (DE, GA, NC, SC, VA), Mt (NC, SC, VA, WV): freshwater marshes, brackish marshes, swamp forests; uncommon (rare in Piedmont south of DE, rare in Mountains). June-August; August-October. NL (Newfoundland) west to AK and Siberia, south to Panhandle FL, n. peninsular FL, and CA. The plant can be very coarse, up to 3 m in height and the stem to 5 cm in diameter. The taxonomic status of *Sium floridanum* Small, known from se. VA south to GA, needs additional investigation; it is probably just a depauperate shade form. [= RAB, C, K, W, WH, WV; > *S. suave* – F, G, GW, MC; > *S. floridanum* Small – F, G, GW, MC, S; > *S. cicutaefolium* Schrank – S]

Smyrnium Linnaeus 1753

A genus of ca. 7 species, herbs, native of Europe.

* ***Smyrnium perfoliatum*** Linnaeus. Mt (AL): moist forests; rare, introduced. Found in a mesic forest in Cherokee County, AL, apparently introduced via seed in nursery material (Keener 2007).

Spermolepis Rafinesque 1825 (Spermolepis)

A genus of 5 species, herbs, of North America, Argentina, and Hawaii. References: Mathias & Constance (1945)=MC.

1 Ovary and fruit with hooked bristles.....***S. echinata***
1 Ovary and fruit smooth or tubercled.
2 Primary rays of the umbel widely spreading to weakly ascending, not greatly differing in length .....***S. divaricata***
2 Primary rays of the umbel strongly ascending, differing conspicuously in length.....***S. inermis***

Spermolepis divaricata (Walter) Rafinesque ex Seringe, Southern Spermolepis, Roughfruit Spermolepis. Cp (FL, GA, NC, SC, VA), Pd (GA, SC): sandy roadsides, disturbed areas; common. April-May; May-June. VA south to s. FL, west to TX, and north in the interior to KS and MO. Apparently native in our area, though weedy in behavior, and perhaps introduced only in VA. [= RAB, C, G, GW, K, MC, S, WH]

* ***Spermolepis echinata*** (Nuttall ex A.P. de Candolle) Heller, Bristlefruit Spermolepis, Hooked Spermolepis. Cp (FL, GA, SC, VA): sandy roadsides, disturbed areas; common (rare in GA, SC, VA), native of sc. United States. April; May. [= RAB, C, F, G, K, MC, S, WH]

Spermolepis inermis (Nuttall ex A.P. de Candolle) Mathias & Constance, Western Spermolepis. Mt (GA), Cp (NC*): calcareous prairies in the Mountains (GA), disturbed areas in the Coastal Plain (NC); rare (GA Rare), northeastward in our area native of sc. United States. April; May. [= RAB, C, F, G, K, MC; *? S. patens* (Nuttall ex A.P. de Candolle) B.L. Robinson – S]

Taenidia (Torrey & A. Gray) Drude 1898 (Yellow Pimpernel)

A monotypic genus (unless *Pseudotaenidia* is included), an herb, temperate, of e. North America. References: Mathias & Constance (1945)=MC. [also see *Pseudotaenidia*]

Taenidia integerrima (Linnaeus) Drude, Yellow Pimpernel. Pd (DE, GA, NC, SC, VA), Mt (GA, NC, SC, VA, WV), Cp (VA): in rocky, dry to dry-mesic forests and woodlands over mafic or calcareous rock, such as diabase, amphibolite, calcareous siltstone, calcareous shale, or limestone; common (uncommon in NC and SC, rare in DE). April-May; May-June. QC, ON, MN, and SD south to c. GA, AL, MS, LA, and TX. [= RAB, C, F, G, K, MC, S, W, WV]

Thaspium Nuttall 1818 (Meadow-parsnip)

A genus of 3-4 species, herbs, temperate, of e. North America. References: Mathias & Constance (1945)=MC; Cooperrider (1985)=Z; Coulter & Rose (1900)=Y.

Identification notes: Because *Thaspium* and *Zizia* are often confused when not in fruit, a combined key emphasizing vegetative characters has been provided; it may also be helpful to use the key to genera, and if a clear answer is obtained, then use the *Thaspium-Zizia* combined key, skipping taxa of the "wrong" genus

1 Leaves 3-4-ternate, the very numerous ultimate segments 1-3 mm wide; petals white (fading to yellowish tan in older herbarium material).....***Thaspium pinnatifidum***
1 Leaves simple, 3-foliolate, or 2-3-ternate, the final leaflets or segments > 5 mm wide; petals yellow, maroon, or pale yellow.
2 Basal leaves 2-ternate or more divided.
3 Leaflets coarsely and rather lacerately serrate or incised, many of the teeth at least 2 mm long as measured on the shorter side; umbel rays 8-10, < 3.5 cm long even in fruit; petals pale to creamy yellow .....***Thaspium barbinode***
3 Leaflets finely to coarsely serrate, but not lacerate or incised, few if any of the teeth > 2 mm long as measured on the shorter side; umbel rays mostly either more in number or longer; petals golden yellow.
4 Teeth of the leaflets fine, averaging (4-) 5-10 per cm of margin, acuminate (the 2 sides making an angle of about 45 degrees); umbel rays (8-) 10-18, in fruit 2.5-4 (-5) cm long; basal leaves many-foliolate, the leaflets mostly acuminate; fruit ca. 2× as long as wide .....***Zizia aurea***
4 Teeth of the leaflets coarse, averaging (1-) 2-3 (-4) per cm of margin, acute to obtuse (the 2 sides making an angle of about 90 degrees); umbel rays 4-10 (-12), the longest to 11 cm long in fruit (some on a plant at least 5 cm long); basal leaves 3-5 (-7)-foliolate, the leaflets mostly rounded to obtuse at the apex; fruit 1-1.5× as long as wide.....***Zizia trifoliata***
2 Basal leaves simple or 3-foliolate.
5 Teeth of the leaflets coarse, averaging 2-3 (-4) per cm of margin, the long side of most of the teeth 2-10 mm long; basal leaves mostly 3-foliolate (or more divided); middle and upper stem leaves equally or more divided than the basal leaves (the most divided leaves usually those of the mid-stem).....***Zizia trifoliata***
5 Teeth of the leaflets fine, averaging 4-10 per cm of margin, the long side of most of the teeth 0.5-2 (-4) mm long; basal leaves simple (and cordate) or 3-foliolate; middle and upper stem leaves 3-foliolate (rarely simple).
6 Teeth relatively acute, without a well-developed callous tip and a thickened, translucent border (use 10×); lower portion of stem puberulent, the upper nodes also usually puberulent (use 10×); leaf margins often ciliolate; umbel rays 7-15; flowers golden yellow.....***Zizia aptera***
6 Teeth relatively obtuse, with a well-developed callous tip and a thickened, translucent border (use 10×); lower portion of stem glabrous, the upper nodes sometimes minutely roughened; leaf margins glabrous and hyaline; umbel rays 4-10 (-11); flowers maroon or golden yellow.
7 Flowers golden yellow .....***Thaspium trifoliatum* *var.* *aureum***
7 Flowers dark maroon.....***Thaspium trifoliatum* *var.* *trifoliatum***

Thaspium barbinode (Michaux) Nuttall. Mt (GA, NC, SC, VA), Pd (DE, GA, NC, SC, VA), Cp (GA, NC, SC, VA): moist forests; common (rare in DE). April-May; July-August. NY and ON west to IA, south to c. GA, c. AL, and ne. MO. The hispid, purple-tinged leaf sheath is a good additional character for this species. [= RAB, S, W; = *Th. barbinode* var. *barbinode* – F, Y; < *Th. barbinode* – C, G, K, MC, WV, Z (also see *Th. chapmanii*)]

Thaspium pinnatifidum (Buckley) A. Gray. Mt (GA, NC): forests and woodlands over calcareous rock, such as limestone, dolostone, or calcareous siltstone); rare. May-June; June-July. KY south to w. NC, e TN (Chester, Wofford, & Kral 1997), and n. AL. The report from VA is of unknown documentation. The distribution and rarity of this plant is complicated because of confusion with *Th. chapmanii*. [= RAB, C, F, G, K, MC, S, W, Y, Z]

Thaspium trifoliatum (Linnaeus) A. Gray *var.* ***aureum*** (Linnaeus) Britton. Mt (NC, SC, VA), Pd (NC, SC, VA), Cp (NC, SC, VA), {GA}: moist forests; uncommon (rare in Coastal Plain). April-May; July-August. NY west to MN, south to SC, AL, AR, and se. KS. Various workers have differed on the characters used to separate two varieties in *T. trifoliatum*. RAB and C separate the two strictly on petal color; F, however, allows var. *aureum* to sometimes have purple petals, seeming to regard the critical differences to be var. *aureum*'s generally more robust size and larger fruits (4.5 mm long vs. 3-4 mm long). It is presently not clear how two varieties should be separated, or, indeed, if varieties are warranted. Though the ranges overlap, var. *aureum* is generally more northern and western, var. *trifoliatum* more southern and eastern. [= K, S, Y; = *T. trifoliatum* var. *flavum* Blake – RAB, C, F, MC, W, WV, Z; < *T. trifoliatum* – G]

Thaspium trifoliatum (Linnaeus) A. Gray *var.* ***trifoliatum***. Mt (NC, SC, VA), Pd (NC, SC, VA), Cp (FL, NC, SC, VA), {GA}: moist forests; common (rare in Coastal Plain). April-May; July-August. NJ, PA, and MO, south to Panhandle FL and LA. [= RAB, C, F, K, MC, S, W, WV, Y, Z; < *T. trifoliatum* – G]

Thaspium chapmanii (Coulter & Rose) Small. Mt (GA, WV), Pd (GA), Cp (FL, GA): calcareous bluffs; rare. Sw. PA, s. ON, s. MI, sw. WI, and s. MN south to Panhandle FL and e. TX. [= *T. barbinode* var. *angustifolium* Coulter & Rose – F; < *Th. barbinode* (Michaux) Nuttall – C, G, K, MC, WH, WV, Z; > *Th. barbinode* var. *angustifolium* – Y; > *Th. barbinode* var. *chapmanii* Coulter & Rose – Y] {not yet keyed}

Torilis Adanson 1763 (Hedge-parsley, Bur-parsley)

A genus of about 15 species, herbs, temperate, of the Old World. References: Mathias & Constance (1945)=MC.

1 Rays reduced or absent, < 5 mm long, the inflorescence therefore compact, appearing like a head; inflorescences opposite the leaves, on peduncles 0-1 (-2) cm long; mericarps dimorphic, one with spines, the other tuberculate..... ***T. nodosa***
1 Rays and pedicels well-developed, > 5 mm long, the inflorescence therefore open, distinctly and obviously an umbel; inflorescences opposite the leaves and terminal, on peduncles (1-) 3-16 cm long; mericarps monomorphic, both with spines.
2 Involucral bracts 0-1; fruits 3-4 mm long (not including the spines); spines straight or nearly so, with a minute hook at the tip ..... ***T. arvensis***
2 Involucral bracts >2, generally 1 per ray; fruits 2-2.5 mm long (not including the spines); spines curved, not hooked at the tip..... ***T. japonica***

* ***Torilis arvensis*** (Hudson) Link, Spreading Bur-parsley, Field Hedge-parsley. Mt (GA, NC, VA, WV), Cp (FL, GA, SC, VA), Pd (GA, NC, SC, VA): roadsides, fields, disturbed areas; uncommon (rare in WV), native of Europe. May-June. [= RAB, C, MC, W; > *T. arvensis* ssp. *arvensis* – K]

* ***Torilis japonica*** (Houttuyn) A.P. de Candolle. Mt (VA, WV), Pd (VA), Cp (VA): disturbed areas; uncommon (rare in VA), native of Eurasia, naturalized south to se. PA and VA. [= C, F, G, K, MC, WV; = *T. anthriscus* (Linnaeus) Gmelin]

* ***Torilis nodosa*** (Linnaeus) Gaertner, Knotted Bur-parsley. Cp (GA?, NC, SC): disturbed areas; rare, native of Mediterranean Europe. May. [= RAB, G, K, MC, S]

Trepocarpus Nuttall ex A.P. de Candolle 1829

A monotypic genus, an herb, temperate, of se. United States. References: Mathias & Constance (1945)=MC.

Trepocarpus aethusae Nuttall ex A.P. de Candolle. Cp (FL), Pd (SC), ?? (GA): rich moist forests, sometimes weedy in disturbed soils; rare. May-June. C. SC south to Panhandle FL and AL, west to e. TX, north in the interior to w. TN, w. KY, AR, and se. OK. Nelson (1993) states that despite "something of a reputation as a rarity," *Trepocarpus* is "a reasonably successful weed." [= RAB, C, GW, K, MC, WH]

Zizia W.D.J. Koch 1825 (Golden-Alexanders)

A genus of about 4 species, herbs, temperate, of North America. References: Mathias & Constance (1945)=MC; Cooperrider (1985)=Z.

[see combined key to *Thaspium* and *Zizia* under *Thaspium*]

Zizia aptera (A. Gray) Fernald, Heartleaf Golden-Alexanders. Mt (GA, NC, SC, VA, WV), Pd (DE, GA, NC, SC, VA), Cp (FL, GA, NC, SC, VA): moist forests, openings, and woodland edges; common (rare in Coastal Plain, rare in DE). April-May;

July-August. NY west to BC, south to GA, Panhandle FL, MO, and CO. [= RAB, F, G, GW, K, MC, W, WH, WV, Z; > *Z. aptera* var. *aptera* – C; = *Z. cordata* W.D.J. Koch ex A.P. de Candolle – S]

Zizia aurea (Linnaeus) W.D.J. Koch, Common Golden-Alexanders. Mt (GA, NC, SC, VA, WV), Pd (DE, GA, NC, SC, VA), Cp (FL, GA, NC, SC, VA): moist forests; common (uncommon in WV, rare in Coastal Plain, rare in DE). April-May; June-July. NB west to SK, south to sw. GA, Panhandle FL, and e. TX. [= RAB, C, F, G, GW, K, MC, S, W, WH, WV, Z]

Zizia trifoliata (Michaux) Fernald, Mountain Golden-Alexanders. Mt (GA, NC, SC, VA, WV), Pd (GA, NC, SC, VA), Cp (FL, GA, NC, SC, VA): moist forests, woodlands, and woodland borders; common (rare in Coastal Plain). April-May; July-August. VA and WV west to AR, south to n. peninsular and Panhandle FL. [= RAB, C, F, G, GW, K, W, WH, WV; > *Z. trifoliata* – MC; > *Z. latifolia* Small – MC, S; > *Z. bebbii* (Coulter & Rose) Britton – S]

AUXILIARY KEYS

Key to *Maianthemum (RUSCACEAE)*, *Polygonatum (RUSCACEAE)*, *Prosartes (LILIACEAE)*, *Streptopus (LILIACEAE)*, and *Uvularia (COLCHICACEAE)*, emphasizing vegetative features

1 Leaves perfoliate.
  2 Leaves puberulent beneath (or rarely glabrate); leaves below the fork (0-) 1 (-2); tepals glabrous within; ..... ***Uvularia grandiflora***
  2 Leaves glabrous and often glaucous beneath; leaves below the fork 2-4; tepals conspicuously granular-papillose within..... ***Uvularia perfoliata***
1 Leaves sessile (though sometimes slightly to strongly clasping).
  3 Stem branched.
    4 Stem brown, wiry, puberulent; distalmost 2 leaves on each branch approximate to one another (sometimes subopposite) and with noticeably oblique bases; flowers and fruits terminal on the branches.
      5 Leaf glabrous on the surface above (except for sparsely pubescent on the midrib and main veins), densely pubescent on the midrib below, sparsely pubescent on the surface below; leaf pubescence weak, often twisted or curled apically (as seen at 10-20× magnification), the leaf therefore very soft to the touch; fruit glabrous, ellipsoid, weakly triangular in cross-section, the surface smooth and shiny, red when ripe; tepals greenish, unspotted; leaves relatively many and small..... ***Prosartes lanuginosa***
      5 Leaf sparsely pubescent on the surface and veins above and below; leaf pubescence stiff, generally straight and perpendicular to the surface (as seen at 10-20× magnification), the leaf therefore slightly rough to the touch; fruit pubescent, strongly 3-lobed (or 1- or 2-lobed by abortion), the surface textured and dull, whitish-tan when ripe; tepals whitish, spotted with purple; leaves relatively few and large..... ***Prosartes maculata***
    4 Stem green, not wiry, glabrous; distalmost 2leaves on each branch no closer together than other leaves, with symmetrical bases; flowers (and fruits) **either** terminal on the branches **or** solitary and axillary to most leaves.
      6 *Streptopus*
        7 Leaf margins and nodes not coarsely ciliate; leaves strongly cordate-clasping; fruit ellipsoid..... ***Streptopus amplexifolius*** *var.* ***amplexifolius***
        7 Leaf margins and nodes coarsely ciliate; leaves sessile to somewhat cordate-clasping (especially the lower leaves of robust individuals); fruit globose ..... ***Streptopus lanceolatus*** *var.* ***lanceolatus***
      6 *Uvularia*
  3 Stem simple.

Maianthemum

Polygonatum

1 Leaves pubescent on the veins beneath; flowers 7-13 mm long ..... ***Polygonatum pubescens***
1 Leaves glabrous; flowers 12-21 mm long.
  2 Stem slender, 1.5-5 mm in diameter; plants to 9 dm tall; lower axillary peduncles terete or nearly so, with (1-) 2-3 (-5) flowers; lowest peduncle in the axil of the (1st-) 3rd (-5th) axil; larger leaves 5.5-15 cm long, 1.2-6 cm wide; lower leaves clasping to 90° (-180°)..... ***Polygonatum biflorum*** *var.* ***biflorum***
  2 Stem robust, 5-13 mm thick below the leaves; plants to 20 dm tall; lower axillary peduncles strongly flattened, with (2-) 3-6 (-15) flowers; lowest peduncle in the axil of the (3rd-) 4th-5th (-8th) leaf; larger leaves 9-25 cm long, 3.5-13 cm wide; lower leaves clasping to 300° ..... ***Polygonatum biflorum*** *var.* ***commutatum***

Uvularia

1 Leaves sessile, the margins scarious and minutely papillose-denticulate; [section *Oakesiella*].
  3 Undivided portion of the style 0.5-1× as long as the style branches; upper stem and lower leaf surfaces puberulent to glabrous, light green; rhizome very short, with clustered, thickened roots.
    4 Leaves cuneate at base, thin in texture, faintly reticulate on the undersurface, glabrous (rarely puberulent becoming glabrate); stems usually glabrous; [of the Coastal Plain and Piedmont]..... ***U. puberula*** *var.* ***nitida***
    4 Leaves broadly rounded to somewhat clasping at base, firm in texture, obviously reticulate on the undersurface, puberulent (sometimes becoming glabrate); stems usually minutely puberulent in lines; [of the Mountains and Piedmont]..... ***Uvularia puberula*** *var.* ***puberula***
  3 Undivided portion of the style 3-5× as long as the style branches; upper stem and lower leaf surfaces glabrous, usually also glaucous; rhizome elongate, with scattered, fibrous roots.
    5 Pedicel bearing a sessile, leaf-like bract 5-17 mm below the flower; capsule sessile at base, conspicuously beaked at apex ..... ***Uvularia floridana***
    5 Pedicel bractless; capsule on a stalk 2-4 (-6) mm long, not beaked..... ***Uvularia sessilifolia***

1 Flowers in a terminal panicle ..... ***Maianthemum racemosum ssp. racemosum***
1 Flowers in a simple raceme.
2 Perianth segments 4 (flowers 2-merous); leaves (1-) 2 (-3)..... ***Maianthemum canadense***
2 Perianth segments 6 (flowers 3-merous); leaves 6 or more ..... ***Maianthemum stellatum***

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